DEPARTMENT OF VETERANS AFFAIRS MEDICAL CENTER

RENOVATE & EXPAND SPACE FOR PATIENT SUPPORT AREAS

VA Project No.: 636-311

Specifications

Construction Documents

Date: December 5, 2014

Prepared by:

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ARCHITECTURE + ENGINEERING

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Division 01

General Requirements

Division 01

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SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

A. Contractor shall completely prepare site for building operations, including demolition and partial removal of existing structures, and furnish labor and materials and perform work for “Renovate and Expand Space for Patient Support Services” as required by drawings and specifications.

B. Visits to the site by Bidders shall be at the pre-bid conference only. Any additional visits shall be approved by the Contracting Officer and arranged with the Project Manager.

C. Offices of Shive-Hattery, 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 Project Manager in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the Project Manager.

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. The contractor’s CP must have the 30-hour OSHA certified Construction Safety course or other relevant competency training as determined by VA CP with input from the ICRA team.

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. Specialty trades foreman, i.e. Electrical, Mechanical, Structural, and Site Development, shall have, as a minimum, the 30-hour OSHA certified Construction Safety course and/or other relevant competency training. Other specialty work, i.e. scaffolding, crane operation, excavation, etc.

shall have pertinent training certificates associated with the work performed.

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

1.2 STATEMENT OF BID ITEM(S)

A. BASE BID (BID ITEM 1): Contractor to provide all labor, materials, tools, equipment, supplies and supervision necessary to perform work according to contract documents for Minor Project 636-311, "Renovate and Expand Space for Patient Support Areas."

B. BID ITEM 2 (Deduct Alternate No. 1: Building 2, Second Floor: Facility Design and Safety Furnishings): Base Bid minus all furnishings on second floor. Reference sheet 2-A10a – LEVEL 2 CONTRACT FURNITURE PLAN.

C. BID ITEM 3 (Deduct Alternate No. 2: Building 2, First Floor: Human Recourses Furnishings): All work described in Bid Item 2 minus all furnishings on first floor. Reference sheet 2-A9a – LEVEL 1 CONTRACT FURNITURE PLAN.

D. BID ITEM 4 (Deduct Alternate No. 3: Building 2: Paint in lieu of wood panel wall): All work described in Bid Item 3 minus wood paneling in Lobby, 1C02 and 2C01. Paint to be chosen by Architect. Reference elevations on Sheet 2-A11.

E. BID ITEM 5 (Deduct Alternate No. 4: Building 2: Eliminate Liquid Nitrogen Storage space): All work described in Bid Item 4 minus all work associated with the Liquid Nitrogen Storage Room. Finish resulting space to match Human Resources, 114.

F. BID ITEM 6 (Deduct Alternate No. 5: Building 2: Masonry in lieu of precast frames): All work described in Bid Item 5 minus precast framing around exterior curtain wall. Reference alternate elevations on Sheet 2-A3.

G. BID ITEM 7 (Deduct Alternate No. 6: Building 2 – First Floor: Asphalt in lieu in concrete): All work described in Bid Item 6 minus concrete paving. Asphalt to be used for paved surfaces as indicated on Civil drawings. Reference sheet 2-C5 – SITE PAVING AND RESTORATION PLAN.

H. BID ITEM 8 (Deduct Alternate No. 7: Building 2: Remove parking lot from project): All work described in Bid Item 7 minus East portion of parking lot as indicated on Civil drawings. Reference sheet 2-C5 – SITE PAVING AND RESTORATION PLAN.

I. BID ITEM 9 (Deduct Alternate No. 8: Building 2: 15kv switchgear and existing vault MH2 shall remain as installed): All work described in Bid Item 8 minus The existing 15kv cable feed (HV1) between existing building 7 15kv switchgear and existing vault MH2 shall remain as installed.

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

A. AFTER AWARD OF CONTRACT, 0 sets of specifications and drawings will be

furnished.

B. Additional sets of drawings may be made by the Contractor, at Contractor's expense at FedBizOps website (FBO.gov).

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. Regular Work Hours: Contractor shall perform work between the hours of 7:00 a.m. and 4:00 p.m. local time Monday through Friday unless otherwise stated on the drawings or in these specifications. No work shall be performed on Federal government holidays or outside these times except for short-term deviations granted through advance arrangements with the VA Project Manager.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor’s employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Project Manager for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action. A minimum of two keys per lock must be provided to the Project Manager. One set of keys provided shall be turned over to the VA Police for emergency access.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith, in the presence of the Project Manager, for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.

3. All Contractor and Sub-Contractor employees who will need after hour access to the Medical Center will need to be sponsored prior to beginning work to receive Non-PIV badges. The process to obtain badges takes a minimum of 14-21 days. Contractor employee will need to be sponsored by a VA employee, have fingerprints taken, picture taken, prior to pick-up of badge. Badge is NOT transferable to anyone else. Should a contractor employee be found in the possession of an unauthorized non-PIV badge, that contractor employee is guilty of unlawful dissemination of federal identification. The employee(s) could be fined, prosecuted, etc. depending upon the circumstance of the possession. Lost badges need to be reported within 24 hours to the Medical Center Police. The cost of replacement of the badge will be actual cost identified later. Failure to turn in a badge is $500.00 – considered theft of federal property. Badges expire every 3 years and must be reissued – no additional cost if the badge is exchanged.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of “sensitive information”.
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
4. Certain documents, sketches, videos or photographs and drawings may be marked “Law Enforcement Sensitive” or “Sensitive Unclassified”. Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
5. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
6. All paper waste or electronic media such as CD’s and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
7. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of “sensitive information”.

E. Motor Vehicle Restrictions

1. Contractor and sub-contractor vehicles shall be allowed to park within the construction site only. Any vehicle found outside of the designated area shall be subject to the rules of the Medical Center for Contractor Parking. The exception is Contractor vehicles for the project are not permitted in Lot O.

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 Project Manager for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor’s competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the Project Manager that individuals have undergone contractor’s safety briefing.

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

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

E. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas that are described in phasing requirements and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
2. Install one-hour and/or 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 Project Manager.

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

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

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

K. Standpipes: Install and extend standpipes up with each floor in accordance with 29 CFR 1926 and NFPA 241. Do not charge wet standpipes subject to freezing until weather protected.

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

M. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with

Project Manager. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Project Manager.

N. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Project Manager.

O. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Project Manager. Obtain permits from facility Project Manager at least 24 hours in advance. This includes requests to shutdown smoke detectors not associated with hot work.

P. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Project Manager.

Q. 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.

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

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

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

1.6 OPERATIONS AND STORAGE AREAS

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

B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting

Officer, the buildings and utilities may be abandoned and need not be removed.

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

D. Working space and space available for storing materials shall be as determined by the Project Manager.

E. Workmen are subject to rules of Medical Center applicable to their conduct.

F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Project Manager 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 to stay within the confines of the space allocated to the Contractor for storage. Any materials found to be outside the approved storage space will be subject to removal. 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 may be permitted subject to fire and safety requirements.

G. Phasing: To ensure such executions, Contractor shall furnish the VA Project Manager with a schedule of approximate dates on which the Contractor intends to accomplish the work. Schedule shall be in sufficient detail to demonstrate construction of major and minor building elements, utilities, systems, relocations of existing equipment, utility disruptions, installation of owner furnished systems and equipment, in each specific area and phase of site,

building or portion thereof. In addition, Contractor shall notify the VA Project Manager 10 calendar days in advance of the proposed date of starting work in existing Medical Center areas, utility disruption, equipment relocation and specific are of site, building or portion thereof. Arrange such dates to insure accomplishment of this work in dates mutually agreeable to the VA Project Manager and Contractor, and within the Contract Time. Areas of Work within the Medical Center are to be accomplished on a mutually agreeable schedule that provides the least disruption of Medical Center operations and within the Contract Time.

H. **Buildings No.'s 38 and 15** will be vacated by Government in accordance with above noted phasing beginning immediately after date of receipt of Notice to Proceed and turned over to Contractor. The **east portion of Building 2** will be vacated by Government in accordance with the above noted phasing beginning immediately after date of receipt of Notice to Proceed and turned over to Contractor.

I. Building No.1 will be occupied during performance of work; but immediate areas of alterations will be vacated according to Government accepted phasing plan provided by the Contractor. Please refer to Phasing regarding notification for Government prior to vacating area for construction.

1. Certain areas of Building No. 1 will be occupied by Medical Center personnel for various periods as listed below:

AREA	**PERIOD**
West portion of Building 2 SB06	Will be occupied and contractor will be escorted while working in area. Access to SB06 must be maintained 24/7

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. Construction Fence: Before construction operations begin exteriorly, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height,

around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by Project Manager. Repair any damage as a result of the fence installation.

K. When a building, or portion of building, is turned over to Contractor, Contractor shall accept entire responsibility therefore.
   1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
   2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.

L. 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 Project Manager.
   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 Project Manager. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director’s prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.
   2. Contractor shall submit a request to interrupt any such services to Project Manager, 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 Project Manager.
5. In case of a contract construction emergency, service will be interrupted on approval of Project Manager. 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.

M. 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.

N. 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. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times. All major equipment used for demolition, ground moving, etc. shall be equipped with scrubbers and maintained in good working condition.
   Contractor shall have a spill prevention plan and clean-up materials available at all times. Appropriate training for all contract employees regarding spills shall be provided within 24 hours of Project Manager’s request.
2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the Project Manager.

O. Coordinate the work for this contract with other construction operations as directed by Project Manager. This includes the scheduling of traffic and the use

of roadways, as specified in Article, USE OF ROADWAYS.

1.7 ALTERATIONS

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

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of buildings.
2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
3. Shall note any discrepancies between drawings and existing conditions at site.
4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Project Manager.

B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Project Manager and/or Supply Representative, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly per contract clauses.

C. Re-Survey: Thirty days before, or mutually agreed upon time, expected partial or final inspection date, the Contractor and Project Manager together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:

1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.

D. Protection: Provide the following protective measures:

1. Wherever existing roof surfaces are disturbed they shall be protected against

water infiltration. In case of leaks, they shall be repaired immediately upon discovery.

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

1.8 INFECTION PREVENTION MEASURES

A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. 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 as specified within the contract documents. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Project Manager 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 Project Manager 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 Project Manager. 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 Project Manager. For construction in any areas that will remain jointly occupied by the medical Center and Contractor's workers, the Contractor shall:
   a. Provide dust proof one-hour or 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. Refer to drawings to determine if a one-hour or two-hour barrier is required. Essentially, all barriers shall be one-hour except when work involves existing two-hour rated walls. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and an agreement is reached with the Project Manager and Medical Center.
   b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other pre-filter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
   c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"),

shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.

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

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

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

g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.

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

E. Final Cleanup:

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

1.9 DISPOSAL AND RETENTION

A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
   1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by Project Manager.
   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.

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

A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work sites, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

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

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

1.11 RESTORATION

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

1.12 PHYSICAL DATA

A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by: Terracon Consultants, Inc., 783 Highway 1 West, Unit 5, Iowa City, IA 52246.

B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on the enclosed Geotechnical Engineering Report, dated October 11, 2011.

C. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at site.

1.13 PROFESSIONAL SURVEYING SERVICES

A registered professional land surveyor or registered civil engineer whose services are retained and paid for by the Contractor shall perform services specified herein and in other specification sections. The Contractor shall certify that the land surveyor or civil engineer is not one who is a regular employee of the Contractor, and that the land surveyor or civil engineer has no financial interest in this contract.

1.14 LAYOUT OF WORK

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

B. Establish and plainly mark center lines for addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure

that location, orientation, and elevations established for each such structure and/or addition, roads, and parking lots are in accordance with lines and elevations shown on contract drawings.

C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
   1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the Project Manager before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.

D. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the Project Manager before any major items of concrete work are placed. In addition, Contractor shall also furnish to the Project Manager certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.
   1. Lines of each building and/or addition.
   2. Elevations of bottoms of footings and tops of floors of each building and/or addition.
   3. Lines and elevations of sewers and of all outside distribution systems.
   4. Lines and elevations of roads, and parking lots.

E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to Project Manager.

F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.15 AS-BUILT DRAWINGS

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

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

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

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

1.16 USE OF ROADWAYS

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

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

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

1.17 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

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

1. Permission to use each unit or system must be given by Project Manager. If the equipment is not installed and maintained in accordance with the following provisions, the Project Manager 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.

D. Contractor shall provide information per table below for each piece of equipment provided under this contract. The information shall be provided at final inspection.

BARCODE REQUEST

MANUFACTURER	
MODEL #	
SERIAL #	
DESCRIPTION	
VENDOR	
$$ VALUE – IF KNOWN	
LOCATION	

1.18 TEMPORARY USE OF EXISTING ELEVATORS

A. Contractor **will not be allowed** the use of existing elevator in building two (2). Outside type hoist shall be used by Contractor for transporting materials and equipment.

B. Use of existing freight elevator in building 1 for handling building materials and Contractor's personnel will be permitted on a share use base with both VA employees and other Contractor’s employees.

1.19 TEMPORARY USE OF NEW ELEVATOR BUILDING 2

A. The Contractor and his personnel shall be permitted use of new elevator(s) subject to the following provisions:

1. Contractor shall make arrangements with the Project Manager for use of elevator. Contractor may obtain elevator for exclusive use.
2. Prior to the use of elevator, the Contractor shall have the elevator inspected and accepted by an ASME accredited, certified elevator safety inspector. The acceptance report shall be submitted to the Project Manager.
3. Submit to the Project Manager the schedule and procedures for maintaining equipment. Indicate the day or days of the week and total hours required for maintenance. A report shall be submitted to the Project Manager monthly indicating the type of maintenance conducted, hours used, and any repairs made to the elevator(s).
4. The Contractor shall be responsible for enforcing the maintenance procedures.
5. During temporary use of elevator all repairs, equipment replacement and cost of maintenance shall be the responsibility of the Contractor.
6. Personnel for operating elevator shall not be provided by the Department of Veterans Affairs.
7. Contractor shall cover and provide maximum protection of the entire elevator installation.
8. The Contractor shall arrange for the elevator company to perform operation of the elevator so that an ASME accredited, certified elevator safety inspector can evaluate the equipment. The Contractor shall be responsible for any costs of the elevator company.
9. All elevator parts worn or damaged during temporary use shall be removed and replaced with new parts. This shall be determined by an ASME accredited certified elevator safety inspector after temporary use and before acceptance by the Government. Submit report to the Project Manager for approval.

10. Elevator shall be tested as required by the testing section of the elevator specifications before acceptance by the Department of Veterans Affairs.

1.20 TEMPORARY TOILETS

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

B. Contractor may have for use of Contractor's workmen, while working in building 1 only, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.21 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 workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

C. 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, contractor provided trailers, 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 Project Manager'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 Center steam distribution system. Steam is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve steam-use so none is wasted. Failure to stop leakage or other waste will be cause for revocation (at Project Manager's discretion), of use of steam from the Medical Center's system.

1.22 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.

1.23 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.

1.24 INSTRUCTIONS

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

B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the Project Manager coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model,

style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Project Manager and shall be considered concluded only when the Project Manager is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Project Manager, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.25 GOVERNMENT-FURNISHED PROPERTY

A. The Government shall deliver to the Contractor, the Government-furnished property shown on the environmental data sheets and drawings.

B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.

C. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.

1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

D. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for

connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.

E. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.

F. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer, as required.

1.26 RELOCATED EQUIPMENT AND/OR ITEMS

A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and/or items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.

B. Perform relocation of such equipment or items at such times and in such a manner as directed by the Project Manager.

C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".

D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.

E. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.27 HISTORIC PRESERVATION

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

END OF SECTION 01 00 00

SECTION 01 32 16.15
PROJECT SCHEDULES

PART 1- GENERAL

1.1 DESCRIPTION:

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

1.2 CONTRACTOR'S REPRESENTATIVE:

A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Project Manager.

B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.

C. The Contractor’s representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT:

A. The Contractor shall submit a qualification proposal to the Project Manager, within 10 days of bid acceptance. The qualification proposal shall include:

1. The name and address of the proposed consultant.
2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.

B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor’s monthly payment request and the signed look ahead report. The Project Manager shall identify the five different report formats that the contractor shall provide.

B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.

C. The VA will report errors in computer-produced reports to the Contractor’s representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Project Manager, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

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

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

D. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or the Project Manager, will do one or both of the following:
   1. Notify the Contractor concerning his actions, opinions, and objections.
   2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.

E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

F. The Complete Project Schedule shall contain approximately 400 work activities/events.

1.6 WORK ACTIVITY/EVENT COST DATA

A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow

curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS and PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS.

C. In accordance with PERFORMANCE OF WORK BY THE CONTRACTOR and PERFORMANCE OF WORK BY THE CONTRACTOR, the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.

D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:

1. Show activities/events as:
   a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
   b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
   c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
   d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
   e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor,

or building, for at least five trades who are performing major work under this contract.

3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the Project Manager may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.

B. The Contractor shall submit the following supporting data in addition to the project schedule:

1. The appropriate project calendar including working days and holidays.
2. The planned number of shifts per day.
3. The number of hours per shift.

Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.

C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the Project Manager. 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 Project Manager’s approval of the Project Schedule.

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

1.8 PAYMENT TO THE CONTRACTOR:

A. Monthly, the contractor shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made

pursuant to Article PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS and PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS. The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.

B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 PAYMENT AND PROGRESS REPORTING

A. Monthly schedule update meetings will be held on dates mutually agreed to by the Project Manager and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the Project Manager three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:

1. Actual start and/or finish dates for updated/completed activities/events.
2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
5. Completion percentage for all completed and partially completed activities/events.
6. Logic and duration revisions required by this section of the specifications.
7. Activity/event duration and percent complete shall be updated independently.

B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Project Manager with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.

C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and Project Manager for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or

durations provided and approved by the Project Manager. 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 Project Manager within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**

D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, Project Manager, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:

1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
3. Reschedule the work in conformance with the specification requirements.

B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the Project Manager for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

1.11 CHANGES TO THE SCHEDULE

A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:

1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
3. The schedule does not represent the actual prosecution and progress of the project.
4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.

B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.

C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the Project Manager.

D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in CHANGES and CHANGES – SUPPLEMENTAL, and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.

E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the Project Manager 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 CHANGE and CHANGES – SUPPLEMENTAL. The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.

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

END OF SECTION 01 32 16.15

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

1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION and, SPECIAL NOTES, 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 Project Manager 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 and CHANGES - SUPPLEMENT 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, other than physical samples, must be submitted by Contractor through the electronic submittal process only. Physical samples shall be submitted by the Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.

A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.

B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail, e-mail, FAX 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 three years.
3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
4. Contractor shall send a copy of transmittal letter to both Project Manager and to Architect-Engineer simultaneously with submission of material to a commercial testing laboratory.
5. Laboratory test reports shall be sent directly to Project Manager 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 Project Manager 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 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.

G. Electronic Submittal Procedures:

1. Summary:
   a. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using a pre-approved website service designed specifically for transmitting submittals between construction team members, such as Submittal Exchange.
   b. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
   c. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
2. Procedures:
   a. Submittal Preparation – Contractor may use any or all of the following options:
      1) Subcontractors and Suppliers provide electronic (PDF)submittals to Contractor via the website.
      2) Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.
      3) Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
   b. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of

the work.

c. Contractor shall transmit each submittal to Architect/Engineer using the website.

d. Architect / Engineer review comments will be made available on the website for downloading. Contractor will receive email notice of completed review.

e. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the contractor.

f. For use with Submittal Exchange or approved program, colors for documenting author shall be: Contractor: Blue, Architect of Record: Red, and VA COTR: Green.

3. Product and Security Requirements:

a. Independently hosted, web-based system for automated tracking, storage, and distribution of contract submittals, Requests For Information, Instructions to Contractor, and other contract related documents. FTP sites, e-mail exchanges, and server-based systems hosted from inside a contractor’s office will not be considered are not acceptable.

b. Utilize 256-bit SSL encryption and hosted at SAS70 Type II compliant data centers.

c. Minimum three years documented experience of use on comparable commercial construction projects.

d. Unlimited individual user accounts and system access for all project subcontractors, general contractor, VA staff, architect, design consultants, and sub-consultants, with no additional fees for those parties to access the system.

e. Separate locations for VA, architect, design consultant, and subconsultant review comments with contractors restricted from viewing comments until final review or release by owner or primary design consultant.

f. Full version histories and dates of exchanges automatically tracked and available for viewing, searching, and reporting in a linear log format compatible with AIA G712.

g. Functionality to group submittals as required packages and apply forms and review comments to entire package simultaneously.

h. Functionality for integrated online PDF viewing and review, including graphical markups and stamps, for VA, architect, design consultants, sub-consultants, and general contractor without need for additional software purchase.

i. Automatic, configurable email notifications for each project team

member for new and reviewed submittals and other items.

j. Automatic, configurable email reminders of past due items.

k. Customized, automated PDF form generation for submittals, RFIs, and other documents matching standard templates used by VA, design consultants, sub-consultants, and general contractor. Documentation and demonstration of automatic form generation using each entity's templates must be submitted as part of any substitution request.

l. System vendor shall provide live web meeting training sessions to contractors, design consultants, sub-consultants, and VA's staff prior to project start.

m. System vendor shall make available minimum thirty-minute live web meeting training sessions for subcontractors at least twice weekly for the entire duration of the project.

n. System vendor shall provide access for VA, design consultants, sub-consultants, general contractor, and subcontractors to live technical support by phone and email minimum of 7 AM to 6 PM CST on standard business days at no additional cost.

o. At completion of project closeout, system vendor shall provide minimum of four archival discs that include all documents, marked up submittals, and tracking logs in a single complete archive package.

4. Costs:

a. General Contractor shall include the full cost of website service in their proposal. This cost is included in the contract amount.

1.10 Samples (except laboratory samples), shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

Shive-Hattery, Inc.
2834 Northgate Drive
Iowa City, Iowa 52245

ATTN: Beth Dingbaum bdingbaum@shive-hattery.com 319-354-3040

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 Project Manager.

List of Submittals

Section	Specification Name Paragraph		Sub-Paragraph	Description
DIVISION 01 - GENERAL REQUIREMENTS				
01 3216.15	Project Schedules	1.5 1.11	A A	Complete Project Schedule Submittal
01 35 26	Safety Requirements	1.4	C	Accident Prevention Plan
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SECTION 01 35 26
SAFETY REQUIREMENTS

1.1 APPLICABLE PUBLICATIONS:

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

B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health Planning

A10.34-2012.....Protection of the Public on or Adjacent to Construction Sites

A10.38-2013.....Basic Elements of an Employer’s Program to Provide a Safe and Healthful Work Environment American National Standard Construction and Demolition Operations

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

E84-2013.....Surface Burning Characteristics of Building Materials

D. The Facilities Guidelines Institute (FGI):

FGI Guidelines-2010Guidelines for Design and Construction of Healthcare Facilities

E. National Fire Protection Association (NFPA):

10-2013.....Standard for Portable Fire Extinguishers

30-2012.....Flammable and Combustible Liquids Code

51B-2014.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work

70-2014.....National Electrical Code

70B-2013.....Recommended Practice for Electrical Equipment Maintenance

70E-2012 .....Standard for Electrical Safety in the Workplace

99-2012.....Health Care Facilities Code

241-2013.....Standard for Safeguarding Construction, Alteration, and Demolition Operations

F. The Joint Commission (TJC)

TJC Manual .....Comprehensive Accreditation and Certification Manual

G. U.S. Nuclear Regulatory Commission

10 CFR 20 .....Standards for Protection Against Radiation

H. U.S. Occupational Safety and Health Administration (OSHA):

29 CFR 1904 .....Reporting and Recording Injuries & Illnesses

29 CFR 1910 .....Safety and Health Regulations for General Industry

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

CPL 2-0.124.....Multi-Employer Citation Policy

I. VHA Directive 2005-007

1.2 DEFINITIONS:

A. OSHA “Competent Person” (CP). 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)). 30 Hour OSHA required.

B. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project. 10 Hour OSHA required.

C. High Visibility Accident. Any mishap which may generate publicity or high visibility.

D. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

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

1. Death, regardless of the time between the injury and death, or the length of the illness;
2. Days away from work (any time lost after day of injury/illness onset);
3. Restricted work;
4. Transfer to another job;
5. Medical treatment beyond first aid;
6. Loss of consciousness; or

7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

1.3 REGULATORY REQUIREMENTS:

A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the Project Manager.

1.4 ACCIDENT PREVENTION PLAN (APP):

A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:

a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
   1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
   2) Plan approver (company/corporate officers authorized to obligate the company);
   3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).

b. **BACKGROUND INFORMATION**. List the following:
   1) Contractor;
   2) Contract number;
   3) Project name;
   4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).

c. **STATEMENT OF SAFETY AND HEALTH POLICY**. Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor’s written safety program goals, objectives, and accident experience goals for this contract should be provided.

d. **RESPONSIBILITIES AND LINES OF AUTHORITIES**. Provide the following:
   1) A statement of the employer’s ultimate responsibility for the implementation of his SOH program;
   2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
   3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.;
   4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
   5) Requirements for pre-task Activity Hazard Analysis (AHAs);

6) Lines of authority;
7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;

e. SUBCONTRACTORS AND SUPPLIERS. If applicable, provide procedures for coordinating SOH activities with other employers on the job site:

1) Identification of subcontractors and suppliers (if known);
2) Safety responsibilities of subcontractors and suppliers.

f. **TRAINING.**

1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc…) and any requirements for periodic retraining/recertification are required.
3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

g. SAFETY AND HEALTH INSPECTIONS.

1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., “Site Safety and Health CP”), proof of inspector’s training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

h. ACCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all OSHA Recordable Incidents. The APP shall include accident/incident investigation procedure &

identify person(s) responsible to provide the following to the Project Manager or Government Designated Authority:

1) Exposure data (man-hours worked);
2) Accident investigations, reports, and logs.

i. **PLANS (PROGRAMS, PROCEDURES) REQUIRED.** Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks in site-specific compliance and accident prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

1) Emergency response ;
2) Contingency for severe weather;
3) Fire Prevention ;
4) Medical Support;
5) Posting of emergency telephone numbers;
6) Prevention of alcohol and drug abuse;
7) Site sanitation (housekeeping, drinking water, toilets);
8) Night operations and lighting ;
9) Hazard communication program;
10) Welding/Cutting “Hot” work ;
11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
12) General Electrical Safety
13) Hazardous energy control (Machine LOTO);
14) Site-Specific Fall Protection & Prevention;
15) Excavation/trenching;
16) Asbestos abatement;
17) Lead abatement;
18) Crane Critical lift;
19) Respiratory protection;
20) Health hazard control program;
21) Radiation Safety Program;
22) Abrasive blasting;
23) Heat/Cold Stress Monitoring;
24) Crystalline Silica Monitoring (Assessment);
25) Demolition plan (to include engineering survey);
26) Formwork and shoring erection and removal;
27) PreCast Concrete.

C. Submit the APP to the Project Manager or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 [__] calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

D. Once accepted by the Project Manager the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Project Manager Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAS):

A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)

B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.

C. Work shall not begin until the AHA for the work activity has been accepted by the Project Manager or Government Designated Authority and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall

protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.

2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
   a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
   b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
3. Submit AHAs to the Project Manager or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 [__] calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the Project Manager or Government Designated Authority.

1.6 PRECONSTRUCTION CONFERENCE:

A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required

by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.

B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.7 “SITE SAFETY AND HEALTH OFFICER” (SSHO) AND “COMPETENT PERSON” (CP):

A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.

B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).

C. These Competent Persons can have collateral duties as the subcontractor’s superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).

D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in

accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.

E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.

B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.

C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.

D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.

E. Submit training records associated with the above training requirements to the Project Manager for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 [fifteen] calendar days prior to the date of the preconstruction conference for acceptance.

F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the Resident Engineer that individuals have undergone contractor’s safety briefing.

G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors’ “Trade Safety and Health CPs” present in their work areas. Coordinate with, and report findings and corrective actions weekly to Project Manager

B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.

1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
2. The Project Manager will be notified immediately prior to start of the inspection and invited to accompany the inspection.
3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
4. A report of the inspection findings with status of abatement will be provided to the Project Manager within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

A. Notify the Project Manager as soon as practical, but no more than four hours after any accident meeting the definition of OSHA Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $5,000, or any weight handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Project Manager determine whether a government investigation will be conducted.

B. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, and property damage accidents resulting in at least $20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162, and provide the report to the Project Manager or Government Designated Authority within 5 [five] calendar days of the accident. The Project Manager will provide copies of any required or special forms.

C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the Project Manager monthly.

D. A summation of all OSHA recordable accidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Project Manager monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Project Manager as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):

A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.

B. Mandatory PPE includes:

1. Hard Hats – unless written authorization is given by the Project Manager in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of

hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.

2. Safety glasses - unless written authorization is given by the Project Manager appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.
3. Appropriate Safety Shoes – based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by each person on site unless written authorization is given by the Project Manager.
4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

1.12 INFECTION CONTROL

Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.

A. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. Risk classifications of Class II or lower will require approval by the Project Manager or Government Designated Authority before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the Project Manager. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The primary project scope area for this project is: **Class 1,** however, work outside the primary project scope area may vary. Refer to attached Infection Risk Assessment for required measures. The required infection control precautions with each class are as follows:

1. Class I requirements:

a. During Construction Work:
   1) Notify the Project Manager.
   2) Execute work by methods to minimize raising dust from construction operations.
   3) Ceiling tiles: Immediately replace a ceiling tiles displaced for visual inspection.
b. Upon Completion:
   1) Clean work area upon completion of task
   2) Notify the Project Manager.

2. Class II requirements:
   a. During Construction Work:
      1) Notify the Project Manager.
      2) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool mounted dust collectors where possible.
      3) Water mist work surfaces to control dust while cutting.
      4) Seal unused doors with duct tape.
      5) Block off and seal air vents.
      6) Remove or isolate HVAC system in areas where work is being performed.
   b. Upon Completion:
      1) Wipe work surfaces with cleaner/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) Upon completion, restore HVAC system where work was performed
      5) Notify the Project Manager .// or Government Designated Authority //
3. Class III requirements:
   a. During Construction Work:
      1) Obtain permit from the Project Manager.
      2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
      3) 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 for vacuuming prior to exit)

before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.

4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
5) Contain construction waste before transport in tightly covered containers.
6) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

1) Do not remove barriers from work area until completed project is inspected by the Project Manager and thoroughly cleaned by the VA Environmental Services Department.
2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
3) Vacuum work area with HEPA filtered vacuums.
4) Wet mop area with cleaner/disinfectant.
5) Upon completion, restore HVAC system where work was performed.
6) Return permit to the Project Manager.

4. Class IV requirements:

a. During Construction Work:

1) Obtain permit from the Project Manager.
2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.
3) 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 for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
4) Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
5) Seal holes, pipes, conduits, and punctures.

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 work site.
7) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.

b. Upon Completion:
1) Do not remove barriers from work area until completed project is inspected by the Project Manager with thorough cleaning by the VA Environmental Services Dept.
2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
3) Contain construction waste before transport in tightly covered containers.
4) Cover transport receptacles or carts. Tape covering unless solid lid.
5) Vacuum work area with HEPA filtered vacuums.
6) Wet mop area with cleaner/disinfectant.
7) Upon completion, restore HVAC system where work was performed.
8) Return permit to the Project Manager.

B. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:
1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping
b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.

c. Class III & IV - Seal all penetrations in existing barrier airtight
d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.

C. Products and Materials:
1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes
2. Barrier Doors: Self Closing One-hour solid core wood in steel frame, painted
3. Dust proof one-hour drywall
4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer’s instructions.
5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
7. Disinfectant: Hospital-approved disinfectant or equivalent product
8. Portable Ceiling Access Module

D. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.

E. A dust control program will be establish and maintained as part of the contractor’s infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic

status reports, and submit to Project Manager for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

F. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will 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 with safe thresholds established.

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

1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
3. Adhesive Walk-off/Carpet Walk-off Mats 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.
4. 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 it is created. Transport these outside the construction area in containers with tightly fitting lids.
5. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
6. 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.

7. 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.

I. 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.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents, or building openings. HEPA filtration on intake vents is required where dust may be introduced.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

A. Contractor shall 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 shall 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.

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

2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician shall 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.
3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

1.14 FIRE SAFETY

A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Project Manager for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.
B. 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.
C. 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).
D. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
2. Install one-hour 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.

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

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

G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Project Manager.

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

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

J. Standpipes: Install and extend standpipes up with each floor in accordance with 29 CFR 1926 and NFPA 241. Do not charge wet standpipes subject to freezing until weather protected.

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 Project Manager. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Resident Engineer.

M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Project Manager.

N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Facility Safety Office. Obtain permits from facility Safety Manager at least 48 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 Project Manager.

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.

1.15 ELECTRICAL

A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J – General Environmental Controls, 29 CFR Part 1910 Subpart S – Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.

B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.

C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Project Manager with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA specific to energized work activities will be developed, reviewed, and accepted prior to the start of that work.

1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout

Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.

2. Verification of the absence of voltage after de-energization and lockout/tagout is considered “energized electrical work” (live work) under NFPA 70E, and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the The Project Manager.

D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alterative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity has been accepted by the Project Manager and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

E. Ground-fault circuit interrupters. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites shall have approved ground-fault circuit interrupters for personnel protection. “Assured Equipment Grounding Conductor Program” only is not allowed.

1.16 FALL PROTECTION

A. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.

1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.

3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.
4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.

B. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) as stated in Section 1.16.

C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
   1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
   2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
   3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
   4. Emergency descent devices shall not be used as working platforms.

D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
   1. The Competent Person’s name and signature;
   2. Dates of initial and last inspections.

E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft (6 m) in height, positive fall protection shall be used.

1.18 EXCAVATION AND TRENCHES

A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P.

B. All excavations and trenches 5 feet in depth or greater shall require a written trenching and excavation permit (NOTE – some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall be completed and provided to the Project Manager prior to commencing work for the day. At the end of the day, the permit shall be closed out and provided to the Project Manager. The permit shall be maintained onsite and include the following:
   1. Determination of soil classification
   2. Indication that utilities have been located and identified. If utilities could not be located after all reasonable attempt, then excavating operations will proceed cautiously.
   3. Indication of selected excavation protective system.
   4. Indication that the spoil pile will be stored at least 2 feet from the edge of the excavation and safe access provided within 25 feet of the workers.
   5. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere.

C. If not using an engineered protective system such as a trench box, shielding, shoring, or other Professional Engineer designed system and using a sloping or benching system, soil classification cannot be Solid Rock or Type A. All soil will be classified as Type B or Type C and sloped or benched in accordance with Appendix B of 29 CFR 1926.

1.19 CRANES

A. All crane work shall comply with 29 CFR 1926 Subpart CC.

B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no “Phase In” date of November 10, 2014.

C. A detailed lift permit shall be submitted 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing. The lift will not be allowed without approval of this document.

D. Crane operators shall not carry loads
   1. over the general public or VAMC personnel
   2. over any occupied building unless
      a. the top two floors are vacated

b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

A. All confined space entry shall comply with 29 CFR 1910.146 except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].

B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the Project Manager.

1.22 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Project Manager. Obtain permits from Project Manager at least 48 hours in advance.

1.23 LADDERS

A. All Ladder use shall comply with 29 CFR 1926 Subpart X.

B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.

C. Manufacturer safety labels shall be in place on ladders

D. Step Ladders shall not be used in the closed position

E. Top steps or cap of step ladders shall not be used as a step

F. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.

1. When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.

G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.

B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. See 21.F for covering and labeling requirements. Skylights located in floors or roofs are considered floor or roof hole/openings.

C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.

1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
2. Covers shall be secured when installed, clearly marked with the word “HOLE”, “COVER” or “Danger, Roof Opening-Do Not Remove” or color-coded or equivalent methods (e.g., red or orange “X”). Workers must be made aware of the meaning for color coding and equivalent methods.
3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
5. Workers are prohibited from standing/walking on skylights.

END OF SECTION 01 35 26

B-2

Attachment A-1

Construction Risk Assessment

Project Name: Renovate & Expand Space for Patient Support Areas	Planned Project Start Date: September 2013
Location of Construction: Buildings 1, basement & 10; Building 2	Estimated Duration: 18 months
Types of Contractor(s)Performing Work: General Construction	

Safety/Life Safety Risk Assessment-Safety officer should be involved in the design/planning of all projects

Y	N	LIFE SAFETY IMPACTS OF PROJECT	If NO, indicate ILSM from below list or describe other intervention
X	X	Will exit egress routes from occupied areas remain unchanged?	1,4,6,7,8,9,12
X	X	Will exit stairs remain unobstructed & fire separated?	
	X	Will fire & smoke compartments remain intact & unchanged?	
	X	Will fire alarm detection systems remain functional & unimpaired?	
	X	Will fire alarm suppression systems remain functional & unimpaired?	
X		Will construction area be separated by non-combustible smoke tight partitions?	
X		Will access to emergency department remain unobstructed?	
	X	Will emergency access by fire department remain unobstructed?	1,4,6,7,8,9,12
Y	**N**	**CONSTRUCTION ACTIVITY**	**If YES, indicate ILSM from below list or describe other intervention**
X		~~Will there be any anticipated utility shutdowns~~? (Communications, electrical, heating/cooling, HVAC, medical gases, vacuum, water, server) ALL	1,4,6,7,8,9,12
X		~~Will there be~~ unusual noise levels for adjacent areas? COTR will notify staff	
	X	Will vibration levels be excessive for hospital machinery to operate properly?	
	X	Will there be excessive distance to exit?	
	X	Will there be hazardous area not protected?	
	X	Will there be conflicts with emergency disaster plan?	
Y	**N**	**PHYSICAL SECURITY IMPACTS**	**If YES, describe necessary intervention(s)**
✓		Will the construction compromise security?	Secure Access Points
Y	**N**	**EMPLOYEE SAFETY**	**If YES, indicate ILSM from below list or describe other intervention**
	X	Will the construction compromise employee safety?	
Y	**N**	**CONTRACT COMPLIANCE**	**If YES, describe necessary intervention(s)**
		Will contract clauses be included for enforcement of identified risks?	

Life Safety/Construction/Security/Employee Safety/Contracting Additional Requirements:

Interim Life Safety Measures (ISLM)

1. Egress. Ensure free and unobstructed exits.
2. Emergency Forces Access
3. Ensuring Operational Life Safety Systems
4. Temporary Construction
5. Additional Fire Fighting Equipment
6. Prohibit Smoking.
7. Control Combustible Loading
8. Conduct 2 Fire Drills Per Shift in Local Area
9. Increase Hazard Surveillance
10. Compartmentation Training of Personnel
11. Conduct Organization Training on Life Safety
12. Notify Fire Department of system impairment
13. Install temporary suppression or Detection system

Safety Manager: Lois Etie	Date: 7/18/12
Project Manager/COTR: Made a note	Date:
Police and Security: Chris Thomson	Date: Secure Access Points
AFGE Union: invited, accepted, not attended	Date:
Contracting: invited, no response, not attended	Date:

626-311; Renovate & Expand Space for Patient Support Areas

Infection Control Risk Assessment

Location and type of construction: Bldgs 1: B and 10 – remodel; Building 2 – replace portion	Project Start Date: September 2013
Project Manager: Marle A. Wolf	Estimated Duration: 18 months?
Supervisor of Area: Randall Millers; Kate Beardsley; Ed Ruppenkamp; Dr. Elizabeth Field; Mr. Barry Sharp Date notified of project:	

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

Class: Class determined by completing above and referring to FM-01 (Red Book) Section II Chapter 7, Risk Assessment Matrix of Precautions for Construction and Renovation.

CLASS I Circle all that apply

1. Execute work by methods to minimize raising dust from construction operations.
2. Immediately replace a ceiling tile displaced for visual inspection

CLASS II (Circle all that apply)

1. Use tools equipped with dust collectors.
2. Seal unused doors with tape.
3. Block off and seal air vents.
4. Remove or isolate HVAC system in areas where work is being performed.
5. Utilize air filtration machine
6. Water mist work surfaces to control dust while cutting.
7. Place dust mat at entrance and exit of work area.
8. Wipe work surfaces with disinfectant.
9. Contain construction waste before transport in tightly covered containers.
10. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
11. Remove isolation of HVAC system in areas where work is being performed.

CLASS III (Circle all that apply)

Obtain infection control approval before construction begins.

1. Implement measures from Class II above, plus.
2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area before construction begins. * Consider off-shift work if critical barrier is not constructed.
3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
4. Cover transport receptacles or carts. Tape covering unless solid lid. Implement measures from Class II above, plus.
5. Do not remove barriers from work area until completed project is inspected by Safety Section & Infection Control & thoroughly cleaned by Facilities Management.
6. Contain construction waste before transport in tightly covered containers.
7. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction.
8. Vacuum work area with HEPA filtered vacuums.
9. Wet mop area with disinfectant.
10. Remove isolation of HVAC system in areas where work is being performed.

CLASS IV (Circle all that apply)

Obtain infection control approval before construction begins.

1. Consider off-shift work.
2. Consider Moving Patients out of area.
3. Implement measures from Class III above, plus
4. Construct anteroom and require all personnel and tools etc. 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.
5. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.
6. Do not remove barriers from work area until completed project is inspected by Safety Section & Infection Control & thoroughly cleaned by Facilities Management.
7. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction.
8. Contain construction waste before transport in tightly covered containers.
9. Cover transport receptacles or carts. Tape covering unless solid lid
10. Vacuum work area with HEPA filtered vacuums.
11. Wet mop area with disinfectant.
12. Remove isolation of HVAC system in areas where work is being performed.

Exceptions/Additional requirements to this permit are noted by comments or attached memoranda:

Infection Control Manager :	Date:		
Nicole K Gerdis	7/19/02		

* need to pay close attention to air intake into the main building in relation to dust *

SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. 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 (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 (JUN 1988)

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

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
811 Vermont Avenue, NW - Room 462
Washington, DC 20420
Telephone Numbers: (202) 461-8217 or (202) 461-8292
Between 9:00 AM - 3:00 PM

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

A. 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

END OF SECTION 01 42 19

SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. 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 Department of Veterans Affairs.

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.....Standard Test for 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

T99-10 (R2004).....Standard Test for the Moisture-Density Relations of Soils Using a 2.5 Kg(5.5 lb.) Rammer and a 305 mm (12 in.) Drop

T104-99 (R2007).....Standard Test for soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

T180-10.....Standard Test for moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop

T191-02(R2006).....Standard Test for soils Using a 2.5 Kg Soils Using a 2.5 Kg 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):

A325-10.....Standard specification for structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

A370-12.....Standard test method and definitions for Mechanical Testing of Steel Products

A416/A416M-10.....Standard specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

A490-12.....Standard Specification for Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

C31/C31M-10.....Standard practice for making and Curing Concrete Test Specimens in the Field

C33/C33M-11a.....Standard Specification for Concrete Aggregates

C39/C39M-12.....Standard Test Method for Compressive Strength of

Cylindrical Concrete Specimens

C109/C109M-11b.....Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

C138/C138M-10B.....Standard Test method for Density (Unit Weigh - Yield, and Air Content (Gravimetric) of Concrete

C140-12.....Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

C143/C143M-10a.....Standard Test Method for Slump of Hydraulic Cement Concrete

C172/C172M-10.....Standard Practice for Sampling Freshly Mixed Concrete

C173/C173M-10b.....Standard Test Method for Air Content of freshly Mixed Concrete by the Volumetric Method

C330/C330M-09.....Standard Specification for Lightweight Aggregates for Structural Concrete

C567/C567M-11.....Standard Test Method for Density Structural Lightweight Concrete

C780-11.....Standard Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

C1019-11.....Standard Test Method for Sampling and Testing Grout

C1064/C1064M-11.....Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete

C1077-11c.....Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

C1314-11a.....Standard Test Method for Compressive Strength of Masonry Prisms

D1188-07e1.....Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

D1143/D1143M-07e1.....Standard Test Methods for Deep Foundations Under Static Axial Compressive Load

D1188-07e1.....Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

D1556-07.....Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

D1557-09.....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft lbf/ft3 (2,700 KNm/m3))

D2166-06.....Standard Test Method for Unconfined Compressive Strength of Cohesive Soil

D2167-08).....Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

D2216-10.....Standard Test Methods for 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)

D2974-07a.....Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

D3666-11 . . . . . .Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Bitumous Paving Materials

D3740-11.....Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction and Inspecting Paving Material

D6938-10.....Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth

E94-04(2010).....Standard Guide for Radiographic Examination

E164-08.....Standard Practice for Contact Ultrasonic Testing of Weldments

E329-11c.....Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection and/or testing

E543-09.....Standard Specification for Agencies Performing Non-Destructive Testing

E605-93(R2011).....Standard Test Methods for Thickness and Density of Sprayed Fire Resistive Material (SFRM) Applied to Structural Members

E709-08.....Standard Guide for Magnetic Particle Examination

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

E. American Welding Society (AWS):
D1.D1.1M-10.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; 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 Project Manager. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Project Manager to such failure.

C. Written Reports: Testing laboratory shall submit test reports to Project Manager, Contractor, unless other arrangements are agreed to in writing by the Project Manager. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to Project Manager 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 Project Manager regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Project Manager extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
2. Provide part time observation of fill placement and compaction and field density testing in building areas and provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D6938.
2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556 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 Project Manager 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.

c. Pavement Subgrade: One test for each 335 m^2 (400 square yards), but in no case fewer than two tests.

d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.

e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.

f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Project Manager. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.

D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Project Manager.

3.2 FOUNDATION CAISSONS:

A. Concrete Testing: Test concrete including materials for concrete as required in Article, CONCRETE of this section, except make two test cylinders for each day's placement of concrete.

B. Maintain a record of concrete used in each caisson. Compare records with calculated volumes.

C. Inspect percussion hole in bottom of each caisson to determine that material is capable of supporting design load.

D. Inspect sides and bottom of each caisson for compliance with contract documents.

E. Submit a certified “Caisson Field Record” for each caisson, recording actual elevation at bottom of shaft; final center line location of top; variation of shaft from plumb; results of all tests performed; actual allowable bearing capacity of bottom; depth of socket into rock; levelness of bottom; seepage of

water; still water level (if allowed to flood); variation of shaft (from dimensions shown); location and size of reinforcement, and evidence of seams, voids, or channels below the bottom. Verify the actual bearing capacity of the rock strata by the use of a calibrated penetrometer or other acceptable method.

F. Caissons Bearing on Hardpan: Take undisturbed samples, suitable for tests required, from caisson bottom. Make auger probe to a depth of 2.5 meters (8 feet) below bottom and visually inspect and classify soil. Verify continuity of strata and thickness.
   1. Conduct the following test on each sample, and report results and evaluations to the Project Manager:
      a. Unconfined Compression Test (ASTM D2166).
      b. Moisture Content (ASTM D2216).
      c. Density.

3.3 LANDSCAPING:

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

B. Submit laboratory test report of topsoil to Project Manager.

3.4 SITE WORK CONCRETE:

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

3.5 CONCRETE:

A. Batch Plant Inspection and Materials Testing:
   1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Project Manager with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Project Manager.
   2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Project Manager .
   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 truck-load mixes conform to proportions of aggregate weight, cement factor, 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 Project Manager 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. Project Manager 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 Project Manager 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 Project Manager. 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 Project Manager. 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.

3.6 REINFORCEMENT:

A. Review mill test reports furnished by Contractor.

3.7 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.
   g. Verify that correction of rejected welds are made in accordance with AWS D1.1.
   h. 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. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
   c. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
   d. 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 Project Manager.

END OF SECTION 01 45 29

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

EP-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.

EP-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.

EP-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

EP-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 Project Manager 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 Contracting Officer and Project Manager 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 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.

EP-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 Project Manager . Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
   a. Box and protect from damage existing trees and shrubs to remain on the construction site.
   b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
   c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
   a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 50 design year storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
   b. Reuse or conserve the collected topsoil sediment as directed by the Project Manager.
   c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features per regulations. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins,

grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.

6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
7. Manage and control spoil areas on Government property to limit spoil to areas shown and prevent erosion of soil or sediment from entering nearby water courses or lakes.
8. Protect adjacent areas from despoilment by temporary excavations and embankments.
9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
11. Handle discarded materials other than those included in the solid waste category as directed by the Project Manager.

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 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 Project Manager. 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 Project Manager. 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 50 feet (dBA):

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

   b. Use shields or other physical barriers to restrict noise transmission.
   c. Provide soundproof housings or enclosures for noise-producing machinery.
   d. Use efficient silencers on equipment air intakes.
   e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
   f. Line hoppers and storage bins with sound deadening material.
   g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 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 3 to 6 feet in front of any building face. Submit the recorded information to the Project Manager 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 Project Manager. 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.

END OF SECTION 01 57 19

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.

B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.

C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:

1. Waste Management Plan development and implementation.
2. Techniques to minimize waste generation.
3. Sorting and separating of waste materials.
4. Salvage of existing materials and items for reuse or resale.
5. Recycling of materials that cannot be reused or sold.

D. At a minimum the following waste categories shall be diverted from landfills:

1. Soil.
2. Inerts (eg, concrete, masonry and asphalt).
3. Clean dimensional wood and palette wood.
4. Green waste (biodegradable landscaping materials).
5. Engineered wood products (plywood, particle board and I-joists, etc).
6. Metal products (eg, steel, wire, beverage containers, copper etc).
7. Cardboard, paper and packaging.
8. Bitumen roofing materials.
9. Plastics (eg, ABS, PVC).
10. Carpet and/or pad.
11. Gypsum board.
12. Insulation.
13. Paint.
14. Fluorescent lamps.

1.2 RELATED WORK

A. Section 02 41 00, DEMOLITION.

B. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the

generation of as little waste as possible. Construction /Demolition waste includes products of the following:

1. Excess or unusable construction materials.
2. Packaging used for construction products.
3. Poor planning and/or layout.
4. Construction error.
5. Over ordering.
6. Weather damage.
7. Contamination.
8. Mishandling.
9. Breakage.

B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.

C. Contractor shall develop and implement procedures to reuse and recycle construction and demolition 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/tools/cwm.php 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 Project Manager 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 **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.

END OF SECTION 01 74 19

SECTION 01 81 11
SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 OBJECTIVES

A. To maximize resource efficiency and reduce the environmental impacts of construction and operation, the Contractor during the construction phase of this project shall implement the following procedures:

1. Select products that minimize consumption of energy, water and non-renewable resources, while minimizing the amounts of pollution resulting from the production and employment of building technologies. It is the intent of this project to conform with EPA’s Five Guiding Principles on environmentally preferable purchasing. The five principles are:
   a. Include environmental considerations as part of the normal purchasing process.
   b. Emphasize pollution prevention early in the purchasing process.
   c. Examine multiple environmental attributes throughout a product’s or service’s life cycle.
   d. Compare relevant environmental impacts when selecting products and services.
   e. Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
2. Control sources for potential Indoor Air Quality (IAQ) pollutants by controlled selection of materials and processes used in project construction in order to attain superior IAQ.
3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in proposing product substitutions and/or changes to specified processes.
4. Use building practices that insure construction debris and particulates do not contaminate or enter duct work prior to system startup and turn over.

1.3 RELATED DOCUMENTS

A. Section 01 74 19 CONSTRUCTION WASTE MANANGEMENT

1.4 DEFINITIONS

A. Agrifiber Products: Composite panel products derived from agricultural fiber

B. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials

C. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight

D. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products has been tracked through its extraction and fabrication to ensure that is was obtained from forests certified by a specified certification program

E. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder

F. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.

G. Third Party Certification: Certification of levels of environmental achievement by nationally recognized sustainability rating system.

H. Light Pollution: Light that extends beyond its source such that the additional light is wasted in an unwanted area or in an area where it inhibits view of the night sky

I. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock

J. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use

K. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre- consumer content must be material that would not have

otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 “Guidelines for the Use of Environmental Marketing Claims”: www.ftc.gov/bcp/grnrule/guides980427

L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 250 miles (400 km) from the Project site

M. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured

N. Sealant: Any material that fills and seals gaps between other materials

O. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.

P. Type 2 Finishes: “Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals offgas

Q. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

1.5 SUBMITTALS

A. Sustainable Design Submittals:

1. Alternative Transportation: Provide manufacturer’s cut sheets for all bike racks installed on site, including the total number of bicycle storage slots provided. Also, provide manufacturer’s cut sheets for any alternative-fuel refueling stations installed on site, including fueling capacity information for an 8-hour period.

2. Heat Island Effect:

a. Site Paving: Provide manufacturer’s cut sheets for all impervious paving materials, highlighting the Solar Reflectance Index (SRI) of the material. Also, provide cut sheets for all pervious paving materials.

b. Roofing Materials: Submittals for roofing materials must include manufacturer’s cut sheets or product data highlighting the Solar

Reflectance Index (SRI) of the material.

3. Exterior Lighting Fixtures: Submittals must include cut sheets with manufacturer’s data on initial fixture lumens above 90° from nadir for all exterior lighting fixtures, and, for parking lot lighting, verification that the fixtures are classified by the IESNA as “full cutoff” (FCO); OR provide documentation that exterior luminaires are IDA-Approved as Dark-Sky Friendly

   by the International Dark Sky Association (IDA) Fixture Seal of Approval Program.
4. Water Conserving Fixtures: Submittals must include manufacturer’s cut sheets for all water-consuming plumbing fixtures and fittings (toilets, urinals, faucets, showerheads, etc.) highlighting maximum flow rates and/or flush rates. Include cut sheets for any automatic faucet-control devices.
5. Process Water Use: Provide manufacturer’s cut sheets for all water-consuming

   commercial equipment (clothes washers, dishwashers, ice machines, etc.), highlighting water consumption performance. Include manufacturer’s cut sheets or product data for any cooling towers, highlighting water consumption estimates, water use reduction measures, and corrosion inhibitors.
6. Elimination of CFCs AND HCFCs: Provide manufacturer’s cut sheets for all cooling equipment with manufacturer’s product data, highlighting refrigerants; provide manufacturer’s cut sheets for all fire-suppression equipment, highlighting fire-suppression agents; provide manufacturer’s cut-sheets for all polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation, highlighting the blowing agent(s).
7. On-Site Renewable Energy Systems: Provide cut sheets and manufacturer’s product data for all on-site renewable energy generating components and equipment, including documentation of output capacity.
8. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer’s product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre- consumer recycled content (by weight) of each material or product

a. An electronic spreadsheet that tabulates the Project's total materials

cost and combined recycled content value (defined as the sum of the post- consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.

9. Interior Adhesives and Sealants: Submittals for all field-applied adhesives

and sealants, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.

a. Provide manufacturers' documentation verifying all adhesives used to apply

laminates, whether shop-applied or field-applied, contain no urea- formaldehyde.

10. Interior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content

11. Exterior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on ambient air quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.

12. Floorcoverings:

a. Carpet Systems: Submittals for all carpet must include the following:

1) A copy of an assessment from the Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or

4.0, with parameters of the model set as described by this specification section.

2) Manufacturer's product data verifying that all carpet systems meet or exceed the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.

13. Composite Wood and Agrifiber Binders: Submittals for all composite

wood and agrifiber products (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) must include manufacturer's product data verifying that these products contain no urea-formaldehyde resins.

14. Systems Furniture and Seating: Provide manufacturer's product data verifying that all systems furniture and seating products meet the requirements of one of the following:
    a. Greenguard certification
    b. SCS Indoor Advantage certification
    c. SCS Indoor Advantage Gold certification
    d. BIFMA Standard X7.1-2005, as tested to BIFMA method M7.1-2005 and as verified by an independent laboratory
    d. Calculated indoor air concentration limits for furniture systems and seating determined by the U.S. EPA's Environmental Technology Verification Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes (September 1999) testing protocol as conducted in an independent air quality testing laboratory
15. Air Filtration: Provide manufacturer's cut sheets and product data highlighting the following:
    a. Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs) per ASHRAE HVAC Design Manual for Hospitals and Clinics.
    b. Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction. See above for requirements
16. Mercury in Lighting: Provide manufacturer's cut sheets or product data for all fluorescent or HID lamps highlighting mercury content.
17. Lighting Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all lighting controls systems components.
18. Thermal Comfort Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all thermal comfort-control systems components.
19. Blended Cement: It is the intent of this specification to reduce CO2 emissions

and other environmentally detrimental effects resulting from the production of portland cement by requiring that all concrete mixes, in aggregate, utilize blended cement mixes to displace portland cement as specified in Section 03 30 00, CONCRETE typically included in conventional construction. Provide the following submittals:

a. Copies of concrete design mixes for all installed concrete
b. Copies of typical regional baseline concrete design mixes for all compressive strengths used on the Project
c. Quantities in cubic yards of each installed concrete mix

20. Gypsum Wall Board: Provide manufacturer's cut sheets or product data verifying that all gypsum wallboard products are moisture and mold-resistant.
21. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.
22. Duct Acoustical Insulation: Provide manufacturer's cut sheets or product data verifying that mechanical sound insulation materials in air distribution
ducts consists of an impervious, non-porous coatings that prevent dust from accumulating in the insulating materials.
23. Green Housekeeping: Provide documentation that all cleaning products and janitorial paper products meet the VOC limits and content requirements of this specification section.

B. Project Materials Cost Data: Provide a spreadsheet in an electronic file indicating the total cost for the Project and the total cost of building materials used for the Project, as follows:

1. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the Project Manager and Architect a preliminary schedule of materials costs for all materials used for the Project organized
by specification section. Exclude labor costs and all mechanical, electrical, and plumbing (MEP) systems materials and labor costs. Include the following: a. Identify each reused or salvaged material, its cost, and its replacement
value.
b. Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its

cost, its combined recycled content value (defined as the sum of the post- consumer recycled content value plus one-half of the pre-consumer recycled content value), and the total combined recycled content value for all materials as a percentage of total materials costs.

c. Identify each biobased material, its source, its cost, and the total value of biobased materials as a percentage of total materials costs. Also provide the total value of rapidly renewable materials (materials made from plants that are harvested in less than a 10-year cycle) as a percentage of total materials costs.

d. Identify each wood-based material, its cost, the total wood-based materials cost, each FSC Certified wood material, its cost, and the total value of Certified wood as a percentage of total wood-based materials costs.

2. Provide final versions of the above spreadsheets to the Project Manager and Architect not more than 14 days after Substantial Completion.

C. Construction Waste Management: See Section 01 74 19 “Construction Waste Management” for submittal requirements.

D. Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:

1. Not more than 30 days after the Preconstruction Meeting, prepare and submit for the Architect and Project Manager’s approval, an electronic copy of the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:

2. Instruction procedures for meeting or exceeding the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling.

a. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage

b. Schedule of submission to Architect of photographs of on-site construction IAQ management measures such as protection of ducts and

on-site stored oil installed absorptive materials

c. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille

d. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit

3. Not more than 30 days following receipt of the approved draft CIAQMP, submit an electronic copy of the approved CIAQMP in an electronic file, along with the following:

a. Manufacturer’s cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for all filtration media to be installed at return air grilles during construction if permanently installed AHUs are used during construction.

b. Manufacturer’s cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs).

4. Not more than 14 days after Substantial Completion provide the following:

a. Documentation verifying required replacement of air filtration media in all air handling units (AHUs) after the completion of construction and prior to occupancy and, if applicable, required installation of filtration during construction.

b. Minimum of 18 Construction photographs to be taken by Multivista Construction Documentation: Six photographs taken on three different occasions during construction of the SMACNA approaches employed, along with a brief description of each approach, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

c. A copy of the report from testing and inspecting agency documenting the results of IAQ testing, demonstrating conformance with IAQ testing procedures and requirements defined in Section 01 81 09 “Testing for Indoor Air Quality.”

E. Sustainable Design Progress Reports: Concurrent with each Application for

Payment, submit reports for the following:

1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19 ”Construction Waste Management.”
2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

1.6 QUALITY ASSURANCE

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

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

PART 2 - PRODUCTS

2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS

A. Site Clearing: Topsoil shall be provided by the Contractor from on-site material which has been stockpiled for reuse. Off-site borrow should only be used when
on-site sources are exhausted. Chip and/or compost on site all vegetated material identified for removal.

B. Do not burn rubbish, organic matter, etc. or any material on the site. Dispose of legally in accordance with Specifications Sections 01 74 19.

C. Roofing Materials: All roofing systems, other than vegetated roof systems, must comply with the following requirements:

1. Low-Sloped roofing less than or equal to 2:12 slope must have an SRI of at least 78.
2. Steep-Sloped roofing greater than 2:12 slope must have an SRI of at least 29.
3. Roofing Materials: Light-colored, reflective, and high-emissivity

roofing helps to reduce localized heat build-up from roof surfaces that contribute to the urban heat island effect.

D. Exterior Lighting Fixtures:

1. All exterior luminaires must emit 0% of the total initial designed fixture lumens at an angle above 90° from nadir and/or meet the requirements of the Dark Sky certification program.
2. Exterior lighting cannot exceed 80% of the lighting power densities defined by ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments.

E. Herbicides and Pest Control: Herbicides shall not be permitted, and pest control measures shall utilize EPA-registered biopesticides only.

F. Landscape Irrigation: Use water-efficient landscape and irrigation strategies, including water reuse and recycling, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities).

G. Water-Conserving Fixtures: Plumbing fixtures and fittings shall use in aggregate at least 20% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements. Flow and flush rates shall not exceed the following:

1. Toilets: no more than 1.3 gallons per flush, otherwise be dual flush 1.6/1.1 gallons per flush, and have documented bowl evacuation capability per MaP testing of at least 400 grams
2. Urinals: Waterless or Water sense rated with no more than 0.5 gallons per flush.
3. Lavatory Faucets: 0.5 gpm with automatic faucet controls
4. Kitchen Sink Lavatories: 2.2 gpm
5. Showerheads: no more than 1.5gpm

H. Elimination of CFCs AND HCFCs:

1. Ozone Protection and Greenhouse Gas Reduction: Base building cooling equipment shall contain no refrigerants other than the following: HCFC-123, HFC-134a, HFC-245fa, HFC-407c, or HFC 410a.
2. Fire suppression systems may not contain ozone-depleting substances such as halon 1301 and 1211.

I. HVAC Distribution Efficiency:

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

J. Measurement and Verification: Install controls and monitoring devices as required by MEP divisions order to comply with International Performance Measurement & Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003, Option D.
   1. The IPMVP provides guidance on situation-appropriate application of measurement and verification strategies.

K. Salvaged or Reused materials: There shall be no substitutions for specified salvaged and reused materials and products.
   1. Salvaged materials: Use of salvaged materials reduces impacts of disposal and manufacturing of replacements.

L. Recycled Content of Materials:
   1. Provide building materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project, exclusive of all MEP equipment, labor, and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.
      a. e post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content

by the total weight of the material and multiplying by the cost of the material.

b. Do not include mechanical and electrical components in the calculations.

c. Do not include labor and delivery costs in the calculations.

d. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims,"
16 CFR 260.7 (e).

e. Utilize all on-site existing paving materials that are scheduled for demolition as granulated fill, and include the cost of this material had it been purchased in the calculations for recycled content value.

f. The materials in the following list must contain the minimum recycled content indicated:

Category	**Minimum Recycled Content**
Cast-in-Place Concrete	6% pre-consumer
CMU: Gray Block	20% pre-consumer
Steel Reinforcing Bars	90% combined
Structural Steel Shapes	90% combined
Steel Fabrications	60% combined
Steel Studs	30% combined
Aluminum Fabrications	30% Post Consumer
Rigid Insulation	20% pre-consumer
Batt insulation	30% combined

END OF SECTION 01 81 11

Division 02

Existing Conditions

Division 02

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Geotechnical Engineering Report

Proposed Phase II DVA IC Building 2 Addition

VA Medical Center,

Iowa City, Iowa

October 11, 2011

Terracon Project No. 06115673.02

Prepared for:

Shive-Hattery, Inc.

Iowa City, Iowa

Prepared by:

Terracon Consultants, Inc.

Iowa City, Iowa

Offices Nationwide
Employee-Owned
Established in 1965
terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

October 11, 2011

Shive-Hattery, Inc.
2834 Northgate Drive
Iowa City, Iowa 52245

Attn: Mr. Eric J. Hendrickson, P.E.
Ph: 319-354-3040
Fax: 319-354-6921
Email: ehendrickson@shive-hattery.com

Re: Geotechnical Engineering Report
Proposed Phase II DVA IC Building 2 Addition
VA Medical Center
Iowa City, Iowa
Terracon Project No. 06115673.02

Dear Mr. Hendrickson:

Terracon Consultants, Inc. (Terracon) has completed the subsurface exploration and geotechnical engineering services for the referenced project in Iowa City, Iowa. This study was performed in general accordance with our Proposal Number P06100549 dated September 8, 2010. The attached report describes the subsurface conditions encountered in the borings, presents the laboratory test data, and provides recommendations regarding the geotechnical recommendations concerning the design and construction of foundations and floor slabs for the proposed addition. In addition, recommendations for general earthwork and subgrade preparation are provided.

We appreciate the opportunity to be of service to you on this phase of your project, and look forward in assisting you during the construction phase. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Bachan K. Sinha, M.S., E.I.
Project Engineer

Jeffrey L. Magner, P.E.
Iowa No. 14651

BKS/JLM: N:\Projects\2011\06115673\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\06115673.02.docx

Copies: Addressee (2)

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Appendix A – Field Exploration **Exhibit No.**

Site Location Plan A-1

Boring Location Plan A-2

Subsurface Soil Profile A-3

Boring Logs A-4

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Laboratory Test Description B-1

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EXECUTIVE SUMMARY

A geotechnical exploration has been performed for the referenced project in Iowa City, Iowa. Terracon"s geotechnical engineering scope of work for this project consisted of drilling and sampling two (2) borings to depths of about 43 to 45½ feet below the existing site grades. Bedrock was encountered in the borings at depths of about 28 to 30½ feet below grade.

Based on the results of this exploration, the site is suitable for the proposed construction. The following geotechnical considerations were identified:

- Special design and construction considerations will be required on this project due to the anticipated foundation loads, presence of existing fill materials at the site, and proximity of the site to existing structure and utilities.

- Existing fill materials were encountered in the borings to depths of about 8 to 9 feet below grade. Based on the test results and composition of the fill, it appears that the fill was not placed as engineered fill with consistent control of moisture and density. It should be noted that structures supported over uncontrolled fills would be at risk for greater than normal settlements and subsequent distress.

- The proposed addition can be supported on a deep foundation system of drilled shafts extending into bedrock. Driven H-piles extending to competent bedrock can also be considered; however, vibration from pile driving will be an issue for safety of the adjacent structures and utilities.

- Care should be taken to avoid undermining existing foundations and grade-supported slabs. Excavations extending below bearing level of the existing foundations and slabs should be avoided. If such excavations are necessary, Terracon should be consulted regarding requirements for sloping, shoring, bracing, or underpinning based on actual conditions encountered during construction.

- The existing variable fill materials present at the site also pose a risk for floor slab movement and potential distress. As a minimum, we recommend at least 18 inches of properly compacted engineered fill be provided below the grade supported floor slabs.

- Most of the near surface inorganic soils, as encountered in the borings appear suitable for use as structural fill; however, significant moisture conditioning should be anticipated if the on-site soils are used as fill.

- Based on the results of the seismic survey, subsurface information obtained from this exploration, and the 2009 International Building Code (IBC), the seismic site classification for this site is C.

- Construction of the foundations and earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing materials, and other geotechnical conditions exposed during construction.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
PROPOSED PHASE II DVA IC BUILDING 2 ADDITION
VA MEDICAL CENTER, IOWA CITY, IOWA

Terracon Project No. 06115673.02
October 11, 2011

1.0 INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Phase II DVA IC Building 2 Addition at the VA Medical Center in Iowa City, Iowa. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- foundation design and construction
- site preparation and earthwork
- groundwater conditions
- floor slab design and construction
- seismic site classification per IBC

Terracon"s geotechnical engineering scope of work included advancement of two (2) soil borings to depths of about 28 to 30½ feet below the existing grades where practical auger or sampler refusal in the underlying limestone bedrock was achieved. After achieving auger refusal, the borings were advanced further about 15 feet using diamond bit core drilling procedures.

A Site Location Plan (Exhibit A-1), a Boring Location Plan (Exhibit A-2), the subsurface soil profile (Exhibit A-3) and boring logs (Exhibit A-4) are included in Appendix A of this report. The results of the laboratory testing performed on soil and rock samples obtained from the site during the field exploration are included on the attached boring logs. Descriptions of the field exploration and laboratory testing are included in their respective appendices.

Terracon has performed previous subsurface explorations at or near this site for various buildings, such as:

- June 2003 (Laboratory Building, Terracon Project No. 06035646, report dated July 10, 2003),
- July 2005 (Research Building No. 41, Terracon Project No. 06055659, reports dated July 28, 2005 and December 13, 2005),
- February 2009 (CSI Building Addition, Terracon Project No. 06095614, report dated February 27, 2009), and
- June 2011, (DVA IC Building # 2 Renovation/Addition, Terracon Project No. 06115660, report dated June 22, 2011).

The information from these prior explorations was also used in developing the recommendations contained in this report.

2.0 PROJECT INFORMATION

2.1 Project Description

ITEM	DESCRIPTION
Site layout	■ Refer to the Site Location Plan (Exhibit A-1) and Boring Location Plan (Exhibit A-2) in Appendix A.
Proposed Structures	■ Phase II DVA IC Building 2 addition, VA Medical Center.
Structure Type	The project is in planning stage at this time; ■ Two-story, slab-on-grade structure; ■ Future expansion planned to 6-story above grade; ■ Steel or reinforced concrete framing (assumed); ■ Steel truss roof (assumed).
Below Grade Areas	■ None
Finished floor elevation	■ The finished floor elevation of the addition will generally match with that of the adjacent/existing building.
Maximum loads	The following loading conditions are based on the information provided. ■ Columns: 400 kips; ■ Columns for future expansion: 1,000 kips; ■ Walls: 20 klf; ■ Uniform Floor Loads: 150 psf.
Maximum allowable settlement (assumed)	■ Total: 1-inch; ■ Differential: 2/3 total settlement
Cut & fill requirements	■ Minimal cut and fill thicknesses within 2 feet (assumed)

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	■ The project site is located inside the existing VA Medical Center premises in Iowa City, Iowa; ■ The proposed addition will be located south of Building 2.
Site topography	■ Existing structures, pavements, and utilities; ■ Based on supplied preliminary site plan, the existing grade elevations at the site vary between about 692 feet (south/ southwest) and 695 feet (north/northeast).

3.0 SUBSURFACE CONDITIONS

3.1 USDA NRCS Soil Mapping

A review of the United States Department of Agriculture - Natural Resources Conservation Service (USDA NRCS) Soil Survey of Johnson County, Iowa indicates that Fayette silt loam is the primary soil type present at undisturbed locations of this site. The classifications provided are for the USDA textural soil classification system for approximately the upper 60 inches of the soil profile. According to the soil survey, these soil types present severe limitations for building construction activities due to shrink-swell characteristics associated it.

3.2 Typical Subsurface Profile

Specific subsurface conditions encountered at the boring locations are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil and rock types. In-situ, the transition between native materials may be gradual. Based on the results of the exploration, subsurface conditions on this site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency/Density
Surficial	8 to 12 inch	3 to 4 inches Asphalt over 5 to 8 inches of crushed stone	N/A
Stratum 1	8 to 9	Existing fill materials - primarily composed of lean clay and lean clay to silty clay	N/A
Stratum 2	23½	Lean clay, lean to fat clay, and fat clay	Medium stiff to very stiff
Stratum 3	28 to 30½	Fine to medium sand with varying amounts of clay	Loose to very loose
Stratum 4[1]	43 to 45½	Limestone	Slightly weathered to auger/sampler refusal

1. Bottom of Borings.

Please review the attached boring logs for a detailed description of the conditions encountered at the individual boring locations.

3.3 Groundwater Conditions

The borings were monitored for the presence and level of groundwater during drilling and sampling. At the time of drilling, groundwater was observed in the borings at depths of about 23 to 24 feet below the existing grades. Due to safety reasons, upon completion of drilling, the boreholes were backfilled with a mixture of sand and site soils and pavements patched.

The observed ground water levels provide an approximate indication of the groundwater conditions existing on the site at the time the borings were drilled. Due to presence of existing fills and low permeability clay soils at this site, longer-term observations using cased holes or piezometers, sealed from the influence of surface water would be required for a better evaluation of the groundwater conditions on this site.

The Johnson County Soil Survey report was also reviewed for information relating to anticipated seasonally high groundwater levels. The primary soil type present in undisturbed areas of the site is reported to have apparent seasonal high groundwater levels at depths of 6½ feet or more below its natural grades.

Fluctuations of the groundwater levels will likely occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. In addition, perched water can develop within existing variable fills and/or high permeability soils overlying less permeable soils following periods of heavy or prolonged precipitation. Therefore, groundwater levels during construction or at other times in the future will be higher or lower than the levels indicated on the boring logs.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the subsurface conditions encountered in the borings and the anticipated foundation loads, it is our opinion that the proposed addition can be supported on a deep foundation system of drilled shafts extending into the underlying limestone bedrock. Driven H-piles extending to competent bedrock can also be considered; however, vibration from pile driving will be an issue for the safety and integrity of the adjacent structures and utilities.

Special design and construction considerations will be required on this project due to:

- anticipated foundation loads,
- presence of existing fill soils at this site,
- demolition and construction adjacent to existing structures and utilities;
- easily disturbed subgrades.

Existing fill soils were encountered in the borings to depths of about 8 to 9 feet below grade. Based on the test results and composition of the fill, it appears that the fill was not placed as engineered fill with consistent control of moisture and density. It should be noted that structures supported over uncontrolled fills would be at risk for greater than normal settlements and subsequent distress.

Provided the owner is willing to accept the risk and potential for adverse performance, in our opinion, the grade supported floor slab for the addition could be supported over stable portions of the existing fill. However, we recommend at least 18 inches of properly compacted structural fill be present below the grade supported floor slabs.

New foundations placed adjacent to existing structures" foundations and grade supported slabs may cause some additional settlement of the existing structures. Care should be taken to avoid undermining existing foundations and slabs. Excavations extending below bearing level of the existing foundations should be avoided. Proper sheeting and shoring should be planned for excavations located near existing foundations and slabs.

It should be noted that most of the site soils are susceptible to disturbance from construction activities, particularly if the soil has high natural moisture content or is wetted by surface water or seepage. Care should be taken during construction to minimize disturbance of the subgrade soils.

4.2 Site Preparation and Earthwork

4.2.1 Demolition Considerations

It is important that the demolition of the existing structures and other improvements be performed with close observation and testing. Any unsuitable fill and unsuitable materials encountered should also be removed at this time. Grade supported slabs may be supported on the new fill placed in the demolition excavations where existing grades are near final grades. The demolition contractor(s) should be aware of project requirements for backfilling so that removal of these fill materials and replacement under controlled conditions is not necessary to provide proper support of grade-supported slabs.

We anticipate that existing utility lines may extend through the proposed addition area. It has been our experience that poorly compacted backfill is commonly found in utility line trenches. Utility lines should be re-routed outside of the addition area whenever feasible. Whether the utility lines are abandoned or not, any poorly compacted backfill above the lines should be removed and replaced.

4.2.2 Excavation Considerations

Any excavations necessary for removal of existing structures or utilities, as well as for the new construction, should be carefully planned and executed, especially adjacent to existing

buildings, pavements, and utilities. These excavation activities have the potential to induce settlement and/or lateral movement of adjacent structures. The existing structures should be monitored before and during construction for any indications of settlement and/or lateral movement. A precondition survey of neighboring improvements prior to construction is recommended. Construction activities should be terminated and Terracon should be contacted if any movement of the existing structures adjacent to construction area is observed.

Proper shoring and bracing of excavations to prevent disturbance and/or undermining of the adjacent structures, utilities, and other improvements will be the responsibility of the demolition, site grading and foundation contractor(s). We recommend that a performance specification be developed that includes such provisions.

All excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the project specifications. Slope heights, slope inclinations and/or excavation depths should in no case exceed those specified in local, state or federal safety regulations, including current OSHA excavation and trench safety standards. If any excavations extend to a depth greater than 20 feet, according to OSHA regulations, side slopes and/or bracing must be designed by a professional engineer. Flatter slopes than shoes required by OSHA could be required in areas where existing variable fills and/or groundwater seepage are present.

4.2.3 Site Preparation

Surficial materials, debris from removal of existing structures, pavements, and utilities, and any otherwise unsuitable materials should be removed from the construction area. Wet or dry material should either be removed or moisture conditioned and recompacted. Soft, dry and/or lower strength soils should be either removed or compacted in place prior to placing new fill.

After rough grade has been established, wherever possible, the exposed subgrade should be proofrolled by the contractor and test probed by Terracon. Proofrolling on clay subgrades could be accomplished by using heavy, rubber-tired construction equipment or a tandem axle dump truck with a gross weight of about 10 tons in floor slab areas. In addition, the subgrade should be scarified, moisture conditioned, and recompacted. This surficial compaction and proofroll would help to provide a stable base for the compaction of new structural fill, and delineates low density, soft, or disturbed areas that may exist below the subgrade level. Soft or loose areas should be undercut, moisture conditioned, and recompacted or replaced with approved structural fill. Subgrade conditions should be observed by Terracon personnel during construction.

Corrective measures will probably be required to increase subgrade stability during subgrade preparation. The owner should budget for additional costs to provide the required corrective

measures. Based on our experience in soils types encountered in the borings, crushed stone thicknesses on the order of 1 to 2 feet could be required to stabilize subgrade soils. A geotextile stabilization material could also be placed below the crushed stone to help stabilize the subgrade soils. As an alternative, the unstable subgrade soils could be undercut, scarified on-site, and compacted with moisture and density control in maximum 9-inch loose lifts up to final subgrade elevation to provide a uniform thickness of well-compacted material. Chemical stabilization using Class C flyash, Portland cement or hydrated lime could also be considered.

Upon completion of grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

4.2.4 Fill Types and Compaction

New fills placed for the project should be low plasticity cohesive soil or granular soil. Fill placed in confined excavations such as utility trenches should consist of relatively clean and well-graded granular material. This should provide for greater ease of placement and compaction in confined areas where larger compaction equipment cannot be operated. The use of granular fill in these isolated and potentially deeper excavations would reduce the potential for differential settlement for the structure components.

Structural fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Low Plasticity Cohesive[2]	CL, CL-ML	General site grading fill.
Granular	GW, GP, GM, GC SW, SP, SM, SC	General site grading fill, below foundations and slabs.
Unsuitable	MH, OL, OH, PT	Green (non-structural) locations.
On-Site Soils	CL, CL-ML, CL/CH	Most of the inorganic site soils, as encountered in the borings, generally appear suitable for reuse as structural fill.[2, 3]

1. Structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation prior to use on this project.
2. Low plasticity cohesive soils (CL, CL-ML) would have a liquid limit of 45 or less and a plasticity index of 23 or less. CL/CH soils should not be used within the building footprint.
3. Some sorting will be required in order to remove any unsuitable materials and debris from the existing fills.

4.2.5 Compaction Requirements

Moisture conditioning of the site soils will likely be required if they are used as engineered fill. Appropriate laboratory tests, including Atterberg Limits for cohesive soils, and Standard Proctor (ASTM D698) moisture-density relationship tests should be performed on proposed fill materials prior to their use as engineered fill. Further evaluation of any on-site soils or off-site fill materials should be performed by Terracon prior to their use in compacted fill sections.

Recommended degree of compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Standard Proctor Test (ASTM D 698)		
	Minimum Compaction Requirement (%)[1]	Range of Moisture Contents for Compaction[1]	
		Minimum	Maximum
Low Plasticity Cohesive			
Below foundations	98	-2%	+3%
Above foundations and below floor slab	95	-2%	+3%
Granular[2,3]			
Below foundations	98	-3%	+3%
Above foundations and below floor slab	95	-3%	+3%

1. We recommend that structural fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted as per ASTM D 4253 and D 4254.
3. Specifically, moisture levels should be maintained at levels satisfactory for compaction to be achieved without the granular fill material bulking during placement or pumping when proofrolled.

We recommend that fill be placed and compacted on stable subgrades in lifts of 9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. Lift thickness should be reduced to 4 inches in loose thickness when hand equipment (e.g., jumping jack, vibratory plate compactor, etc.) is used. A vibrating smooth drum compactor should not be used on clay soils. All new fill placement and compaction should be observed and tested by Terracon personnel.

4.2.6 Grading and Drainage

Final surrounding grades should be sloped away from the addition on all sides. In addition, roof drainage should be collected by a system of gutters and downspouts and transmitted by pipe to the storm water drainage system or discharged a minimum of 5 feet away from the addition. As an alternative, splash blocks may be used as long as the ground surface is paved and slopes away from the addition.

4.3 Deep Foundation

4.3.1 Drilled Shaft Foundations

The proposed addition can be supported on a deep foundation system of drilled shafts extending into bedrock. Limestone bedrock was encountered in the borings at depths of about 28 to 30½ feet below the existing grades. Based on the test results on the rock core obtained from the borings, the underlying bedrock material can be classified as a hard formation with RQD values ranging from about 37% to 82%.

The design parameters provided in the **DRILLED SHAFT DESIGN SUMMARY** table should be used for the design of drilled shaft foundations. The values presented for allowable side friction include a factor of safety of approximately 2, and are for uplift loads only. The values presented for allowable end bearing include a factor of safety of approximately 3. Side friction should be ignored within the frost zone and for compressive loading. Drilled shafts should be spaced at least 3 shaft diameters apart (center-to-center) if side friction is used for uplift loads.

DRILLED SHAFT DESIGN SUMMARY		
Material Type	**Allowable Side Friction[1] (psf)**	**Allowable End Bearing Pressure[2] (psf)**
Frost Zone, 0 to 3½ feet	- -	- -
Existing fills	- -	- -
Native Clay/Silt	300	- -
Native sands	350	- -
Moderately Weathered Bedrock	750	- -
Slightly Weathered Bedrock	1,500	80,000

1. For uplift loading only.
2. Shafts should extend to rock auger refusal and at least one diameter into moderately to slightly weathered bedrock for end bearing to be considered. Use of a core barrel may be required to achieve adequate penetration, and penetration depths will vary.

Tensile reinforcement should extend to the bottom of shafts subjected to uplift loading. Buoyant unit weights of the soil and concrete should be used in the calculations below the highest anticipated groundwater elevation.

We recommend a minimum shaft diameter of 30 inches be used in order to permit cleaning and testing of the shaft bottoms. Drilled shafts should have a minimum center-to-center spacing of 3 diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual shafts in a group versus the capacity calculated using the perimeter of the shaft group acting as a unit. The lesser of the two capacities should be used in design.

Post-construction settlements of drilled shafts designed and constructed as described in this report are estimated to range from about ½ to ¾ inch. Differential settlement between individual shafts can typically be estimated at ½ to ⅔ the total settlement.

The use of temporary steel casing and/or slurry drilling procedures is recommended at this site during drilled shaft construction in order to prevent collapse of the sidewalls within existing fills and native sands and to control groundwater seepage. Difficult drilling conditions should be expected in the weathered bedrock, and the potential for hard bedrock drilling conditions should also be anticipated.

Use of a telescoping casing arrangement can be considered to avoid handling long casing lengths. The lower casing, in particular, should be of sufficient length and stiffness and have an appropriate cutting edge to allow it to be firmly seated into the bedrock in order to seal out groundwater. If possible, excess water should be evacuated from the casing in order to place concrete in the "dry".

Care should be taken so that the sides and bottom of the excavation are not disturbed during construction. The bottom of the shaft excavation should be free of loose material before concrete placement. Concrete should be placed as soon as possible after the foundation excavation is completed to reduce the potential disturbance of the bearing surface.

Concrete for "dry" drilled shaft construction should have a slump of about 5 to 7 inches. Concrete should be directed into the shaft utilizing a centering chute. Concrete for "wet" shaft construction would require higher slump concrete, and should be placed using a tremie pipe positioned within 6 inches of the base of the shaft at the start of concrete placement. The tremie pipe should be maintained at least 5 feet below the level of concrete in the shaft during concrete placement.

While withdrawing casing, care should be exercised to maintain concrete inside the casing at a sufficient level to resist earth and hydrostatic pressures acting on the casing exterior. Arching of the concrete, loss of seal and other problems can occur during casing removal and result in contamination of the drilled shaft. These conditions should be considered during the design and construction phases. Placement of loose soil backfill should not be permitted around the casing prior to removal.

Terracon should be retained to observe all drilled shaft excavations to evaluate the suitability of the bearing materials and to verify that conditions in the drilled shaft excavations are consistent with those encountered in the test borings. If unsuitable materials are encountered at planned depths, it may be necessary to deepen the shaft.

4.3.2 Driven H-Piles Design Considerations

H-piles driven to practical refusal in the limestone bedrock could be used for support of the structure, and would derive their compressive load capacities from end bearing. Allowable design compressive load capacities of driven steel piles could be calculated by taking the allowable steel working stress of 12 kips per square inch (ksi) for piles driven to refusal times the cross-sectional steel area. For example, an HP 10x42 pile could be used for this project and an allowable design load of about 148 kips could be used for piles driven to practical refusal in the underlying bedrock. Typical rock penetration for driven piles will vary based on pile size and location across the building area.

Pile caps and grade beams should extend at least 3½ feet below lowest adjacent grade to avoid uplift due to frost. Individual pile settlement should be on the order of ½ inch when designed according to the criteria presented in this report. Differential settlement between individual piles can typically be estimated at ½ to $^{2}/_{3}$ the total settlement.

The contractor should select a driving hammer and cushion combination which is capable of installing the selected piling without overstressing the pile material. The hammer should have a rated energy in foot-pounds at least equal to 15 percent of the design compressive load capacity in pounds. The contractor should submit the pile driving plan and the pile hammer – cushion combination to the engineer for evaluation of the driving stresses in advance of pile installation. During driving a maximum of 12 blows per inch is recommended to reduce the potential of damage to the piles.

If practical refusal is experienced above the anticipated rock surface elevation, then the pile may be on a boulder or other obstruction and a replacement pile should be driven. If this occurs, the situation should be evaluated by Terracon during the pile driving operations.

The contractor should be prepared to cut or splice piles, as necessary. Splicing of piles should be in accordance with specifications provided by the project structural engineer.

Pile driving conditions, hammer efficiency, and stress on the pile during driving could be better evaluated during installation using a Pile Driving Analyzer (PDA). A Terracon representative should observe pile driving operations. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

The existing facility (structures and subsurface utilities) should be observed prior to pile installation to document their condition. These structures should also be observed during pile installation for any indications of movement. Pile driving should be stopped and Terracon contacted if movement or cracking of the existing structures is observed. Monitoring vibration levels during pile driving should be considered. It should be understood that although vibrations from pile driving may be below levels that will cause structural damage, they may be felt by occupants of the adjacent buildings. The potential impact of driving piles at this site should be considered when evaluating this alternative. Terracon is able to perform vibration monitoring upon request.

4.3.3 Deep Foundations Lateral Earth Pressures

The drilled shafts and H-piles can be designed to resist lateral loads using the design parameters provided in the following table. Passive resistance for perimeter foundation elements beneath unheated areas should be ignored at least 3½ feet below the lowest adjacent finished grade for frost protection.

The material properties presented below should be used for estimating the lateral capacity of fixed or free-headed shafts/piles. These values represent the material properties present in the site vicinity and have been assigned for use in a computer program for lateral load analysis such as LPILE. These values are representative of the materials encountered in the borings. Since deflection or a service limit criterion will most likely control lateral capacity design, no safety/resistance factor is included with these parameters.

CRITERIA FOR LATERAL SHAFT/PILE CAPACITIES				
Material Property	**Recommended Value**			
Material	Native lean clay, lean clay to silty clay, and lean to fat clay	Fine to Medium Sand with Clay / Clayey Sand	Highly Weathered Bedrock	Moderately to Slightly Weathered Bedrock
Moist Unit Weight[1] (pcf)	115	120	155	165
Saturated Unit Weight[1] (pcf)	120	120	155	165
Submerged Unit Weight[1] (pcf)	60	60	95	105
Cohesion[2,3] (psf)	500[3]	- -	20,000	150,000
Internal Friction Angle[2,4] (degrees)	24[4]	30	- -	- -
E_{50} (strain)	0.01 - 0.02	- -	0.004	0.002
Soil Modulus k_h – Static[4] (pci)	30 - 100	60	- -	- -

1. Submerged unit weight should be used below the expected water table.
2. Should be ignored within frost depth.
3. Ignore cohesion in clay and silty clay soils for “drained” conditions.

4. "Drained" conditions only for clay and silt soils.
5. Soil modulus (k_h) for static loading; for cyclical loading of clays, values should be no more than 40% of the values shown.

Group action for lateral resistance of shafts/piles should be taken into account when spacing is less than six (6) diameters (center to center), and design parameters for allowable passive resistance in the direction of the load should be reduced in accordance with the following table.

Shaft/Pile Spacing (Diameters)	Reduction Factors
6D	1.0
4D	0.85
3D	0.65

The shafts/piles should be spaced at least three diameters apart (center-to-center) if they will be used to resist lateral loads. Pile caps and/or grade beams could be subject to uplift loading due to frost action; thus, perimeter foundation elements beneath unheated areas should extend at least 3½ feet below the lowest adjacent finished grade for frost protection.

It should be noted that the load capacities provided herein are based on the stresses induced in the supporting soil and rock strata. The structural capacity of the shafts/piles should be checked to assure that they can safely accommodate the combined stresses induced by axial and lateral forces. Lateral deflections of shafts/piles should be evaluated using an appropriate analysis method, and will depend upon the shaft/pile"s cross section area, length, configuration, stiffness and "fixed head" or "free head" condition. We can provide additional analyses and estimates of lateral deflections for specific loading conditions upon request.

4.4 Construction Adjacent to Existing Building

Differential settlement between the addition and the adjacent/existing structure is expected to approach the magnitude of the total settlement of the addition. Expansion joints should be provided between the existing building and the proposed addition to accommodate differential movements between the two structures. Underground piping between the two structures should be designed with flexible couplings and utility knockouts in foundation walls should be oversized, so minor deflections in alignment do not result in breakage or distress. Care should be taken during any excavation adjacent to existing foundations, so as not to disturb any existing foundation bearing soils.

Support of the addition on existing foundations is not expected, but if increasing the loads on existing foundations is considered, additional settlements of building components could occur. The structural capacity of the existing foundations should be evaluated by a licensed structural engineer where any increase in loading is planned.

4.5 Seismic Considerations

This seismic class information is based on Terracon"s site-specific seismic class survey conducted near this site on May 16, 2011 for the Phase I addition. Based on the Site Class Definitions in Table 1615.1.1 of the 2009 International Building Code, and the average shear wave velocity of 1,800 ft/s derived from our seismic survey data, Terracon recommends a Class C seismic site classification for design.

DESCRIPTION	VALUE
2009 International Building Code Site Classification (IBC) [1]	C
Site Latitude	N 41° 39.81"
Site Longitude	W 91° 32.89"

[1] Note: In general accordance with the *2009 International Building Code,* Table 1615.1.1.

4.6 Floor Slabs

4.6.1 Design Recommendations

DESCRIPTION	VALUE
Floor slab	■ Slab-on-grade Portland cement concrete
Floor slab support	■ Minimum 18 inches of properly compacted structural fill be provided below the floor slab. ■ Should include at least 6 inches of free-draining (less than 6% passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 98% of ASTM D 698.
Unheated areas subject to frost	■ Minimum of 3½ feet of clean (less than 6% passing the U.S. No. 200 sieve) material below slabs.
Modulus of subgrade reaction	■ 100 pounds per square inch per inch (psi/in). The modulus value was obtained based on our experience with similar subgrade conditions.

It should be noted that settlements of floor slabs supported on existing fill materials cannot be accurately predicted, but could be larger than normal and result in some cracking. Frequent control joints are recommended in the slabs where existing fill materials are present to help control any cracking. A higher than normal percentage of steel reinforcement should be considered in slabs to provide additional strength and help control crack displacement. Additional replacement of existing fill materials below the slab areas with new structural fill could also be considered to help reduce the risk and to provide a more uniform bearing surface. Any unsuitable subgrade materials observed during construction should be overexcavated and replaced with new structural fill.

Slabs-on-grade should be isolated from structures and utilities to allow for their independent movement. Joints should be constructed at regular intervals as recommended by the American Concrete Institute (ACI) to help control the location of any cracking. Keyed and doweled joints should be considered. The owner should be made aware that differential movement between the slabs and foundations could occur.

4.6.2 Construction Considerations

The floor slab subgrade should be prepared in accordance with **Section 4.2 (Site Preparation and Earthwork)** of this report. Care should be taken to maintain the subgrade moisture content, prior to construction of the floor slabs. If the subgrade should become desiccated, the affected material should be removed or these materials should be scarified, moistened, and recompacted prior to floor slab placement. In addition, we recommend the placement of the new fills for floor slab support be placed as far in advance of slab construction as possible to allow settlement of the underlying soils from the weight of the new structural fill, and thereby, reduce post-construction total and differential settlements.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates that any differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks that occur beyond the length of the structural dowels. The structural engineer should account for this potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Where practical, we recommend “early-entry” cutting of crack-control joints in floor slabs. Cutting of the concrete in its „green” state typically reduces the potential for micro-cracking of the slabs prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of slabs may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the slabs.

4.7 Frost Considerations

The site soils are frost susceptible and small amounts of water can affect the performance of the slabs on-grade. Exterior slabs should be anticipated to heave during winter months. If frost action needs to be eliminated in critical areas, we recommend the use of non-frost susceptible structural or structural slabs (e.g., structural stoops in front of outer doors). Placement of non-

frost susceptible material in large areas may not be feasible; however, the following recommendations are provided to help reduce potential frost heave:

- Providing surface drainage away from the addition and slabs and toward the site storm drainage system;
- Installing drain tiles around the perimeter of the addition, stoops, below exterior slabs, and connect them to the storm drainage system;
- Placing non-frost susceptible fill as backfill beneath slabs that are critical to the project;

As an alternative to extending the non-frost susceptible fill to the full frost depth, consideration can be made to placing extruded polystyrene or cellular concrete under a buffer of at least 2 feet of non-frost susceptible fill.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

Support of floor slabs on or above existing fill soils is discussed in this report. However, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation.

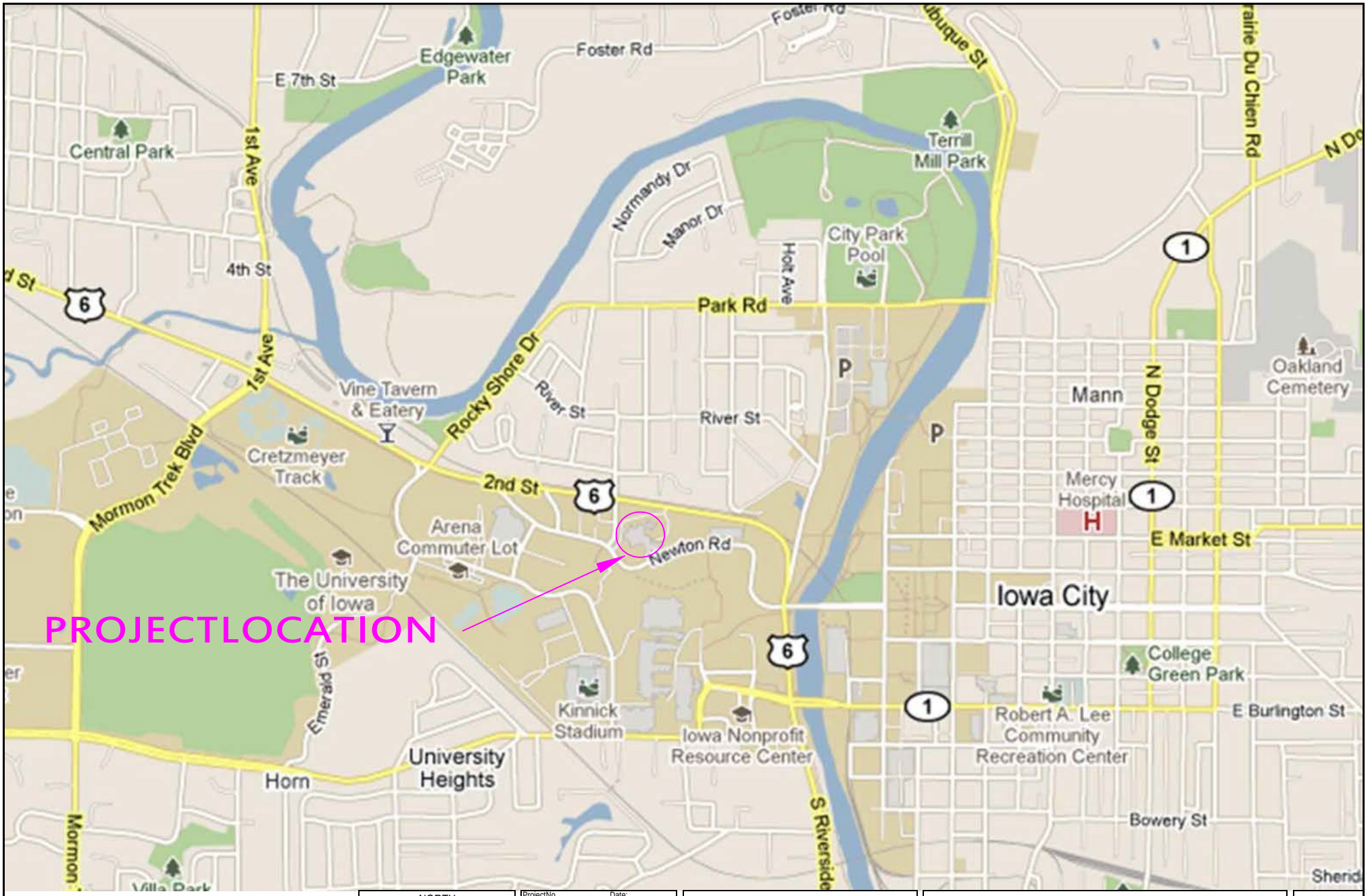
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. 10/11/11 Jeffrey L. Magner, P.E. Date My license renewal date is December 31, 2012.

APPENDIX A

FIELD EXPLORATION



BASEDRAWINGFROMGOOGLEMAPS
THISDRAWINGISINTENDEDFORGENERALLOCATION
PURPOSESONLY

NORTH

0 1600'

APPROXIMATEDRAWINGSCALE

ProjectNo.	06115673
Date:	10311
ProjectMngr:	BKS
DrawnBy:	PC
FileName:	06115673-01.dwg
LayoutName:	SITELOCATION

Terracon
ConsultingEngineersandScientists

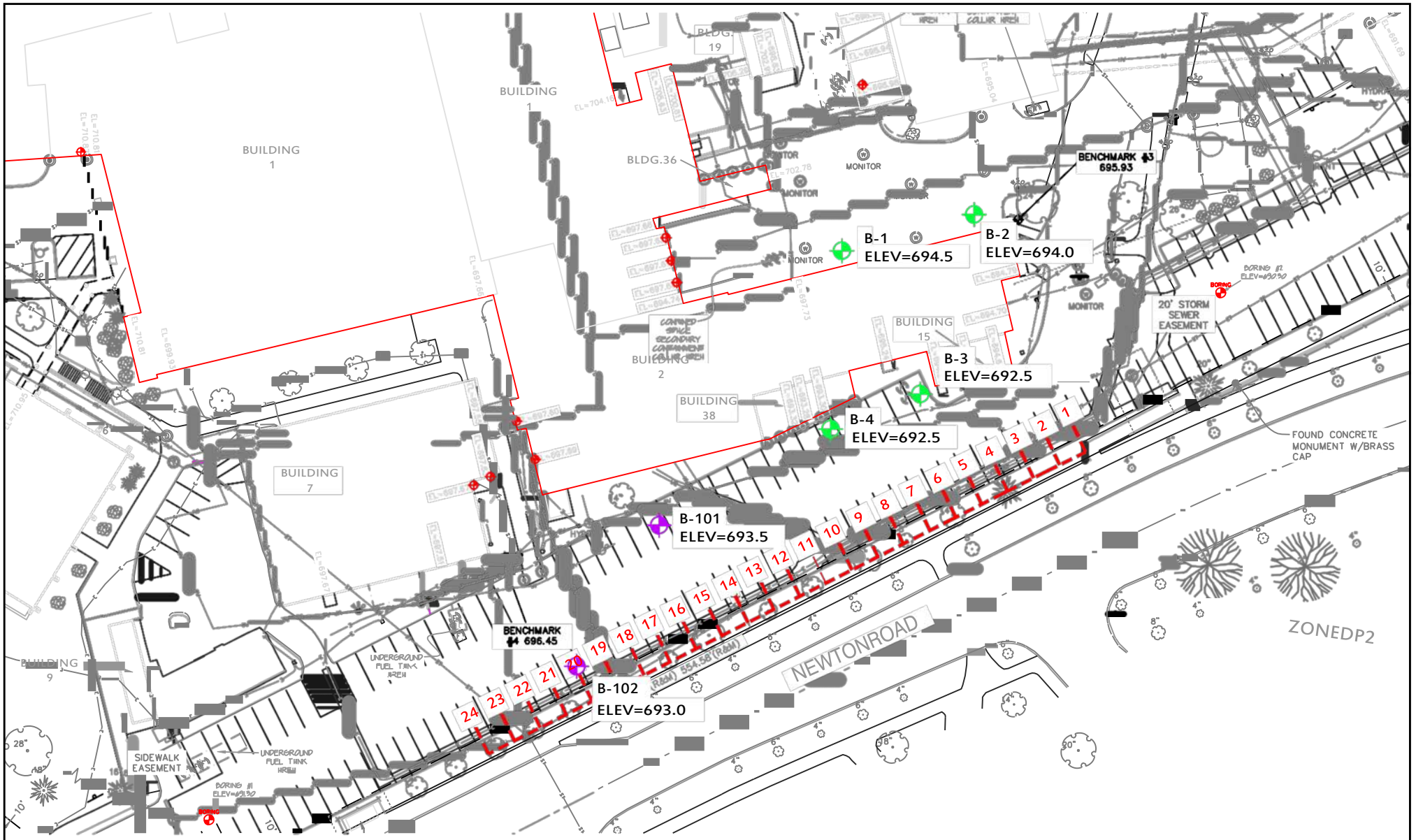
783HIGHWAY1WEST IOWACITY,IOWA52246
PH.(319)533-2262 FAX.(319)688-3008

SITELOCATIONPLAN

PROPOSEDPHASEIIDVAICBUILDING2RENOVATION-
VAMEDICALCENTER
601HIGHWAY6WEST
IOWACITY,IOWA

EXHIBIT

A-1



LEGEND

- -APPROXIMATEBORINGLOCATIONANDELEVATION
- -APPROXIMATEBORINGLOCATION(PROJECTNO.06105660)
- -APPROXIMATESEISMICRUN(PROJECTNO.06105660)

BASEDRAWINGFROMCADDRAWINGTITLED'8549001_SITE SURVEY.dwg'RECEIVEDFROMSHIVE-HATTERY THISDRAWINGISINTENDEDFORGENERALLOCATION PURPOSESONLY

NORTH

0 60'

APPROXIMATEDRAWINGSCALE

ProjectNo.	06115673
Date:	10311
ProjectMngr:	BKS
DrawnBy:	PC
FileName:	06115673-01.dwg
LayoutName:	BORINGLOCATION

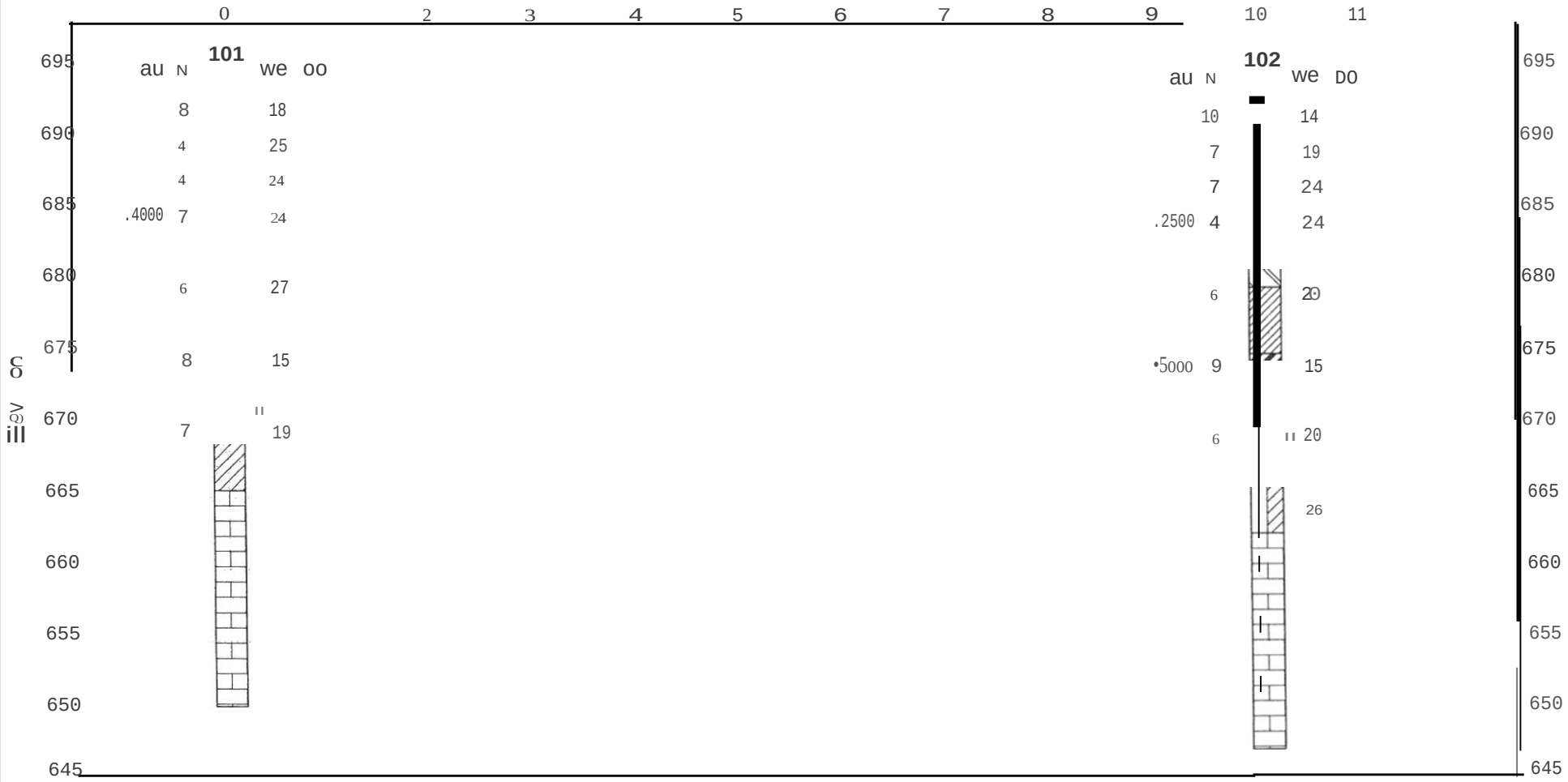
Terracon
ConsultingEngineersandScientists
783HIGHWAY1WEST IOWACITY,IOWA52246
PH.(319)533-2262 FAX.(319)688-3008

BORINGLOCATIONPLAN

PROPOSEDPHASEIIDVAICBUILDING2RENOVATION-VAMEDICALCENTER
601HIGHWAY6WEST
IOWACITY,IOWA

EXHIBIT

A-2



SUBSURFACE SOIL PROFILE
ExhibitA-3

Phase II OVA IC Building 2 Addition
601 Highway 6 West
Iowa City, Iowa

TI NO.	DATE	PLATE
06115673	Oct 11	1

Irerracon

LOG OF BORING NO. 101

CLIENT	FACILITY
Shive-Hattery, Inc.	VA Medical Center
SITE: 601 Highway 6 West, Iowa City, Iowa	PROJECT: Phase II DVA IC Building 2 Addition

Approx. Surface Elevation.: 693.5 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	
			HS						
		1	SS	10	8	18			
			HS						
5		2	SS	7	4	25			
			HS						
		3	SS	11	4	24			
			HS						
10	CL/CH	4	SS	14	7	24		*4000	
			HS						
15	CL/CH	5	SS	15	6	27			Disturbed Sample
			HS						
20	CL/CH	6	SS	14	8	15			
			HS						
25	SC	7	SS	17	7	19			
			HS						
30		R1	DB	100%	RQD 58%				
		R2	DB	100%	RQD 82%				

3" Asphaltic Cement Concrete over 5" Crushed Stone

FILL,MIXTUREOFLEANCLAY &SILTYCLAY,TRACESAND & ORGANICS, Gray Brown and Dark Brown

685.5

8

LEANTOFATCLAY,TRACESAND &GRAVEL, Gray Brown, Stiff

23.5 670

CLAYEYFINETOMEDIUM SAND, TRACEGRAVEL, Gray Brown to Gray, Loose

28 665.5

*** **SLIGHTLY WEATHERED LIMESTONE**, Brown Gray to Gray, Hard, Very Thin to Thin Bedding, Very Close to Close Joints, Solid

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	23	WD	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	9-21-11		
BORING COMPLETED	9-21-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06115673

LOG OF BORING NO. 101

CLIENT	FACILITY
Shive-Hattery, Inc.	VA Medical Center
SITE: 601 Highway 6 West, Iowa City, Iowa	PROJECT: Phase II DVA IC Building 2 Addition

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
	*** **SLIGHTLY WEATHERED LIMESTONE**, Brown Gray to Gray, Hard, Very Thin to Thin Bedding, Very Close to Close Joints, Solid	35		R3	DB	98%	RQD 60%			
	Vuggy below about 42 feet.	40		R4	DB	94%	RQD 39%			
	43 650.5									
	BOTTOM OF BORING									
	*** Classification estimated from disturbed and core samples. Petrographic analysis may reveal other rock types.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	23	WD	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	9-21-11		
BORING COMPLETED	9-21-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06115673

LOG OF BORING NO. 102

CLIENT	FACILITY
Shive-Hattery, Inc.	VA Medical Center
SITE	**PROJECT**
601 Highway 6 West Iowa City, Iowa	Phase II DVA IC Building 2 Addition

Approx. Surface Elevation.: 693 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	DESCRIPTION
			HS						**4" Asphaltic Cement Concrete over 8" Crushed Stone**
		1	SS	14	10	14			**FILL,MIXTUREOFLEANCLAY &SILTYCLAY,TRACESAND**, Gray Brown and Brown
			HS						
5		2	SS	13	7	19			
			HS						
		3	SS	10	7	24			
			HS						
9									684
10	CL/CH	4	SS	13	4	24		*2500	**LEANTOFATCLAY,TRACESAND**, Brown, Medium Stiff to Stiff
			HS						
13.5									679.5
15	CL	5	SS	14	6	20			**LEANCLAYWITHSAND**, Brown Gray, Medium Stiff
			HS						
18									675
20	CH	6	SS	17	9	15		*6000	**FATCLAY,TRACESAND**, Brown Gray, Stiff to Very Stiff
			HS						
23.5									669.5
25	SP-SC	7	SS	15	6	20			**FINETOMEDIUMSANDWITH CLAY, TRACEGRAVEL**, Gray Brown to Reddish Brown, Loose to Very Loose
			HS						
30	SP-SC	8	SS	10	1	26			
		R1	DB	88%	RQD 37%				
30.5									662.5

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	24	WS	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	9-21-11		
BORING COMPLETED	9-21-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06115673

LOG OF BORING NO. 102

CLIENT	FACILITY
Shive-Hattery, Inc.	VA Medical Center
SITE: 601 Highway 6 West, Iowa City, Iowa	PROJECT: Phase II DVA IC Building 2 Addition

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
		35								
	*** **SLIGHTLYWEATHERED LIMESTONE**, Gray Brown to Brown Gray, Hard Very Thin to Thin Bedding, Very Close to Close Joints, Solid			R2	DB	88%	RQD 58%			
		40								
				R3	DB	97%	RQD 73%			
	45.5 647.5	45								
	BOTTOM OF BORING									
	*** Classification estimated from disturbed and core samples. Petrographic analysis may reveal other rock types.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	24	WS	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	9-21-11		
BORING COMPLETED	9-21-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06115673

BORINGS FROM PREVIOUS EXPLORATION
(TERRACON PROJECT NO: 06105660)

LOG OF BORING NO. 1

CLIENT	OWNER
Shive-Hattery, Inc.	VA Medical Center
SITE	**PROJECT**
601 Highway 6 West Iowa City, Iowa	DVA IC Building 2 Renovation / Addition

Approx. Surface Elevation.: 694.5 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
8" Concrete over 3" Crushed Limestone				PA					
FILL,LEANCLAY,TRACESAND &CRUSHEDSTONEPIECES, Brown			1	SS	5	7	20 23		
				PA					
	5		2	ST	6		23		
6 — 688.5		CL/ML	3	ST	7		23	100	*1500
				PA					
LEANCLAYTOSILTY CLAY, TRACESAND& GRAVEL, Brown to Gray Brown, Medium Stiff	10	CL/ML	4	ST	13		24	100	1180
				PA					
	15	CL/ML	5	ST	12		27	97	1900
19 — 675.5				PA					
SANDYLEANCLAY,TRACEGRAVEL, Brown, Stiff	20	CL	6	ST	18		15	116	2720 *4000
23.5 — 671				PA					
24 — 670.5 *** **HIGHLYWEATHERED&BROKEN LIMESTONE**, Gray Brown			7	SS	0	50/.5"			

Practical Sampler Refusal
@ about 24 feet.
BOTTOM OF BORING

*** Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	NONE	WD	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	5-16-11		
BORING COMPLETED	5-16-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06105660

LOG OF BORING NO. 2

CLIENT	OWNER
Shive-Hattery, Inc.	VA Medical Center
SITE	**PROJECT**
601 Highway 6 West Iowa City, Iowa	DVA IC Building 2 Renovation / Addition

Approx. Surface Elevation.: 694 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	BEDROCK COMPRESSIVE STRENGTH, psi
			HS						
	CL/ML	1	ST	10		27	94	830	LL = 36 PI = 15
			HS						
5	CL/ML	2	ST	8		24	95	1110	
	CL/ML	3	ST	17		21	100	1460	
			HS						
10	CL/ML	4	ST	17		21	102	1500	
			HS						
15	CL/ML	5	ST	20		26	102	2180	
			HS						
20	CL	6	ST	15		20	105	3200 *5000	LL = 34 PI = 19
			HS						
25	CL	7	SS	11	14	14		*7000	
			HS						
30		R1	DB	96%	RQD 56%				

7" Concrete over 3" Crushed Limestone

LEANCLAYTOSILTY CLAY, TRACESAND, Brown to Gray Brown, Soft to Stiff

18 — 676

LEANCLAY,TRACESAND, Gray Brown, Stiff to Very Stiff

22 — 672

SANDYLEANCLAY,TRACEGRAVEL, Brown Gray, Very Stiff

27 — 667

28 — 666

*** **HIGHLYWEATHERED&BROKEN LIMESTONE**, Gray

Practical Auger Refusal @ about 28 feet.

*** **MODERATELY WEATHERED LIMESTONE**, Gray

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	NONE	WD	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	5-16-11		
BORING COMPLETED	5-16-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06105660

LOG OF BORING NO. 2

CLIENT	OWNER
Shive-Hattery, Inc.	VA Medical Center
SITE: 601 Highway 6 West, Iowa City, Iowa	PROJECT: DVA IC Building 2 Renovation / Addition

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	BEDROCK COMPRESSIVE STRENGTH, psi
	*** **MODERATELY WEATHERED LIMESTONE**, Gray	35		R2	DB	100%	RQD 80%		166		14,350
38		656									
	BOTTOM OF BORING										

*** Classification estimated from disturbed and core samples. Petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	NONE	WD	Backfilled
WL			
WL	Exhibit A-4		

Terracon

BORING STARTED	5-16-11		
BORING COMPLETED	5-16-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06105660

LOG OF BORING NO. 3

CLIENT	OWNER
Shive-Hattery, Inc.	VA Medical Center
SITE	**PROJECT**
601 Highway 6 West Iowa City, Iowa	DVA IC Building 2 Renovation / Addition

Approx. Surface Elevation.: 692.5 ft

DESCRIPTION	Elevation	DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
3" Asphalt over 5" Crushed Limestone					PA					
FILL,LEANCLAY,TRACESAND &GRAVEL, Gray Brown to Brown				1	SS	3	3	25		
				2	ST	3		26		
5.5	687	5			PA					
LEANCLAY,TRACESAND, Gray Brown, Stiff			CL	3	ST	11		26	99	2400
					PA					
		10	CL	4	ST	5		23	100	3220
12	680.5				PA					
LEANCLAYTOSILTYCLAY, TRACE SAND, Gray Brown, Medium Stiff		15	CL/ML	5	ST	8		25	98	1280
					PA					
19	673.5									
LEANCLAY,TRACESAND, Brown, Stiff		20	CL	6	ST	11		21	106	2270
22	670.5				PA					
LEANTOFATCLAY,TRACESAND, Gray Brown, Very Stiff		25	CL/CH	7	ST	12		26	103	4340
27 ▽	665.5				PA					
28 *** **HIGHLYWEATHERED&BROKEN LIMESTONE**, Gray Brown	664.5									

Practical Auger Refusal @ about 28 feet.
BOTTOM OF BORING
*** Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 27	WD	▼ Backfilled
WL	▼		▼
WL	Exhibit A-4		

Terracon

BORING STARTED	5-16-11		
BORING COMPLETED	5-16-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06105660

LOG OF BORING NO. 4

CLIENT	OWNER
Shive-Hattery, Inc.	VA Medical Center
SITE	**PROJECT**
601 Highway 6 West Iowa City, Iowa	DVA IC Building 2 Renovation / Addition

Approx. Surface Elevation.: 692.5 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	BEDROCK COMPRESSIVE STRENGTH, psi
	2" Asphalt				HS						
	FILL,LEANCLAY,TRACESAND &ASPHALTPIECES, Brown			1	SS	4	4	22			
				2	ST	18		25 28	96 91		
	5 687.5	5									
			CL/ML	3	HS ST	8		24	100	2600	
	LEANCLAYTOSILTY CLAY, TRACESAND, Brown to Gray Brown, Stiff to Soft				HS						
		10	CL/ML	4	ST	8		25	99	2400	LL = 38 PI = 18
					HS						
		15	CL/ML	5	ST	16		27	97	910	
	17.5 675				HS						
		20	CL/CH	6	ST	15		18	112	3860	
	LEANTOFATCLAY,TRACESAND &GRAVEL, Gray Brown, Medium Stiff to Stiff				HS						
		25	CL/CH	7	ST	13		24	95	1360 *2500	
	26 666.5										
					HS						
	28 664.5 *** **HIGHLYWEATHERED& BROKEN LIMESTONE**, Gray										
	Practical Auger Refusal @ about 28 feet.			R1	DB	96%	RQD 80%				
	*** **MODERATELY WEATHERED LIMESTONE**, Gray	30							167		13,200

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types; in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	26	WS	Backfilled
WL			
WL			

Terracon

BORING STARTED	5-16-11		
BORING COMPLETED	5-16-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06105660

BOREHOLE 06105660.GPJ TERRACON.GDT 6/22/11

LOG OF BORING NO. 4

CLIENT	OWNER
Shive-Hattery, Inc.	VA Medical Center
SITE: 601 Highway 6 West, Iowa City, Iowa	PROJECT: DVA IC Building 2 Renovation / Addition

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	BEDROCK COMPRESSIVE STRENGTH, psi
	*** **MODERATELYWEATHERED LIMESTONE**, Gray	35		R2	DB	33%	RQD 14%				
		40		R3	DB	100%	RQD 83%				
	41 651.5										
	BOTTOM OF BORING										
	*** Classification estimated from disturbed and samples. Petrographic analysis may reveal other rock types.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 26	WS	▼ Backfilled
WL	▼		▼
WL	Exhibit A-4		

Terracon

BORING STARTED	5-16-11		
BORING COMPLETED	5-16-11		
RIG	928	FOREMAN	SZ
APPROVED	BKS	JOB #	06105660

Field Exploration Description

The field exploration consisted of performing two (2) borings to depths of about 28 to 30½ feet below the existing grades where practical auger refusal was achieved into the underlying limestone bedrock. After achieving auger refusal, the borings were further advanced about 15 feet using diamond bit core drilling procedures. The boring locations were selected by Terracon based on the supplied site plan and in coordination with Shive-Hattery, Inc. personnel. Distances from the boring locations to the reference features shown on the attached plan are approximate and were located using a measuring wheel and/or cloth tape, and right angles were estimated. The approximate boring locations are indicated on the attached Boring Location Plan. The ground surface elevations indicated on the boring logs and Boring Location Plan are also approximate (rounded to the nearest ½ foot), and were obtained by the drill crew with a level and rod. The elevations were referenced to the top of first floor of the adjacent building located near and northwest of Boring 2. An elevation of 697.5 feet was provided for this reference. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a truck-mounted, rotary drilling rig using continuous flight, hollow-stemmed augers to advance the boreholes. Samples were obtained using split-barrel sampling procedures. In the split-barrel sampling procedure, a standard 2-inch O.D. split-barrel sampling spoon is driven into the ground with a 140-pound hammer falling a distance of 30 inches. A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed for this project. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the standard penetration resistance value. These values are indicated on the boring logs at the corresponding depths of occurrence. The samples were sealed and transported to the laboratory for testing and classification.

After the core samples were retrieved, they were placed in a box and logged. The rock was later visually classified, and the "percent recovery" and rock quality designation (RQD) was determined for each run.

The "percent recovery" is the ratio of the sample length retrieved to the drilled length, expressed as a percent. An indication of the actual in-situ rock quality is provided by calculating the sample's RQD. The RQD is the percentage of the length of broken cores retrieved which have core segments at least 4 inches in length compared to each drilled length. The percent recovery and RQD are related to rock soundness and quality as illustrated below:

Relation of RQD and In-Situ Rock Quality	
RQD (%)	**Rock Quality**
90 – 100	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
0 – 25	Very Poor

Field logs of the borings were prepared by the drill crew. Each log included visual classification of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs by a geotechnical engineer and include modifications based on laboratory observation and tests on select samples.

APPENDIX B

LABORATORY TESTING

Laboratory Testing

Soil samples were tested in the laboratory to measure their natural water contents. A hand penetrometer was used to estimate the unconfined compressive strength of some cohesive samples. The hand penetrometer provides a better estimate of soil consistency than visual examination alone. Six (6) bedrock density and compressive strength tests were performed to aid in classifying the rock samples and evaluating their engineering properties. The results of the laboratory tests are shown on the boring logs, adjacent to the soil and rock profiles, at their corresponding sample depths.

As a part of the laboratory testing program, the soil and rock samples were classified in the laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described above. Additional testing could be performed to more accurately classify the samples. Portions of the recovered samples were placed in jars, and the samples will be retained for at least 1 month in case additional testing is requested. The soil and rock descriptions presented on the boring logs for native materials are in accordance with our enclosed General Notes and Unified Soil Classification System (USCS). The estimated group symbol for the USCS is also shown on the boring logs, and a brief description of the Unified System is attached to this report.

Classification of rock materials is in accordance with the enclosed General Notes – Sedimentary Rock Classification and has been estimated from core and disturbed samples. Petrographic analysis may indicate other rock types.

APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-$^{3}/_{8}$" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2" O.D., 3" O.D., unless otherwise noted	PA:	Power Auger (Solid Stem)
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	BCR:	Before Casing Removal
WCI:	Wet Cave in	WD:	While Drilling	ACR:	After Casing Removal
DCI:	Dry Cave in	AB:	After Boring	N/E:	Not Encountered

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0 - 1	Very Soft
500 – 1,000	2 - 4	Soft
1,000 – 2,000	4 - 8	Medium Stiff
2,000 – 4,000	8 - 15	Stiff
4,000 – 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 50	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	≥ 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	> 30

Rev 04/10

GENERAL NOTES
Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCI.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCI when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz (SiO_2), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (1/2 inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

PHYSICAL PROPERTIES:

DEGREE OF WEATHERING	
Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION	
Limestone and Dolomite	
Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.
Shale, Siltstone and Claystone	
Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.
Sandstone and Conglomerate	
Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers

BEDDING AND JOINT CHARACTERISTICS		
Bed Thickness	**Joint Spacing**	**Dimensions**
Very Thick	Very Wide	>10’
Thick	Wide	3’ – 10’
Medium	Moderately Close	1’ – 3’
Thin	Close	2” – 1’
Very Thin	Very Close	0.4” – 2”
Laminated	---	0.1” – 0.4”

Bedding Plane	A plane dividing sedimentary rocks of the same or different lithology.
Joint	Fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
Seam	Generally applies to bedding plane with an unspecified degree of weathering.

SOLUTION AND VOID CONDITIONS	
Solid	Contains no voids
Vuggy (Pitted)	Rock having small solution pits or cavities up to ½ inch diameter, frequently with a mineral lining.
Porous	Containing numerous voids, pores, or other openings, which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large.

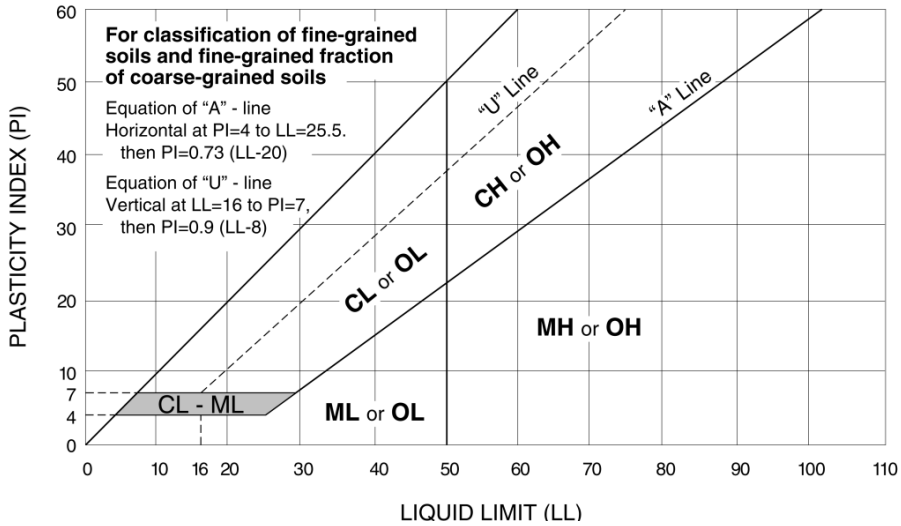
UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



Terracon

Exhibit C-3

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 11, EARTH MOVING (SHORT FORM).

B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.

D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.

E. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

F. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS Article, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS Article, PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.

E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.

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

G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Project Manager. 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 Project Manager’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, INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES:

A. Demolish and remove outside utility service lines shown to be removed.

B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 DEMOLITION:

A. Completely demolish and remove portions of buildings and structures, including all appurtenances related or connected thereto, as noted below:
   1. As required for installation of new utility service lines.

2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.

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 Project Manager. 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. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500 mm (5feet) below surrounding grade, shall be includedas part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications. The contractor shall legally dispose of all excavated drilled pier and elevator piston soil material as indicated above. The oil contaminated soils are to be assumed to be present in all drilled piers and elevator piston for the entire depth of the drilled pier, and the contractor shall provide the necessary testing in order for the disposal site to accept the oil contaminated soils.

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 Project Manager. When Utility lines are encountered that are not indicated on the drawings, the Project Manager shall be notified prior to further work in that area.

3.2 CLEAN-UP:

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

END OF SECTION 02 41 00

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PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

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

1.1.2 EXTENT OF WORK

A. Below is a brief description of the estimated quantities of asbestos containing materials to be abated by the glovebag method. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.

B. Removal, clean-up and disposal of ACM piping and fittings and asbestos contaminated elements in an appropriate regulated area in the following approximate quantities;

Do not abate ACM from piping and fittings; wrap and remove for disposal.

Building 2 (Drawing 2-E-AA1) –

162 linear feet of 50 - 150 millimeter (mm) (2" - 6") diameter pipe insulation

17 fittings 50 - 150 mm (2" - 6") in diameter

20 square feet of wrap on rooftop air handler

Building 15 (Drawing 2-E-AA1) –

60 fittings 50 - 150 mm (2" - 6") in diameter

1.1.3 RELATED WORK

A. Section 07 84 00; FIRESTOPPING.

B. Section 02 41 00; DEMOLITION.

C. Division 09; FINISHES.

D. Division 22; PLUMBING.

E. 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

F. 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

G. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

H. Section 22 05 19, METERS AND GAGES FOR PLUMBING PIPING / Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING / Section 22 05 33, HEAT TRACING FOR PLUMBING PIPING / Section 22 11 00, FACILITY WATER DISTRIBUTION / Section 22 13 00, FACILITY SANITARY SEWERAGE / Section 22 13 23, SANITARY WASTE INTERCEPTORS / Section 22 14 00, FACILITY STORM DRAINAGE / Section 22 66 00, CHEMICAL-WASTE SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 23 11 23, FACILITY NATURAL-GAS PIPING.

I. Section 23 21 13, HYDRONIC PIPING / Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING.

J. Section 23 31 00, HVAC DUCTS AND CASINGS / Section 23 37 00, AIR OUTLETS AND INLETS.

1.1.4 TASKS

The work tasks are summarized briefly as follows:

A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, work-site

preparations, emergency procedures arrangements, and standard operating procedures for glovebag asbestos abatement work.

B. Abatement activities including removal, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.

C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES

A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State, and Local regulations and requirements.

B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved pre-abatement work plan. Asbestos abatement drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

The Contractor may only use the service elevators.

1.2 VARIATIONS IN QUANTITY

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimates which are limited by the physical constraints imposed by occupancy of the buildings. Accordingly, minor variations (+/- 5%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the Contractor shall provide unit prices for additional footage for newly discovered materials and those prices will be used for additional work under the contract.

1.3 STOP ASBESTOS REMOVAL

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

A. Airborne PCM analysis results equal to or greater than (≥) 0.01 f/cc outside a regulated area or >0.05 f/cc inside a regulated area;
B. Breach/break in regulated area critical barrier(s)/floor;
C. Serious injury/death at the site;
D. Fire/safety emergency at the site;
E. Respiratory protection system failure;
F. Power failure or loss of wetting agent; or
G. Any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

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

1.4.2 GLOSSARY

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

ACE - Asbestos-contaminated elements.

ACM - Asbestos-containing material.

Aerosol - Solid or liquid particulate suspended in air.

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

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

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

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

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

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

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (phase contrast microscopy) and polycarbonate for TEM (transmission electron microscopy)

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

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

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

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

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

Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment

leaving the regulated area. In an emergency, it may be used to evacuate personnel.

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

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

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

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

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

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

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

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

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

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

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

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

Class I asbestos work - Activities involving the removal of thermal system insulation (TSI) and surfacing ACM and presumed asbestos-containing material (PACM).

Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes,

but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

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

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's industrial hygiene consultant (VPIH/CIH).

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

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

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

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

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

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

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

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM

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

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

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

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

Encapsulation - Treating ACM with an encapsulant.

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

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

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

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

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

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

Friable asbestos-containing material - Any material containing more than 1 percent asbestos as determined using the method specified in appendix A, Subpart F, 40 Code of Federal Regulations (CFR) 763, Section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

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

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

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

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

HVAC - Heating, ventilation, and air conditioning

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (k)(5).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a

minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH.

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

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

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

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

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

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

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

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

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

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

Standard operating procedures (SOPs) - Asbestos work procedures required to be submitted by the contractor before work begins.

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

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

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

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

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

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

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

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

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

Waste/equipment decontamination facility (W/EDF) – The area in which equipment is decontaminated before removal from the regulated area.

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

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

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

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

A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

B. AIHA American Industrial Hygiene Association
3141 Fairview Park Drive, Suite 777
Falls Church, VA 22042
703-849-8888

C. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300

D. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400

E. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420

F. CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900

G. CS Commercial Standard of the National Institute of Standards and Technology(NIST)
U. S. Department of Commerce
Government Printing Office
Washington, DC 20420

H. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949

I. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420

J. MSHA Mine Safety and Health Administration
Respiratory Protection Division
Ballston Tower #3
Department of Labor
Arlington, VA 22203
703-235-1452

K. NIST National Institute for Standards and Technology
U. S. Department of Commerce
Gaithersburg, MD 20234
301-921-1000

L. NEC National Electrical Code (by NFPA)

M. NEMA National Electrical Manufacturer's Association
2101 L Street, NW
Washington, DC 20037

N. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555

O. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236

P. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Government Printing Office
Washington, DC 20402

Q. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800

R. USA United States Army
Army Chemical Corps
Department of Defense
Washington, DC 20420

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards, and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations, and standards are adopted into this specification and will have the same force and effect as this specification.

B. The most recent edition of any relevant regulation, standard, document, or code shall be in effect. Where conflict among the requirements or with these specification exists, the most stringent requirement(s) shall be utilized.

C. Copies of all standards, regulations, codes, and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

1.5.2 CONTRACTOR RESPONSIBILITY

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

1.5.3 FEDERAL REQUIREMENTS

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

A. Occupational Safety and Health Administration **(OSHA)**

1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
2. Title 29 CFR 1910.132 - Personal Protective Equipment
3. Title 29 CFR 1910.134 - Respiratory Protection
4. Title 29 CFR 1926 - Construction Industry Standards
5. Title 29 CFR 1910.1020 - Access to Employee Exposure and Medical Records
6. Title 29 CFR 1910.1200 - Hazard Communication
7. Title 29 CFR 1910.151 - Medical and First Aid

B. Environmental Protection Agency **(EPA)**

1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
2. 40 CFR 763Subpart E – Asbestos-Containing Materials in Schools

C. Department of Transportation **(DOT)**

Title 49 CFR 100 - 185 - Transportation

1.5.4 STATE REQUIREMENTS:

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

A. Applicable Iowa State Regulations, Iowa Administrative Code (IAC)

1. IAC 567-23—Asbestos Fiber Emissions
2. IAC 567-109—Asbestos-Containing Waste Disposal
3. IAC 875-10—Occupational Exposure to Asbestos
4. IAC 875-155—Asbestos Removal and Encapsulation Activities

1.5.5 STANDARDS

A. Standards which govern asbestos abatement activities include, but are not limited to, the following:

1. American National Standards Institute (ANSI)Z9.2-79 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and Z88.2 - Practices for Respiratory Protection.
2. Underwriters Laboratories (UL)586-90 - UL Standard for Safety of HEPA Filter Units, 7th Edition.

B. Standards which govern encapsulation work include, but are not limited to, the following:

1. American Society for Testing and Materials (ASTM)

C. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:

1. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
2. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
3. NFPA 101 - Life Safety Code

1.5.6 EPA GUIDANCE DOCUMENTS

A. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference. EPA publications can be ordered from (800) 424-9065.

B. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024

C. Asbestos Waste Management Guidance EPA 530-SW-85-007.

D. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001

E. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

1.5.7 NOTICES

A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:

1. The Contractor shall notify the Iowa Department of Natural Resources (IDNR) and Iowa Department of Labor (IDOL) at least 10 working days prior to the commencement of work in accordance with IAC 875-155. State requirements include the "Notification of Demolition and Renovation Record" form and other required notification documents.

B. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame in which notification is given to EPA, State, and Local authorities.

1.5.8 PERMITS/LICENSES

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

1. The abatement contractor must be permitted by the State of Iowa.
2. Asbestos abatement workers must be licensed by the State of Iowa.

1.5.9 POSTING AND FILING OF REGULATIONS

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

1.5.10 VA RESPONSIBILITIES

Prior to commencement of work:

A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**

B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized and method of analysis.

C. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the

abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

1.5.11 SITE SECURITY

A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.

B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent Person shall immediately notify the VA.

C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.

D. Access to the regulated area shall be through a single decontamination unit, if required. All other access (doors, windows, hallways, etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside, however, they shall be sealed with poly sheeting and taped until needed.

E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24-hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.

F. The Abatement Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location, and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.

G. The regulated area shall be locked during non-working hours and secured by VA security guards.

1.5.12 EMERGENCY ACTION PLAN AND ARRANGEMENTS

A. An Emergency Action Plan shall be developed by the Contractor prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a);(b).

B. Emergency procedures shall be in written form and prominently posted and available in the regulated area. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.

C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule and layout of regulated area, particularly barriers that may affect response capabilities.

D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.

E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.

   1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.

   2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.

F. Telephone numbers of all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.

G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3 minutes of a life-threatening injury/illness. Bloodborne pathogen training shall also be verified for those personnel required to provide first aid/CPR.

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

1.5.13 PRE-CONSTRUCTION MEETING

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

A. Proof of Contractor permitting.

B. Proof the Competent Person is trained and licensed and approved for working in this State. Verification of the experience of the Competent Person shall also be presented.

C. A list of all workers who will participate in the project, including experience and verification of training and licensing.

D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.

E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).

F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.

G. A copy of the Contractor's Standard Operating Procedures for Class I Glovebag Asbestos Abatement. In these procedures, the following information must be detailed, specific for this project.

1. Regulated area preparation procedures;
2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
3. If required, decontamination area set-up/layout and decontamination procedures for employees;
4. Glovebag abatement methods/procedures and equipment to be used;
5. Personal protective equipment to be used;

H. At this meeting the Contractor shall provide all submittals as required.

I. Procedures for handling, packaging and disposal of asbestos waste.

J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

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

1.6.1 PERSONNEL

A. Administrative and supervisory personnel shall consist of a qualified Competent Person as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.

B. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; social security number; qualifications; accreditation card with picture; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.

C. Minimum qualifications for Contractor and assigned personnel are:

1. The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for asbestos work; has adequate materials, equipment and supplies to perform the work.

2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project; has completed EPA AHERA/OSHA/State/Local training

requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.

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

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

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

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

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

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualification. The procedure must be written clearly enough for workers to understand. A

copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

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

1.7.5 MEDICAL WRITTEN OPINION

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

1.7.6 RESPIRATOR FIT TEST

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

1.7.7 RESPIRATOR FIT CHECK

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

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

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

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer

meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

1.8.2 MEDICAL EXAMINATIONS

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

1.8.3 PERSONAL PROTECTIVE EQUIPMENT

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

1.8.4 REGULATED AREA ENTRY PROCEDURE

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

1.8.5 DECONTAMINATION PROCEDURE – PAPR

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

A. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.

B. Still wearing the respirator and completely naked, proceed to the shower. Showering is MANDATORY. Care must be taken to follow reasonable procedures in removing the respirator to avoid asbestos fibers wile showering. The following procedure is required as a minimum:

1. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
2. With respirator still in place, thoroughly decontaminate body, hair, respirator face piece, and all other parts of the respirator except the blower and battery pack on a PAPR. Pay particular attention to cleaning the seal between the face and respirator facepiece and under the respirator straps.
3. Take a deep breath, hold it and/or exhale slowly, completely wetting hair, face, and respirator. While still holding breath, remove the respirator and hold it away from the face before starting to breathe.

C. Carefully decontaminate the facepiece of the respirator inside and out. If using a PAPR, shut down using the following sequence: a) first cap inlets to filters; b) turn blower off to keep debris collected on the inlet side of the filter from dislodging and contaminating the outside of the unit; c) thoroughly decontaminate blower and hoses; d) carefully decontaminate battery pack with a wet rag being cautious of getting water in the battery pack thus preventing destruction. **THIS PROCEDURE IS NOT A SUBSTITUTE FOR RESPIRATOR CLEANING!**

D. Shower and wash body completely with soap and water. Rinse thoroughly.

E. Rinse shower room walls and floor to drain prior to exiting.

F. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

1.8.6 REGULATED AREA REQUIREMENTS

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

1.9 DECONTAMINATION FACILITIES

1.9.1 DESCRIPTION

Provide each regulated area with separate personnel (PDF) and waste/equipment decontamination facilities (W/EDF). Ensure that the PDF is the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

1.9.2 GENERAL REQUIREMENTS

All personnel entering or exiting a regulated area shall follow the requirements at 29 CFR 1926.1101 (j)(1) and these specifications. All equipment and materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and W/EDF must be constructed of a minimum of three (3) layers of 6-mil opaque fire retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of three (3) layers of 6-mil poly shall also be used to cover the floor under the PDF and W/EDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weigh sheets with layers of duct tape so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting.

1.9.3 TEMPORARY FACILITIES TO THE PDF AND W/EDF

The Competent Person shall provide temporary water service connections to the PDF and W/EDF. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of adequate pressure and meet requirements of 29 CFR 1910.141(d)(3). Provide adequate temporary electric power with ground fault protection and overhead wiring in the PDF and W/EDF. Provide a sub-panel for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the PDF and W/EDF. Provide temporary heat to maintain 70°F throughout the PDF and W/EDF..

1.9.4 PERSONNEL DECONTAMINATION FACILITY (PDF)

The Competent Person shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room. The PDF must be sized to accommodate the number of personnel scheduled for the project. The shower room, located in the center of the PDF, shall be fitted with as many portable showers as necessary to insure all employees can complete the entire decontamination procedure within 15 minutes. The PDF shall be constructed of opaque poly for privacy. The PDF shall be constructed to eliminate any parallel routes of egress without showering.

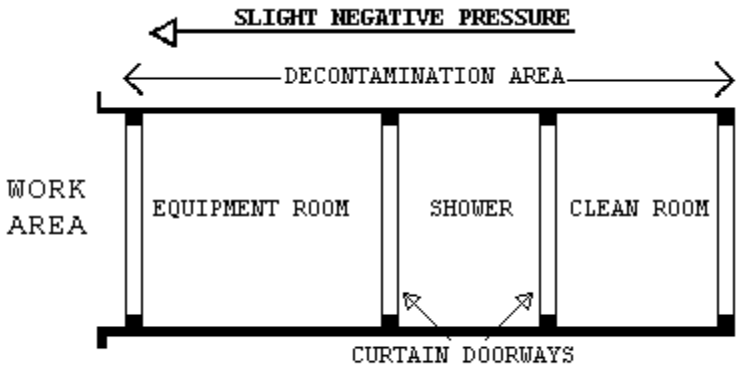
1. Clean Room: The clean room must be physically and visually separated from the rest of the building to protect the privacy of personnel

changing clothes. The clean room shall be constructed of at least two (2) layers of 6-mil fire retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide flapped doorways. One doorway shall be the entry from outside the PDF and the second doorway shall be to the shower room of the PDF. The floor of the clean room shall be maintained in a clean, dry condition. Shower overflow shall not be allowed into the clean room. An adequate supply of disposable towels shall be provided. Provide storage lockers per person. A portable fire extinguisher, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing in the clean room and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by posting guards at both entry points to the PDF so no male can enter or exit the PDF during her stay in the PDF.

2. Shower Room: The Competent Person shall assure that the shower room is a completely water tight compartment to be used for the movement of all personnel from the clean room to the equipment room and for the showering of all personnel going from the regulated area to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using air tight walls made from at least three (3) layers of 6-mil fire retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Waste water will be pumped to a drain after being filtered through a minimum of a 100 micrometer (µm) sock in the shower drain; a 20-µm; and a final 5-µm filter. Filters will be

changed a minimum of daily or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.

3. Equipment Room: The Competent Person shall provide an equipment room which shall be an air tight compartment for the storage of work equipment, reusable footwear and for use as a change station for personnel exiting the regulated area. The equipment room shall be separated from the regulated area by a minimum three (3) foot wide door made of two (2) layers of 6-mil fire retardant poly. The equipment room shall be separated from the regulated area, the shower room and the rest of the building by air tight walls and ceiling constructed of a minimum of three (3) layers of 6-mil fire retardant poly. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6-mil fire retardant poly per shift change and remove this layer after each shift. Provide a temporary electrical sub-panel equipped with GFCI in this room to accommodate any equipment required in the regulated area.
4. The PDF shall consist of the following: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each doorway in the PDF is minimum of two (2) layers of 6-mil fire retardant poly.

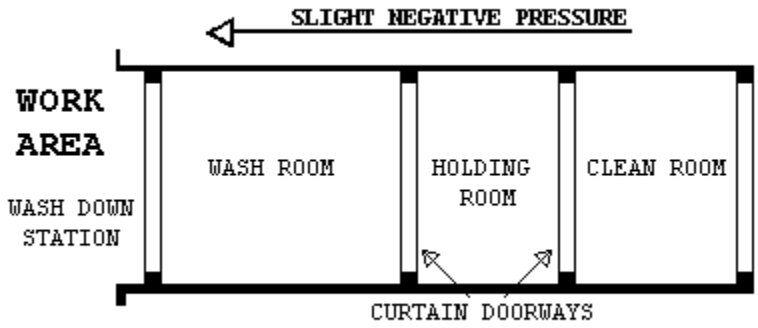


1.9.5 WASTE/EQUIPMENT DECONTAMINATION FACILITY (W/EDF)

The Competent Person shall provide a W/EDF consisting of a wash room, holding room, and clean room for removal of all waste, equipment and

contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF daily. All surfaces in the W/EDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The W/EDF shall consist of the following:

1. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the wash room as an equipment, bag and container cleaning station.
2. Wash Room: Provide a wash room for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the wash room using 50 x 100 mm (2" x 4") wood framing and three (3) layers of 6-mil fire retardant poly. Locate the wash room so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the wash room shall be constructed of two (2) layers of 6-mil fire retardant poly.
3. Holding Room: Provide a holding room as a drop location for bagged materials passed from the wash room. Construct the holding room using 50 x 100 mm (2" x 4") wood framing and three (3) layers of 6-mil fire retardant poly. The holding room shall be located so that bagged material cannot be passed from the wash room to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of two (2) layers of 6-mil fire retardant poly.
4. Clean Room: Provide a clean room to isolate the holding room from the building exterior. Construct the clean room using 50 x 100 mm (2" x 4") wood framing and two (2) layers of 6-mil fire retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of two layers of 6-mil fire retardant poly.
5. The W/EDF shall be provided as follows: Wash room leading to a holding room followed by a clean room leading to outside the regulated area. See diagram.



1.9.6 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES

At washdown station in the regulated area, thoroughly wet clean contaminated equipment and/or sealed polyethylene bags and pass into wash room after visual inspection. When passing anything into the wash room, close all doorways of the W/EDF, other than the doorway between the washdown station and the wash room. Keep all outside personnel clear of the W/EDF. Once inside the wash room, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the holding room. Close all doorways except the doorway between the holding room and the clean room. Workers from the clean room/exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. These personnel will not be required to wear PPE. At no time shall personnel from the clean side be allowed to enter the wash room.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)

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

A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).

B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient to prevent damage or contamination. Flammable materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated/work area until abatement is completed.

C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized place.

D. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.

E. Poly sheeting put under the glovebag regulated area shall be a minimum of 6-mils in thickness.

F. If required, the method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces.

G. Polyethylene sheeting utilized for personnel decontamination facility shall be opaque white or black in color, 6-mil fire retardant poly.

H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.

I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements shall be provided. Fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project shall also be provided. All electrically operated hand tools, equipment, electric cords shall be equipped with GFCI protection.

J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water, and falling material).

K. Disposal bags – two (2) layers of 6-mil, for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.

L. The VA shall be provided a copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication.

Chlorinated compounds shall not be used with any spray adhesive or other product. Appropriate encapsulant(s) shall be provided.

M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k)(7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the clean room.

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

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

2.2.1 GENERAL

Using critical barriers, seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All horizontal surfaces in the regulated area must be covered with two (2) layers of 6-mil fire retardant poly to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated, immediately stop work and clean up the contamination at no additional cost to the Government. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 2.2.8; FIRESTOPPING.

2.2.2 PREPARATION PRIOR TO SEALING THE REGULATED AREA

Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work, or completely cover with two (2) layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA

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

2.2.4 CRITICAL BARRIERS

Completely separate any openings into the regulated area from adjacent areas using fire retardant poly at least 6-mils thick and duct tape. Individually seal with two (2) layers of 6-mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly.

2.2.5 SECONDARY BARRIERS

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

2.2.6 EXTENSION OF THE REGULATED AREA

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

2.2.7 FIRESTOPPING

A. Through penetrations caused by cables, cable trays, pipes, sleeves must be firestopped with a fire-rated firestop system providing an airtight seal.

B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The Contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA Representative immediately. All walls, floors, and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshal.

C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

2.3 MONITORING, INSPECTION AND TESTING

2.3.1 GENERAL

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

B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.

C. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the

responsibility of the CPIH with review and approval of the VPIH/CIH. An agreement between the CPIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IHs and delivered to the VA's representative.

2.3.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT

A. The purpose of the work of the VPIH/CIH is to: Assure quality; resolve problems; and prevent the spread of contamination beyond the regulated area. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:

1. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
2. Task 2: Perform continuous air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
3. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of unforeseen developments, etc.
5. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area or building at the conclusion of the abatement and clean-up work to certify compliance with all regulations and the VA requirements/specifications.
6. Task 6: Issue certificate of decontamination for each regulated area or building and project report.

B. All data, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and

consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.

C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

2.3.3 MONITORING, INSPECTION AND TESTING BY ABATEMENT CONTRACTOR CPIH

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

collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH responsibilities.

2.4 STANDARD OPERATING PROCEDURES

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

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

2.5 SUBMITTALS

2.5.1 PRE-CONSTRUCTION MEETING SUBMITTALS

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

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

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

C. Submit Standard Operating Procedures developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH.

D. Submit the specifics of the materials and equipment to be used for this project with brand names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
   1. HEPA vacuums, air monitoring pumps, calibration devices, and emergency power generating system.
   2. Waste water filtration system, shower system, critical/floor barriers.
   3. Encapsulants, surfactants, hand held sprayers, airless sprayers, glovebags, fire extinguishers.
   4. Personal protective equipment.
   5. Fire safety equipment to be used in the regulated area.

E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.

F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.

G. Submit the name, location, and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A.

H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
   1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project:

Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; Completion Date

2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last three (3) years:
   Project Name; Reason; Date; Reference Name/Number; Resolution
3. List asbestos regulatory citations, penalties, damages paid and legal actions taken against the company in the last three (3) years. Provide copies and all information needed for verification.

I. Submit information on personnel: Provide a resume; address each item completely; provide references; phone numbers; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.

1. CPIH: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of SOPs developed; medical opinion; current respirator fit test.
2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person /Supervisor; list of similar projects as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion; current respirator fit test.
3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion; current respirator fit test.

J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of SOPs incorporating the requirements of this specification; information on

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

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

1. Submit, before the start of work, the manufacturer's technical data and MSDS for encapsulants used on the project. Provide application instructions also.

2.5.2 SUBMITTALS DURING ABATEMENT

A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as critical barrier breeching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWAs/ELs. Submit this daily log to VA's representative.

B. The CPIH shall document and maintain the following during abatement and submit as appropriate to the VA's representative.

1. Inspection and approval of the regulated area preparation prior to start of work and daily during work.
2. Removal of any poly critical/floor barriers.
3. Visual inspection/testing by the CPIH prior to application of lockdown encapsulation.
4. Packaging and removal of ACM waste from regulated area.
5. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The CPIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. The report shall include a certificate of completion, signed and dated by

the CPIH, in accordance with Attachment #1. The VA Representative will forward the abatement report to the Medical Center after completion of the project.

2.6 ENCAPSULANTS

2.6.1 TYPES OF ENCAPSULANTS

A. The following four types of encapsulants must comply with comply with performance requirements as stated in paragraph 2.6.2:
   1. Removal encapsulant - used as a wetting agent to remove ACM.
   2. Bridging encapsulant - provides a tough, durable coating on ACM.
   3. Penetrating encapsulant - penetrates/encapsulates ACM at least 13 mm (1/2").
   4. Lockdown encapsulant - seals microscopic fibers on surfaces after ACM removal.

2.6.2 PERFORMANCE REQUIREMENTS

Encapsulants shall meet the latest requirements of EPA; shall not contain toxic or hazardous substances; or solvents; and shall comply with the following performance requirements:

A. General Requirements for all Encapsulants:
   1. ASTM E84: Flame spread of 25; smoke emission of 50.
   2. University of Pittsburgh Protocol: Combustion Toxicity; zero mortality.
   3. ASTM C732: Accelerated Aging Test; Life Expectancy - 20 years.
   4. ASTM E96: Permeability - minimum of 0.4 perms.

B. Bridging/Penetrating Encapsulants:
   1. ASTM E736: Cohesion/Adhesion Test - 24 kPa (50 lbs/ft^2).
   2. ASTM E119: Fire Resistance - three (3) hours (Classified by UL for use on fibrous/cementitious fireproofing).
   3. ASTM D2794: Gardner Impact Test; Impact Resistance - minimum 11.5 kg-mm (43 in/lb).
   4. ASTM D522: Mandrel Bend Test; Flexibility - no rupture or cracking.

C. Lockdown Encapsulants:
   1. ASTM E119: Fire resistance - three (3) hours (tested with fireproofing over encapsulant applied directly to steel member).
   2. ASTM E736: Bond Strength - 48 kPa (100 lbs/ft^2) (test compatibility with cementitious and fibrous fireproofing).
   3. In certain situations, encapsulants may have to be applied to hot pipes/equipment. The encapsulant must be able to withstand high

temperatures without cracking or off-gassing any noxious vapors during application.

2.7 CERTIFICATES OF COMPLIANCE

The Contractor shall submit to the VA representative certification from the manufacturer indicating compliance with performance requirements for encapsulants when applied according to manufacturer recommendations.

2.8 RECYCLABLE PROTECTIVE CLOTHING

If recyclable clothing is provided, all requirements of EPA, DOT and OSHA shall be met.

PART 3 - EXECUTION

3.1 PRE-ABATEMENT ACTIVITIES

3.1.1 PRE-ABATEMENT MEETING

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

3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

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

A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.

B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of 10/95 A/E Quality Alert indicating the failure to identify asbestos

as applicable to glovebag abatement in the areas listed. Make sure these areas are looked at/reviewed on the project: Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside chases/walls; transite piping/ductwork/sheets; behind radiators; below window sills; water/sewer lines; electrical conduit coverings; steam line trench coverings.

C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects which the Contractor is required to remove from the regulated area have been cleaned and removed or properly protected from contamination.

   Movable objects such as chairs, pictures, bulletin board postings, etc. will be removed by VA staff before the asbestos abatement activities commence.

D. Shut down and seal with a minimum of two (2) layers of 6-mil fire retardant poly all HVAC systems serving the regulated area. The regulated area critical barriers shall be completely isolated from any other air in the building. The VA's representative will monitor the isolation provision.

E. Shut down and lock out in accordance with 29 CFR 1910.147 all electrical circuits which pose a potential hazard. Electrical arrangements will be tailored to the particular regulated area and the systems involved. All electrical circuits affected will be turned off at the circuit box outside the regulated area, not just the wall switch. The goal is to eliminate the potential for electrical shock which is a major threat to life in the regulated area due to water use and possible energized circuits. Electrical lines used to power equipment in the regulated area shall conform to all electrical safety standards and shall be isolated by the use of a ground fault circuit interrupter (GFCI). All GFCI shall be tested prior to use. The VA's representative will monitor the electrical shutdown.

F. If required, remove and dispose of carpeting from floors in the regulated area.

G. Inspect existing firestopping in the regulated area. Correct as needed.

3.1.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.

B. Upon completion of all preparatory work, the CPIH will inspect the work and systems and will notify the VA's representative when the work is

completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved SOPs, especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation.

C. The CPIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.

D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification.

3.2 REGULATED AREA PREPARATIONS

3.2.1 OSHA DANGER SIGNS

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

3.2.2 SHUT DOWN - LOCK OUT ELECTRICAL

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

3.2.3 SHUT DOWN - LOCK OUT HVAC

Shut down and lock out heating, cooling, and air conditioning system **(HVAC)** components that are in, supply or pass through the regulated area.

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

3.2.4 SANITARY FACILITIES

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

3.2.5 WATER FOR ABATEMENT

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

3.2.6 PRE-CLEANING MOVABLE OBJECTS

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

3.2.7 PRE-CLEANING FIXED OBJECTS

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

The abatement contractor will preclean and enclose objects permanently fixed on walls.

3.2.8 PRE-CLEANING SURFACES IN THE REGULATED AREA

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

3.3 CONTAINMENT BARRIERS AND COVERINGS FOR THE REGULATED AREA

3.3.1 GENERAL

Seal off any openings at the perimeter of the regulated area with critical barriers to completely isolate the regulated area and to contain all airborne asbestos contamination created by the abatement activities. Should the adjacent area past the regulated area become contaminated due to improper work activities, the Contractor shall suspend work inside the regulated area, continue wetting, and clean the adjacent areas in accordance with procedures described in these specifications. Any and all costs associated with the adjacent area cleanup shall not be borne by the VA.

3.3.2 PREPARATION PRIOR TO SEALING OFF

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

3.3.3 CONTROLLING ACCESS TO THE REGULATED AREA

Access to the regulated area shall be permitted only through the PDF. All other means of access shall be closed off by proper sealing and DANGER signs posted on the clean side of the regulated area where it is adjacent to or within view of any occupiable area. An opaque visual barrier of 6-mil poly shall be provided so that the abatement work is not visible to any building occupants. If the area adjacent to the regulated area is accessible to the public, construct a solid barrier on the public side of the sheeting for protection and isolation of the project. The barrier shall be constructed with nominal 2" x 4" (50 mm x 100 mm) wood or metal studs 16" (400 mm) on centers, securely anchored to prevent movement and covered with a minimum of 1/2" (12.5 mm) plywood. Provide an appropriate number of OSHA DANGER signs for each visual and physical barrier. Any alternative method must be given a written approval by the VA's representative.

3.3.4 CRITICAL BARRIERS

The regulated area must be completely separated from the adjacent areas, and the outside by at least two (2) layers of 6-mil fire retardant poly and duct tape/spray adhesive. Individually seal all supply and exhaust ventilation openings, lighting fixtures, clocks, doorways, windows, convectors, speakers, and other openings into the

regulated area with two (2) layers of 6-mil fire retardant poly, and taped securely in place with duct tape/spray adhesive. Critical barriers must remain in place until all work and clearances have been completed. Light fixtures shall not be operational during abatement. Auxiliary lighting shall be provided. If needed, provide plywood squares 6" x 6" x 3/8" (150 mm x 150 mm x 18 mm) held in place with one 6d smooth masonry/galvanized nail driven through the center of the plywood square and duct tape on the poly so as to clamp the poly to the wall/surface. Locate plywood squares at each end, corner, and 4' (1,200 mm) maximum on centers.

3.3.5 EXTENSION OF THE REGULATED AREA

If the regulated area barrier is breached in any manner that could allow the passage of asbestos fibers or debris, the Competent Person shall immediately stop work, continue wetting, and proceed to extend the regulated area to enclose the affected area as per procedures described in this specification. If the affected area cannot be enclosed, decontamination measures and cleanup shall start immediately. All personnel shall be isolated from the affected area until decontamination/cleanup is completed as verified by visual inspection and air monitoring. Air monitoring at completion must indicate background levels.

3.3.6 FLOOR BARRIERS

All floors within 10’ of glovebag work shall be covered with two (2) layers of 6-mil fire retardant poly.

3.4 REMOVAL OF PIPING ACM

3.4.1 WETTING MATERIALS

A. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure the wetting of ACM meets the definition of "adequately wet" in the EPA NESHAPs regulation and OSHA’s “wet methods” for the duration of the project. A removal encapsulant may be used instead of amended water with written approval of the VA's representative.

B. Amended Water: Provide water to which a surfactant has been added shall be used to wet the ACM and reduce the potential for fiber release during disturbance of ACM. The mixture must be equal to or greater than the wetting provided by water amended by a surfactant consisting one ounce of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with 5 gallons (19 L) of water.

C. Removal Encapsulant: Provide a penetrating encapsulant designed specifically for the removal of ACM. The material must, when used, result in adequate wetting of the ACM and retard fiber release during disturbance equal to or greater than the amended water described above in B.

3.4.2 SECONDARY BARRIER AND WALKWAYS

A. Install as a drop cloth a 6-mil poly sheet at the beginning of each work shift where removal is to be done during that shift. Completely cover floors within 10 feet (3 M) of the area where work is to done. Secure the secondary barrier with duct tape to prevent debris from getting behind it. Remove the secondary barrier at the end of the shift or as work in the area is completed. Keep residue on the secondary barrier wetted. When removing, fold inward to prevent spillage and place in a disposal bag.

B. Install walkways using 6-mil poly between the regulated area and the decontamination facilities (PDF and W/EDF) to protect the floor from contamination and damage. Install the walkways at the beginning of each shift and remove at the end of each shift.

3.4.3 WET REMOVAL OF ACM

Using acceptable glovebag procedures, adequately and thoroughly wet the ACM to be removed prior to removal to reduce/prevent fiber release to the air. Adequate time must be allowed for the amended water to saturate the ACM. Abatement personnel must not disturb dry ACM. Use a fine spray of amended water or removal encapsulant. Saturate the material sufficiently to wet to the substrate without causing excessive dripping. The material must be sprayed repeatedly/continuously during the removal process in order to maintain adequately wet conditions. Removal encapsulants must be applied in accordance with the manufacturer's written instructions. Perforate or carefully separate, using wet methods, an outer covering that is painted or jacketed in order to allow penetration and wetting of the material. Where necessary, carefully remove covering while wetting to minimize fiber release. In no event shall dry removal occur except in the case of electrical hazards or a greater safety issue is possible!

3.5 GLOVEBAG REMOVAL PROCEDURES

3.5.1 GENERAL

All applicable OSHA requirements and glovebag manufacturer’s recommendations shall be met during glove bagging operations.

1. Mix the surfactant with water in the garden sprayer, following the manufacturer's directions.
2. Have each employee put on a HEPA-filtered respirator approved for asbestos and check the fit using the positive/negative fit check.
3. Have each employee put on a disposable full-body suit. Remember, the hood goes over the respirator straps.
4. Check closely the integrity of the glove bag to be used. Check all seams, gloves, sleeves, and glove openings. OSHA requires the bottom of the bag to be seamless.
5. Check the pipe where the work will be performed. If it is damaged (broken lagging, hanging, etc.), wrap the entire length of the pipe in poly sheeting and "candy stripe" it with duct tape.
6. Attach glovebag with required tools per manufacturer’s instructions.
7. Using the smoke tube and aspirator bulb, test 10% of glovebags by placing the tube into the water porthole (2" opening to glove bag), and fill the bag with smoke and squeeze it. If leaks are found, they should be taped closed using duct tape and the bag should be retested with smoke.
8. Insert the wand from the water sprayer through the water porthole.
9. Insert the hose end from a HEPA vacuum into the upper portion of the glove bag.
10. Wet and remove the pipe insulation.
11. If the section of pipe is covered with an aluminum jacket, remove it first using the wire cutters to cut any bands and the tin snips to remove the aluminum. It is important to fold the sharp edges in to prevent cutting the bag when placing it in the bottom.
12. When the work is complete, spray the upper portion of the bag and clean-push all residue into the bottom of the bag with the other waste material. Be very thorough. Use adequate water.
13. Put all tools, after washing them off in the bag, in one of the sleeves of glove bag and turn it inside out, drawing it outside of the bag. Twist the sleeve tightly several times to seal it and tape it several tight turns with duct tape. Cut through the middle of the duct tape and remove the sleeve. Put the sleeve in the next glove

bag or put it in a bucket of water to decontaminate the tools after cutting the sleeve open.

14. Turn on the HEPA vacuum and collapse the bag completely. Remove the vacuum nozzle, seal the hole with duct tape, twist the bag tightly several times in the middle, and tape it to keep the material in the bottom during removal of the glove bag from the pipe.
15. Slip a disposal bag over the glove bag (still attached to the pipe). Remove the tape securing the ends, and slit open the top of the glove bag and carefully fold it down into the disposal bag. Double bag and gooseneck waste materials.

3.5.2 NEGATIVE PRESSURE GLOVEBAG PROCEDURE

1. In addition to the above requirements, the HEPA vacuum shall be run continuously during the glovebag procedure until completion at which time the glovebag will be collapsed by the HEPA vacuum prior to removal from the pipe/component.
2. The HEPA vacuum shall be attached and operated as needed to prevent collapse of the glovebag during the removal process.

3.6 LOCKDOWN ENCAPSULATION

3.6.1 GENERAL

Lockdown encapsulation is an integral part of the ACM removal. At the conclusion of ACM removal and before removal of the primary barriers, all piping surfaces shall be encapsulated with a bridging encapsulant.

3.6.2 SEALING EXPOSED EDGES

Seal edges of ACM exposed by removal work with two coats of encapsulant. Prior to sealing, permit the exposed edges to dry completely to permit penetration of the encapsulant.

3.7 DISPOSAL OF ACM WASTE MATERIALS

3.7.1 GENERAL

Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Disposal shall be done at the approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.7.2 PROCEDURES

A. Asbestos waste shall be packaged and moved through the W/EDF into a covered transport container in accordance with procedures in this specification. Waste shall be double-bagged prior to disposal. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall be

securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goosenecked prior to tightly sealing with at least three (3) wraps of duct tape. Ensure that unauthorized persons do not have access to the waste material once it is outside the regulated area. All transport containers must be covered at all times when not in use. NESHAPs signs must be on containers during loading and unloading. Material shall not be transported in open vehicles. If drums are used for packaging, the drums shall be labeled properly and shall not be re-used.

B. Waste Load Out: Waste load out shall be done in accordance with the procedures in W/EDF Decontamination Procedures. Bags shall be decontaminated on exterior surfaces by wet cleaning and/or HEPA vacuuming before being placed in the second bag.

C. Asbestos waste with sharp edged components, i.e., nails, screws, lath, strapping, tin sheeting, jacketing, metal mesh, etc., which might tear poly bags shall be wrapped securely in burlap before packaging and, if needed, use a poly lined fiber drum as the second container, prior to disposal.

3.8 PROJECT DECONTAMINATION

3.8.1 GENERAL

A. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH.

B. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleaning of the regulated area surfaces after the primary barrier removal.

C. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.8.2 REGULATED AREA CLEARANCE

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

3.8.3 WORK DESCRIPTION

Decontamination includes the cleaning and clearance of the air in the regulated area and the decontamination and removal of the

enclosures/facilities installed prior to the abatement work including primary/critical barriers, PDF, and W/EDF facilities.

3.8.4 PRE-DECONTAMINATION CONDITIONS

A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removed and disposed of along with any gross debris generated by the work.

B. At the start of decontamination, the following shall be in place:
   1. Critical barriers over all openings consisting of two layers of 6-mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
   2. Decontamination facilities, if required for personnel and equipment in operating condition.

3.8.5 FIRST CLEANING

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping methods. Use each surface of a cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. If determined by the CPIH/VPIH/CIH, additional cleaning(s) may be needed.

3.8.6 PRE-CLEARANCE INSPECTION AND TESTING

The CPIH and VPIH/CIH will perform a thorough and detailed visual inspection after the first cleaning to determine whether there is any visible residue in the regulated area. If the visual inspection is acceptable, the CPIH will perform pre-clearance sampling using aggressive clearance as detailed in 40 CFR 763 Subpart E-Asbestos-Containing Materials in Schools (AHERA), Appendix A(III)(B)(7)(d). If the sampling results show values below 0.005 f/cc, then the Contractor shall notify the VA's representative of the results with a brief report from the CPIH documenting the inspection and sampling results and a statement verifying that the regulated area is ready for lockdown encapsulation. The VA reserves the right to utilize their own VPIH/CIH to perform a pre-clearance inspection and testing for verification.

3.8.7 LOCKDOWN ENCAPSULATION OF ABATED SURFACES

With the express written permission of the VA's representative, perform lockdown encapsulation of all surfaces from which asbestos was abated in accordance with the procedures in this specification.

3.9 FINAL VISUAL INSPECTIONS AND AIR CLEARANCE TESTING

3.9.1 GENERAL

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

3.9.2 FINAL VISUAL INSPECTION

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

3.9.3 FINAL AIR CLEARANCE TESTING

A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final testing. Air samples will be collected and analyzed in accordance with procedures for PCM/TEM in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures. Additional inspection and testing will be done at the expense of the Contractor.

B. If the results of the PCM/TEM are acceptable, remove the critical barriers. Any small quantities of residue material found upon removal of the poly shall be removed with a HEPA vacuum and localized isolation. If significant quantities are found as determined by the VPIH/CIH, then the entire area affected shall be cleaned as specified in the final cleaning.

C. When release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.9.4 FINAL AIR CLEARANCE PROCEDURES

A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels

have been reduced to or below 0.005 f/cc as measured with PCM/TEM methods.

B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:

1. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method or asbestos fibers counted using the TEM method.
2. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques. Samples will be collected on 0.8-μm MCE filters for PCM analysis and 0.45-μm polycarbonate filters for TEM analysis. Before pumps are started, initiate aggressive sampling as detailed in 40 CFR 763 Subpart E-Asbestos-Containing Materials in Schools (AHERA), Appendix A (III)(B)(7)(d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off.

3.9.5 CLEARANCE SAMPLING USING PCM

The NIOSH 7400 method will be used for clearance sampling with a minimum collection volume of 1,200 liters of air. A minimum of five (5) PCM clearance samples will be collected.

3.9.6 CLEARANCE SAMPLING USING TEM

TEM clearance requires a minimum of thirteen (13) samples taken and analyzed, including five (5) samples in the regulated area, five (5) samples outside the regulated area and three (3) field blanks using polycarbonate filters.

3.9.7 LABORATORY TESTING OF PCM SAMPLES

The services of an AIHA accredited laboratory will be employed by the VA to perform analysis of the air samples. Samples will be sent by the VPIH/CIH so that verbal/faxed reports can be received within 24 hours. A complete record, certified by the laboratory, of all air monitoring tests and results will be furnished to the VA’s representative and the Contractor.

3.9.8 LABORATORY TESTING OF TEM SAMPLES

Samples shall be sent by the VPIH/CIH to an accredited laboratory for analysis by TEM. Verbal/faxed results from the laboratory shall be

available within 24 hours after receipt of the samples. A complete record, certified by the laboratory, of all TEM results shall be furnished to the VA's representative and the Contractor.

3.10 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.10.1 COMPLETION OF ABATEMENT WORK

After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:

A. Remove all equipment, materials, and debris from the project area.
B. Package and dispose of all asbestos waste as required.
C. Repair or replace all interior finishes damaged during the abatement work.
D. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.10.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

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

3.10.3 WORK SHIFTS

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

3.10.4 REINSULATION

If required as part of the contract, replace all asbestos-containing insulation with suitable non-asbestos material. Provide MSDSs for all replacement materials. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE:_____

PROJECT NAME: Renovate & Expand Areas for Patient Support Areas

VAMC/ADDRESS: 601 Highway 6 West, Iowa City, Iowa 52246

1. I certify that I have personally inspected, monitored, and supervised the abatement work of

   (specify regulated area or Building):_____

   which took place from _____ to _____.

2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.

3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.

4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.

5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.

6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.

7. That all glovebag work was done in accordance with OSHA requirements and the manufacturer’s recommendations.

   CPIH Name: _____

   Signature/Date: _____

   Asbestos Abatement Contractor's Name: _____

   Signature/Date: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: Renovate & Expand Areas for Patient Support Areas DATE:_____

PROJECT ADDRESS: 601 Highway 6 West, Iowa City, Iowa 52246

ABATEMENT CONTRACTOR'S NAME:_____

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

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

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

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

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

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

Signature:_____Social Security Number:_____

Printed Name:_____Witness:_____

ATTACHMENT #3

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

VA PROJECT NAME AND NUMBER: Renovate & Expand Areas for Patient Support Areas, VA 636-311

VA MEDICAL FACILITY: 601 Highway 6 West, Iowa City, Iowa 52246

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:_____

1. I verify that the following individual

   Name:_____Social Security Number:_____

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

   Address: _____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH:_____Date:_____

Printed Name of CPIH:_____

Signature of Contractor:_____Date:_____

Printed Name of Contractor:_____

ATTACHMENT #4

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

VA Project Location: 601 Highway 6 West, Iowa City, Iowa 52246

VA Project #: 636-311

VA Project Description: Renovate & Expand Areas for Patient Support Areas

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

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

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

Abatement Contractor Owner's Signature_____Date_____

Abatement Contractor Competent Person(s)_____Date_____

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ASBESTOS FLOOR TILE AND MASTIC ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

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

1.1.2 EXTENT OF WORK

A. Below is a brief description of the estimated quantities of asbestos flooring materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy himself as the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
B. Removal, clean-up and disposal of ACM flooring in an appropriate regulated area in the following approximate quantities:

Building 2 (Drawing 2E-AA1)
- 2,170 square feet of flooring and mastic
- 4 linear feet of sealant around pipe penetrations
- 1 sink with undercoating
- 1 fume hood

1.1.3 RELATED WORK

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

1.1.4 TASKS

The work tasks are summarized briefly as follows:
A. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, regulated area preparations, emergency procedures arrangements, and Asbestos Hazard Abatement Plans for asbestos abatement work.
B. Abatement activities including removal of floor tile and mastic, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.

C. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

1.1.5 ABATEMENT CONTRACTOR USE OF PREMISES

A. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.

B. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved VA Design Construction Procedure. VA Design Construction Procedure drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

The Contractor may only use the service elevators.

1.2 VARIATIONS IN QUANTITY

The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimated which are limited by the physical constraints imposed by occupancy of the buildings and accessibility to ACM. Accordingly, minor variations (+/- 5%) in quantities of ACM within the regulated area are considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the contractor shall provide unit prices for newly discovered ACM and those prices shall be used for additional work required under the contract.

1.3 STOP ASBESTOS REMOVAL

If the Contracting Officer; their field representative; (the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist/Certified Industrial Hygienist (VPIH/CIH) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA-filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as it is practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the VA Contracting Officer. A stop asbestos removal order may be issued at any time the VA Contracting Officer determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the VPIH/CIH time. The occurrence of any of the following events shall be reported immediately by the Contractor’s

competent person to the VA Contracting Office or field representative using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the Contracting Officer as soon as practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities:

A. Airborne PCM analysis results equal to or greater than (≥) 0.01 f/cc outside a regulated area or >0.05 f/cc inside a regulated area;
B. Breach or break in regulated area containment barrier(s);
C. Less than –0.02" water column gauge (WCG) pressure in the regulated area;
D. Serious injury/death at the site;
E. Fire/safety emergency at the site;
F. Respiratory protection system failure;
G. Power failure or loss of wetting agent; or
H. any visible emissions observed outside the regulated area.

1.4 DEFINITIONS

1.4.1 GENERAL

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

1.4.2 GLOSSARY

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition, and renovation activities related to asbestos containing materials (ACM).

Aerosol - Solid or liquid particulate suspended in air.

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

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

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

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

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

Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The National Institute for Occupational Health and Safety (NIOSH) 7400 Method, Issue 2 is used to determine the fiber levels in air. For personal samples and clearance air testing using phase contrast microscopy (PCM) analysis. NIOSH Method 7402 can be used when it is necessary to confirm fibers counted by PCM as being asbestos. The AHERA transmission electron microscopy (TEM) analysis may be used for background, area samples, and clearance samples when required by this specification, or at the discretion of the VPIH/CIH as appropriate.

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester membrane for PCM (phase contrast microscopy) and polycarbonate for TEM (transmission electron microscopy)

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

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

Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.

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

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

Asbestos-contaminated soil (ACS) – Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.

Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos project monitor – Some states require that any person conducting asbestos abatement clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

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

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

Authorized visitor - Any person approved by the VA; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal, and State EPA)..

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

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

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

Primary barrier – Plastic barriers placed over critical barriers and exposed directly to abatement work.

Secondary barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.

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

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

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

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

Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work - Activities involving the removal of thermal system insulation (TSI) and surfacing ACM and presumed asbestos-containing material (PACM).

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

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

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's professional industrial hygiene consultant/Certified Industrial Hygienist (VPIH/CIH).

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

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

Contractor's Professional Industrial Hygienist (CPIH/CIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of a PIH and may be a certified industrial hygienist (CIH).

Count - Refers to the fiber count or the average number of fibers greater than five (5) micrometers (µm) in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace – An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos-contaminated soil.

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

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

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

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

Disturbance - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard

sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag which shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

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

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

Encapsulation - Treating ACM with an encapsulant.

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

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

Fiber - A particulate form of asbestos, 5 micrometers or longer, with a length to width (aspect) ratio of at least 3 to 1.

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

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

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

Friable asbestos-containing material - Any material containing more than one (1) percent of asbestos as determined using the method specified in appendix A, Subpart F, 40 Code of Federal Regulations (CFR) 763, Section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

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

High efficiency particulate air (HEPA) filter – An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

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

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

HVAC - Heating, ventilation, and air conditioning

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

Industrial hygiene technician (IH technician) - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work assigned. Some states require that an industrial hygienist technician conducting asbestos abatement clearance inspection and clearance air sampling be licensed as an asbestos project monitor.

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

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

National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR Part 61, Subpart M).

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

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

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

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

Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.

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

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

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

Personal protective equipment (PPE) – equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, and respirators.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8-hour time-weighted average. For asbestos fibers, the 8-hour time-weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc) of air and the 30-minute excursion limit is 1.0 1 f/cc.

Pipe tunnel – An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the pipes to access heating elements. These areas may contain asbestos pipe insulation, asbestos fittings, or asbestos-contaminated soil.

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

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator respectively.

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

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29 CFR 1926.1101 (b); has completed two specialized State-approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH. The PIH may be either the VA's PIH (VPIH) or Contractor's PIH (CPIH/CIH).

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

Assigned protection factor - A value assigned by OSHA to indicate the expected protection provided by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

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

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

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

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

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

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

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

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

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

Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.
Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.
Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.
VA Professional Industrial Hygienist (VPIH/CIH) – The Department of Veterans Affairs Professional Industrial Hygienist must meet the qualifications of a PIH, and may be a Certified Industrial Hygienist (CIH).
VA Representative - The VA official responsible for on-going project work.
Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.
Waste/equipment decontamination facility (W/EDF) – The area in which equipment is decontaminated before removal from the regulated area.
Waste generator - Any owner or operator whose act or process produces asbestos-containing waste material.
Waste shipment record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.
Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

1.4.3 REFERENCED STANDARDS ORGANIZATIONS

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

A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

B. AIHA American Industrial Hygiene Association
3141 Fairview Park Drive, Suite 777
Falls Church, VA 22042
703-849-8888

C. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018
212-354-3300

D. ASTM American Society for Testing and Materials
1916 Race St.
Philadelphia, PA 19103
215-299-5400

E. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420

F. CGA Compressed Gas Association

1235 Jefferson Davis Highway
Arlington, VA 22202
703-979-0900

G. CS Commercial Standard of the National Institute of Standards and Technology (NIST)
U. S. Department of Commerce
Government Printing Office
Washington, DC 20420

H. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949

I. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420

I. NEC National Electrical Code (by NFPA)

J. NEMA National Electrical Manufacturer's Association
2101 L Street, NW
Washington, DC 20037

K. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555

L. NIOSH National Institutes for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, OH 45226
513-533-8236

M. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Government Printing Office
Washington, DC 20402

N. UL Underwriters Laboratory
333 Pfingsten Rd.
Northbrook, IL 60062
312-272-8800

1.5 APPLICABLE CODES AND REGULATIONS

1.5.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS

A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards, and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations, and standards are adopted into this specification and will have the same force and effect as this specification.

B. The most recent edition of any relevant regulation, standard, document, or code shall be in effect. Where conflict among the requirements or

with these specifications exists, the most stringent requirement(s) shall be utilized.

C. Copies of all standards, regulations, codes, and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system.

1.5.2 CONTRACTOR RESPONSIBILITY

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

1.5.3 FEDERAL REQUIREMENTS

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

A. Occupational Safety and Health Administration (OSHA)
   1. Title 29 CFR 1926.1101 - Construction Standard for Asbestos
   2. Title 29 CFR 1910.132 - Personal Protective Equipment
   3. Title 29 CFR 1910.134 - Respiratory Protection
   4. Title 29 CFR 1926 - Construction Industry Standards
   5. Title 29 CFR 1910.1020 - Access to Employee Exposure and Medical Records
   6. Title 29 CFR 1910.1200 - Hazard Communication
   7. Title 29 CFR 1910.151 - Medical and First Aid
B. Environmental Protection Agency (EPA)
   1. 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
   2. 40 CFR 763Subpart E - Asbestos-Containing Materials in Schools
C. Department of Transportation (DOT)
   Title 49 CFR 100 - 185 – Transportation

1.5.4 STATE REQUIREMENTS

State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

A. Applicable Iowa State Regulations, Iowa Administrative Code (IAC)
   1. IAC 567-23—Asbestos Fiber Emissions
   2. IAC 567-109—Asbestos-Containing Waste Disposal
   3. IAC 875-10—Occupational Exposure to Asbestos
   4. IAC 875-155—Asbestos Removal and Encapsulation Activities

1.5.5 STANDARDS

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

1.5.6 EPA GUIDANCE DOCUMENTS

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

1.5.7 NOTICES

A. State and Local agencies: Send written notification as required by state and local regulations including the local fire department prior to beginning any work on ACM as follows:
   1. The Contractor shall notify the Iowa Department of Natural Resources (IDNR) and Iowa Department of Labor (IDOL) at least 10 working days prior to the commencement of work in accordance with IAC 875-155. State requirements include the "Notification of Demolition and Renovation Record" form and other required notification documents.
B. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame in which notifications are given to EPA, State, and Local authorities.

1.5.8 PERMITS/LICENSES

A. The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.
   1. The abatement contractor must be permitted by the State of Iowa.
   2. Asbestos abatement workers must be licensed by the State of Iowa.

1.5.9 POSTING AND FILING OF REGULATIONS

A. Maintain two (2) copies of applicable Federal, State, and Local regulations. Post one copy of each at the regulated area where workers

will have daily access to the regulations and keep another copy in the Contractor's office.

1.5.10 VA RESPONSIBILITIES

Prior to commencement of work:

A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**

B. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized, calibration data, and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

1.5.11 SITE SECURITY

A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.

B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent person shall immediately notify the VA.

C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.

D. Access to the regulated area shall be through a critical barrier doorway. All other access (doors, windows, hallways, etc.) shall be sealed or locked to prevent entry to or exit from the regulated area. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed.

E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24-hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.

F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location, and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.

G. The regulated area shall be locked during non-working hours and secured by VA security guards.

1.5.12 EMERGENCY ACTION PLAN AND ARRANGEMENTS

A. An Emergency Action Plan shall be developed prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1910.38 (a);(b).
B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.
C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.
D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.
E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
   1. For non-life-threatening situations - employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
   2. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, remove them from the regulated area, and secure proper medical treatment.
F. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne pathogen training shall also be verified for those personnel required to provide first aid/CPR.
H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the Asbestos Hazard Abatement Plans during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos abatement work is stopped and wetting is continued until correction of the problem.

1.5.13 PRE-CONSTRUCTION MEETING

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

A. Proof of Contractor permitting.

B. Proof the Competent Person(s) is trained and licensed and approved for working in this State. Verification of the experience of the Competent Person(s) shall also be presented.
C. A list of all workers who will participate in the project, including experience and verification of training and licensing.
D. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
E. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
F. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
G. A copy of the Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project.
   1. Regulated area preparation procedures;
   2. Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d);
   3. Decontamination area set-up/layout and decontamination procedures for employees;
   4. Abatement methods/procedures and equipment to be used;
   5. Personal protective equipment to be used;
H. At this meeting, the Contractor shall provide all submittals as required.
I. Procedures for handling, packaging, and disposal of asbestos waste.
J. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

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

1.6.1 PERSONNEL

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

for asbestos work; and has adequate materials, equipment and supplies to perform the work.

2. The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.
3. The Contractor Professional Industrial Hygienist/CIH (CPIH/CIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and complexity as this project; has developed at least one complete Asbestos Hazard Abatement Plan for asbestos abatement; has trained abatement personnel for three (3) years; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course or equivalent, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.
4. The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the Asbestos Hazard Abatement Plans of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; and has certificate of training/current refresher and State accreditation/license.

All personnel should be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM

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

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR

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

1.7.3 SELECTION AND USE OF RESPIRATORS

The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualifications. The procedure must written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room

of the decontamination unit for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

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

1.7.5 MEDICAL WRITTEN OPINION

No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress.

1.7.6 RESPIRATOR FIT TEST

All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in accordance with 29 CFR 1910.134 (f) and Appendix A. Quantitative fit tests shall be done for powered air-purifying respirators (PAPRs) which have been put into a motor/blower failure mode.

1.7.7 RESPIRATOR FIT CHECK

The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece-to-face seal as evidenced by failure of a user seal check shall preclude that person from wearing a respirator inside the regulated area until resolution of the problem.

1.7.8 MAINTENANCE AND CARE OF RESPIRATORS

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

1.7.9 SUPPLIED AIR SYSTEMS

If a supplied air system is used, the system shall meet all requirements of 29 CFR 1910.134 and the ANSI/Compressed Gas Association (CGA) Commodity Specification for Air current requirements for Type 1 - Grade D breathing air. Low pressure systems are not allowed to be used on asbestos abatement projects. Supplied-air respirator use shall be in accordance with EPA/NIOSH publication EPA-560-OPTS-86-001 "A Guide to Respiratory Protection for the Asbestos Abatement Industry." The Competent Person on site will be responsible for the supplied air system to ensure the safety of the worker.

1.8 WORKER PROTECTION

1.8.1 TRAINING OF ABATEMENT PERSONNEL

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

1.8.2 MEDICAL EXAMINATIONS

Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the medical opinion the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

1.8.3 PERSONAL PROTECTIVE EQUIPMENT

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

1.8.4 REGULATED AREA ENTRY PROCEDURE

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

1.8.5 DECONTAMINATION PROCEDURE

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

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

1.8.6 REGULATED AREA REQUIREMENTS

The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for Class I regulated areas at 29 CFR 1926.1101 (e) are met applicable to Class II work. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew

tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES:

1.9.1 DESCRIPTION:

Provide each regulated area with waste/equipment decontamination facilities (W/EDF). Ensure that the W/EDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

1.9.2 GENERAL REQUIREMENTS

All personnel entering or exiting a regulated area must go through the W/EDF and shall follow the requirements at 29 CFR 1926.1101 (j)(1) and these specifications. All waste, equipment, and contaminated materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the W/EDF must be constructed of a minimum of three (3) layers of 6-mil opaque fire retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of three (3) layers of 6-mil poly shall also be used to cover the floor under the W/EDF unit. Construct doors so that they overlap and secure to adjacent surfaces. Weight inner doorway sheets with layers of duct tape so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting and reduce potential for non-authorized personnel entering the regulated area.

1.9.3 WASTE/EQUIPMENT DECONTAMINATION PROCEDURES:

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

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT

2.1 MATERIALS AND EQUIPMENT

2.1.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS)

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

A. All materials shall be delivered in their original package, container, or bundle bearing the name of the manufacturer and the brand name (where applicable).
B. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.

C. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.
D. The Competent Person shall inspect for damaged, deteriorating, or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mil shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
F. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape furring strips, spray glue, staples, nails, screws, lumber, and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
G. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6-mil fire retardant poly.
H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and wastewater filtration system shall be provided by the Contractor.
I. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders, and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.
J. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
K. Disposal bags – two (2) layers of 6-mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
L. The VA shall be provided an advance copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-project submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover, or other product. Appropriate encapsulant(s) shall be provided.
M. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k)(7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
N. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.1.2 NEGATIVE PRESSURE FILTRATION SYSTEM

The Contractor shall provide enough HEPA negative air machines to continuously maintain a pressure differential of -0.02" water column gauge (WCG). The Competent Person shall determine the number of units needed for the regulated area by dividing the cubic feet in the regulated area by 15 and then dividing that result by the cubic feet

per minute (CFM) for each unit to determine the number of units needed to continuously maintain a pressure differential of -0.02" WCG. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area.

NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50% efficiency. The contractor shall consider this in their determination of number of units needed to continuously maintain a pressure differential of -0.02" WCG. The contractor shall use 8 air changes per hour or double the number of machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2" pressure drop across the filters.

2.1.3 DESIGN AND LAYOUT

A. Before start of work submit the design and layout of the regulated area and the negative air machines. The submittal shall indicate the number of, location of and size of negative air machines. The point(s) of exhaust, air flow within the regulated area, anticipated negative pressure differential, and supporting calculations for sizing shall be provided. In addition, submit the following:
   1. Method of supplying power to the units and designation/location of the panels.
   2. Description of testing method(s) for correct air volume and pressure differential.
   3. If auxiliary power supply is to be provided for the negative air machines, provide a schematic diagram of the power supply and manufacturer's data on the generator and switch.

2.1.4 NEGATIVE AIR MACHINES (HEPA UNITS)

A. Negative Air Machine Cabinet: The cabinet shall be constructed of steel or other durable material capable of withstanding potential damage from rough handling and transportation. The width of the cabinet shall be less than 30" in order to fit in standard doorways. The cabinet must be factory sealed to prevent asbestos fibers from being released during use, transport, or maintenance. Any access to and replacement of filters shall be from the inlet end. The unit must be on casters or wheels.
B. Negative Air Machine Fan: The rating capacity of the fan must indicate the CFM under actual operating conditions. Manufacturer's typically use "free-air" (no resistance) conditions when rating fans. The fan must be a centrifugal type fan.
C. Negative Air Machine Final Filter: The final filter shall be a HEPA filter. The filter media must be completely sealed on all edges within a structurally rigid frame. The filter shall align with a continuous flexible gasket material in the negative air machine housing to form an air tight seal. Each HEPA filter shall be certified by the manufacturer to have an efficiency of not less than 99.97%. Testing shall have been done in accordance with Military Standard MIL-STD-282 and Army Instruction Manual 136-300-175A. Each filter must bear a UL586 label to indicate ability to perform under specified conditions. Each filter shall be marked with the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of test air flow.
D. Negative Air Machine Pre-filters: The pre-filters, which protect the final HEPA filter by removing larger particles, are required to prolong the operating life of the HEPA filter. Two stages of pre-filtration are

required. A first stage pre-filter shall be a low efficiency type for particles 10 micrometers (µm) or larger. A second stage pre-filter shall have a medium efficiency effective for particles down to 5-µm or larger. Pre-filters shall be installed either on or in the intake opening of the NAM and the second stage filter must be held in place with a special housing or clamps.

E. Negative Air Machine Instrumentation: Each unit must be equipped with a gauge to measure the pressure drop across the filters and to indicate when filters have become loaded and need to be changed. A table indicating the cfm for various pressure readings on the gauge shall be affixed near the gauge for reference or the reading shall indicate at what point the filters shall be changed, noting CFM delivery. The unit must have an elapsed time meter to show total hours of operation.

F. Negative Air Machine Safety and Warning Devices: An electrical/ mechanical lockout must be provided to prevent the fan from being operated without a HEPA filter. Units must be equipped with an automatic shutdown device to stop the fan in the event of a rupture in the HEPA filter or blockage in the discharge of the fan. Warning lights are required to indicate normal operation; too high a pressure drop across filters; or too low of a pressure drop across filters.

G. Negative Air Machine Electrical: All electrical components shall be approved by the National Electrical Manufacturer's Association (NEMA) and Underwriters Laboratories (UL). Each unit must be provided with overload protection and the motor, fan, fan housing, and cabinet must be grounded.

H. It is essential that replacement HEPA filters be tested using an “in-line” testing method, to ensure the seal around the periphery was not damaged during replacement. Damage to the outer HEPA filter seal could allow contaminated air to bypass the HEPA filter and be discharged to an inappropriate location. Contractor will provide written documentation of test results for negative air machine units with HEPA filters changed by the contractor or documentation when changed and tested by the contractor filters.

2.1.5 PRESSURE DIFFERENTIAL

The fully operational negative air system within the regulated area shall continuously maintain a pressure differential of -0.02" water column gauge. Before any disturbance of any asbestos material, this shall be demonstrated to the VA by use of a pressure differential meter/manometer as required by OSHA 29 CFR 1926.1101(e)(5)(i). The Competent Person shall be responsible for providing, maintaining, and documenting the negative pressure and air changes as required by OSHA and this specification.

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA

2.2.1 GENERAL

A. Using critical barriers, seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, shall immediately stop work and clean up the contamination at no additional cost to the VA. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 3.1.4.8; FIRESTOPPING.

B. Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment, and/or supplies shall be removed by the VA from the regulated area before commencing work. Any objects remaining in the regulated area shall be completely covered with two (2) layers of 6-mil fire retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.

2.2.3 CONTROLLING ACCESS TO THE REGULATED AREA

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

2.2.4 CRITICAL BARRIERS

Completely separate any operations in the regulated area from adjacent areas using two (2) layers of 6-mil fire retardant poly and duct tape. Individually seal with two (2) layers of 6-mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.

2.2.5 SECONDARY BARRIERS:

A loose layer of 6-mil poly shall be used as a drop cloth to protect the primary layers from debris generated during the abatement. This layer shall be replaced as needed during the work and at a minimum once per work day.

2.2.6 EXTENSION OF THE REGULATED AREA

If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

2.2.7 FIRESTOPPING

A. Through penetrations caused by cables, cable trays, pipes, sleeves, conduits, etc. must be firestopped with a fire-rated firestop system providing an air tight seal.
B. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA representative immediately. All walls, floors, and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshal.

C. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

2.3 MONITORING, INSPECTION AND TESTING

2.3.1 GENERAL

A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the Employee exposure to asbestos must not exceed 0.1 fibers per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The CPIH/CIH is responsible for and shall inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.

B. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.

C. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH/CIH with review and approval of the VPIH/CIH. An agreement between the CPIH/CIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples, location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative.

2.3.2 SCOPE OF SERVICES OF THE VPIH/CIH CONSULTANT

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

B. All documentation, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.

C. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

2.3.3 MONITORING, INSPECTION AND TESTING BY CONTRACTOR CPIH/CIH

The Contractor’s CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor’s personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in sampling and analysis. The IH Technician shall have successfully completed a NIOSH 582 Course or equivalent and provide documentation. The IH Technician shall participate in the AIHA Registry Programs, LLC Asbestos Analysis Registry program or participate in the AIHA Laboratory Accreditation Programs, LLC Proficiency in Analytical Testing (PAT) Program for fiber counting quality control assurance.

The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor (or Abatement Worker) and Building Inspector. The IH Technician shall have participated in five (5) abatement projects collecting personal and area samples as well as responsibility for documentation on substantially similar projects in size and scope. The analytic laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and approved by the VA prior to start of the project. A daily log shall be maintained by the CPIH/CIH or IH Technician, documenting all OSHA requirements for air personal monitoring for asbestos in 29 CFR 1926.1101 (f), (g), and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH/CIH responsibilities. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.4 ASBESTOS HAZARD ABATEMENT PLAN

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

A. Minimum Personnel Qualifications
B. Emergency Action Plan/Contingency Plans and Arrangements
C. Security and Safety Procedures
D. Respiratory Protection/Personal Protective Equipment Program and Training
E. Medical Surveillance Program and Recordkeeping
F. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area
G. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
H. Negative Pressure Systems Requirements
I. Monitoring, Inspections, and Testing
J. Removal Procedures for ACM
K. Removal of Contaminated Soil (if applicable)
L. Encapsulation Procedures for ACM
M. Disposal of ACM waste/equipment
N. Regulated Area Decontamination/Clean-up
O. Regulated Area Visual and Air Clearance
P. Project Completion/Closeout

2.5 SUBMITTALS

2.5.1 PRE-START MEETING SUBMITTALS

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

A. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.

B. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.

C. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed, and dated by the CPIH/CIH.

D. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
   1. Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device, infra-red heating machines, and emergency power generating system.
   2. Containment barriers.
   3. Encapsulants, surfactants, hand held sprayers, airless sprayers, and fire extinguishers.
   4. Respirators, protective clothing, personal protective equipment.
   5. Fire safety equipment to be used in the regulated area.

E. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.

F. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.

G. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A; area or clearance air monitoring must be done in accordance with EPA AHERA protocols.

H. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
   1. Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date

2. List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; Resolution
3. List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including and of the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.

I. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH/CIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.1020 and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
   1. CPIH/CIH and IH Technician: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; number of workers trained; samples of training materials; samples of AHAP(s) developed; medical opinion; and current respirator fit test.
   2. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
   3. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.

J. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of the AHAP incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IHs familiar with your air monitoring and Asbestos Hazard Abatement Plans; copies of monitoring results of the five (5) referenced projects listed and analytical method(s) used.

K. Rented equipment must be decontaminated prior to returning to the rental agency.

L. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all MSDS, and application instructions.

2.5.2 SUBMITTALS DURING ABATEMENT

A. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel

entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breeching, equipment failures, emergencies, and any cause for stopping work; representative air monitoring and results/TWAs/ELs. Submit this information daily to the VPIH/CIH.

B. The CPIH/CIH shall document and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.
   1. Removal of any poly barriers.
   2. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
   3. Packaging and removal of ACM waste from regulated area.
   4. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT

The CPIH/CIH shall submit a project report consisting of the daily log book requirements and documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the containment and transportation of waste from the containment with applicable Chain of Custody forms. The report shall include a certificate of completion, signed and dated by the CPIH/CIH, in accordance with Attachment #1. All clearance and perimeter area samples must be submitted. The VA Representative will retain the abatement report after completion of the project and provide copies of the abatement report to VAMC Office of Engineer and the Safety Office.

PART 3 - EXECUTION

3.1 PRE-ABATEMENT ACTIVITIES

3.1.1 PRE-ABATEMENT MEETING

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

3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS

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

A. Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video

photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.

B. The VA Representative, the Contractor, and the VPIH/CIH must be aware of VA A/E Quality Alert 07/09 indicating the failure to identify asbestos in the areas listed as well as common issues when preparing specifications and contract documents. This is especially critical when demolition is planned, because AHERA surveys are non-destructive, and ACM may remain undetected. A NESHAPS (destructive) ACM inspection should be conducted on all building structures that will be demolished. Ensure the following areas are inspected on the project: Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside utility chases/walls; transite piping/ductwork/ sheets; behind radiators; lab fume hoods; transite lab countertops; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawl spaces(previous abatement contamination); flooring/mastic covered by carpeting/new flooring; exterior insulated wall panels; on underground fuel tanks; and steam line trench coverings.

C. Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.

   Movable objects such as chairs, pictures, bulletin board postings, etc. will be removed by VA staff before the asbestos abatement activities commence.

D. If present and required, remove and dispose of carpeting from floors in the regulated area. If ACM floor tile is attached to the carpet while the Contractor is removing the carpet that section of the carpet will be disposed of as asbestos waste.

E. Inspect existing firestopping in the regulated area. Correct as needed.

3.1.3 PRE-ABATEMENT CONSTRUCTION AND OPERATIONS

A. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.

B. Upon completion of all preparatory work, the CPIH/CIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved AHAP, especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation. The operational systems for respiratory protection and the negative pressure system shall be demonstrated for proper performance.

C. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.

D. Upon satisfactory inspection of the installation of and operation of systems the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification and all applicable regulations.

3.2 REGULATED AREA PREPARATIONS

3.2.1 OSHA DANGER SIGNS

Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where

airborne concentrations of asbestos may exceed the PEL. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs will be posted following construction of the regulated area enclosure.

3.2.2 CONTROLLING ACCESS TO THE REGULATED AREA

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

3.2.3 SHUT DOWN - LOCK OUT ELECTRICAL

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

3.2.4 SHUT DOWN - LOCK OUT HVAC

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

3.2.5 SANITARY FACILITIES

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

3.2.6 WATER FOR ABATEMENT

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

3.2.7 PREPARATION PRIOR TO SEALING OFF

Place all tools, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. Remove all uncontaminated removable furniture, equipment, and/or supplies from the regulated area before commencing work, or completely cover with two (2) layers of 6-mil fire retardant poly sheeting and secure with duct tape. Lock out and tag out any HVAC systems in the regulated area.

3.2.8 CRITICAL BARRIERS

Completely separate any openings into the regulated area from adjacent areas using fire retardant poly at least 6-mils thick and duct tape. Individually seal with two (2) layers of 6-mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects in the regulated area. Heat must be shut off any objects covered with poly

3.2.9 FLOOR BARRIERS

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

3.2.10 PRE-CLEANING MOVABLE OBJECTS

Pre-cleaning of ACM-contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

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

3.2.11 PRE-CLEANING FIXED OBJECTS

Pre-cleaning of ACM-contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area

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

The abatement contractor will preclean and enclose objects permanently fixed on walls.

3.2.12 PRE-CLEANING SURFACES IN THE REGULATED AREA

Pre-cleaning of ACM-contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area

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

3.2.13 EXTENSION OF THE REGULATED AREA

If the regulated area barrier is breached in any manner that could allow the passage of asbestos fibers or debris, the Competent Person shall immediately stop work, continue wetting, and proceed to extend the regulated area to enclose the affected area as per procedures described in this specification. If the affected area cannot be enclosed, decontamination measures and cleanup shall start immediately. All personnel shall be isolated from the affected area until decontamination/cleanup is completed as verified by visual inspection and air monitoring. Air monitoring at completion must indicate background levels.

3.3 REMOVAL OF CLASS II FLOORING

3.3.1 GENERAL

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

3.3.2 REMOVAL OF FLOORING MATERIALS

A. All requirements of OSHA Flooring agreement provisions shall be followed:
   1. The Contractor shall provide enough HEPA negative air machines to effect > - 0.02″ WCG pressure. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area. The contractor shall use double the number of machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2" pressure drop across the filters.
   2. Flooring shall be removed intact, as much as possible. Do not rip or tear flooring.
   3. Mechanical chipping or sanding is not allowed.
   4. Flooring shall be removed with an infra-red heating unit operated by trained personnel following the manufacturer’s instructions.
   5. Wet clean and HEPA vacuum the floor before and after removal of flooring.
   6. Place a 6-mil poly layer 4’ by 10’ adjacent to the regulated area for use as a decontaminated area. All waste must be contained in the regulated area.
   7. Package all waste in 6-mil poly lined fiberboard drums.

3.3.3 REMOVAL OF MASTIC

A. All chemical mastic removers must be low in volatile organic compound (VOC) content, have a flash point greater than 200° Fahrenheit, contain no chlorinated solvents, and comply with California Air Resources Board (CARB) thresholds for VOCs (effective January 1, 2010).
B. A negative air machine as required under flooring removal shall be provided.

C. Follow all manufacturers' instructions in the use of the mastic removal material.
D. Package all waste in 6-mil poly lined fiberboard drums.
E. Prior to application of any liquid material, check the floor for penetrations and seal before removing mastic.

3.3.4 REMOVAL OF UNDERCOATED SINKS

A. Remove sink and wrap as soon as possible with two (2) layers of 6-mil plastic for disposal. Maintain good housekeeping in work areas during abatement.

3.4 DISPOSAL OF CLASS II WASTE MATERIAL

3.4.1 GENERAL

Dispose of waste ACM and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 100–185 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

3.5 PROJECT DECONTAMINATION

3.5.1 GENERAL

A. The VA must be notified at least 24 hours in advance of any waste removed from the containment,
B. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
C. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
D. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

3.5.2 REGULATED AREA CLEARANCE

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

3.5.3 WORK DESCRIPTION

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

3.5.4 PRE-DECONTAMINATION CONDITIONS

A. Before decontamination starts, all ACM waste from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removed and disposed of along with any gross debris generated by the work.

B. At the start of decontamination, the following shall be in place:
   1. Critical barriers over all openings consisting of two layers of 6-mil poly which is the sole barrier between the regulated area and the rest of the building or outside.
   2. Decontamination facilities, if required for personnel and equipment in operating condition.

3.5.5 CLEANING:

Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the CPIH/VPIH/CIH.

3.6 VISUAL INSPECTION AND AIR CLEARANCE TESTING

3.6.1 GENERAL

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

3.6.2 VISUAL INSPECTION

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

3.6.3 AIR CLEARANCE TESTING

A. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final clearance testing. Air samples will be collected and analyzed in accordance with procedures for AHERA in this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for clearance and a minimum of one field blank. If work is equal to or more than 260 lf/160 sf/35 cf, AHERA TEM sampling shall be performed for clearance. TEM analysis shall be done in accordance with procedures for EPA AHERA in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is achieved. **All additional inspection and testing costs will be borne by the Contractor**.
B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.6.4 FINAL AIR CLEARANCE PROCEDURES

A. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.005 f/cc as measured by the AHERA PCM protocol, or 70 AHERA structures per square millimeter (s/mm^2) by AHERA TEM.

B. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
   1. Fibers Counted: “Fibers” referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method or asbestos fibers counted using the AHERA TEM method.
   2. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques except where soil is not encapsulated or enclosed. Samples will be collected on 0.8-µm MCE filters for PCM analysis and 0.45-µm polycarbonate filters for TEM. Using calibrated pumps, a minimum of 1,200 liters of air shall be collected for clearance samples. Before pumps are started, initiate aggressive air mixing sampling as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off. The negative pressure system shall continue to operate.

3.7 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

3.7.1 COMPLETION OF ABATEMENT WORK

A. After thorough decontamination, complete asbestos abatement work upon meeting the regulated area clearance criteria and fulfilling the following:
   1. Remove all equipment, materials, and debris from the project area.
   2. Package and dispose of all asbestos waste as required.
   3. Repair or replace all interior finishes damaged during the abatement work.
   4. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.7.2 CERTIFICATE OF COMPLETION BY CONTRACTOR

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

3.7.3 WORK SHIFTS

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

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project #: 636-311

PROJECT NAME: Renovate & Expand Areas for Patient Support Areas

Abatement Contractor: _____

VAMC/ADDRESS: 601 Highway 6 West, Iowa City, Iowa 52246

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):

   which took place from / / to / /

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

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date: _____

Abatement Contractor Print Name: _____

ATTACHMENT #2
CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: Renovate & Expand Areas for Patient Support Areas DATE:_____

PROJECT ADDRESS: 601 Highway 6 West, Iowa City, Iowa 52246

ABATEMENT CONTRACTOR'S NAME:_____

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

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

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

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

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

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

Signature:_____ Social Security Number:_____

Printed Name:_____ Witness:_____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

VA PROJECT NAME AND NUMBER: Renovate & Expand Areas for Patient Support Areas, VA 636-311

VA MEDICAL FACILITY: 601 Highway 6 West, Iowa City, Iowa 52246

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:_____

1. I verify that the following individual

   Name:_____ Social Security Number:_____

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

   Address:_____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH:_____ Date:_____

Printed Name of CPIH/CIH: _____

Signature of Contractor:_____ Date:_____

Printed Name of Contractor:_____

ATTACHMENT #4

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

VA Project Location: 601 Highway 6 West, Iowa City, Iowa 52246_____

VA Project #: 636-311

VA Project Description: Renovate & Expand Areas for Patient Support Areas

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

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

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

Abatement Contractor Owner's Signature_____Date_____

Abatement Contractor Competent Person(s)_____Date_____

- - END- - - -

SECTION 02 83 33.13
LEAD-BASED PAINT REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies abatement and disposal of lead-based paint (LBP) and controls needed to limit occupational and environmental exposure to lead hazards.

1.2 RELATED WORK

A. Section 02 41 00, DEMOLITION.

B. Section 09 91 00, PAINTING.

1.3 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 basic designation only.

B. Code of Federal Regulations (CFR):

CFR 29 Part 1910.....Occupational Safety and Health Standards

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

CFR 40 Part 148.....Hazardous Waste Injection Restrictions

CFR 40 Part 260.....Hazardous Waste Management System: General

CFR 40 Part 261.....Identification and Listing of Hazardous Waste

CFR 40 Part 262.....Standards Applicable to Generators of Hazardous Waste

CRF 40 Part 263.....Standards Applicable to Transporters of Hazardous Waste

CFR 40 Part 264.....Standards for Owners and Operations of Hazardous Waste Treatment, Storage, and Disposal Facilities

CFR 40 Part 265.....Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

CFR 40 Part 268.....Land Disposal Restrictions

CFR 49 Part 172.....Hazardous Material Table, Special Provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements

CFR 49 Part 178.....Specifications for Packaging

C. National Fire Protection Association (NFPA):

NFPA 701-2004.....Methods of Fire Test for Flame-Resistant Textiles and Films

D. National Institute for Occupational Safety And Health (NIOSH)

NIOSH OSHA Booklet 3142.Lead in Construction

E. Underwriters Laboratories (UL)

UL 586-1996 (Rev 2009)..High-Efficiency, Particulate, Air Filter Units

F. American National Standards Institute

Z9.2-2006.....Fundamentals Governing the Design and Operation of Local Exhaust Systems

Z88.6-2006.....Respiratory Protection

1.4 DEFINITIONS

A. Action Level: Employee exposure, without regard to use of respirations, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, ”30 micrograms per cubic meter of air" refers to the action level.

B. Area Monitoring: Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations which may reach the breathing zone of personnel potentially exposed to lead.

C. Physical Boundary: Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."

D. Certified Industrial Hygienist (CIH): As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.

E. Change Rooms and Shower Facilities: Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross- contamination.

F. Competent Person: A person capable of identifying lead hazards in the work area and is authorized by the contractor to take corrective action.

G. Decontamination Room: Room for removal of contaminated personal protective equipment (PPE).

H. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

I. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron

size particles.

J. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

K. Lead Control Area: An enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-containing paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.

L. Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1910.1025. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula. PEL (micrograms/cubic meter of air) = 400/No. of hrs worked per day

M. Personnel Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1910.1025. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 150 mm to 225 mm (6 to 9 inches) and the center at the nose or mouth of an employee.

1.5 QUALITY ASSURANCE

A. Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.62 (I) (1) (i) & (ii). The examination shall not be required if adequate records show that employees have been examined as required by 29 CFR 1926.62(I) without the last year.

B. Medical Records: Maintain complete and accurate medical records of employees in accordance with 29 CFR 1910.20.

C. Training: Train each employee performing paint removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.

D. Training Certification: Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

E. Respiratory Protection Program:

1. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter as required by 29 CFR 1926.62.

2. Establish and implement a respiratory protection program as required

by 29 CFR 1910.134, 29 CFR 1910.1025, and 29 CFR 1926.62.

F. Hazard Communication Program: Establish and implement a Hazard Communication Program as required by 29 CFR 1910.1200.

G. Hazardous Waste Management: The Hazardous Waste Management plan shall comply with applicable requirements of Federal, State, and local hazardous waste regulations and address:

1. Identification of hazardous wastes associated with the work.
2. Estimated quantities of wastes to be generated and disposed of.
3. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact.
4. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
5. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
6. Spill prevention, containment, and cleanup contingency measures to be implemented.
7. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
8. Cost for hazardous waste disposal according to this plan.

H. Safety and Health Compliance:

1. In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1910.1025. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work.
2. Where specification requirements and the referenced documents vary, the most stringent requirements shall apply.

J. Pre-Construction Conference: Along with the CIH, meet with the Contracting Officer to discuss in detail the lead-containing paint removal work plan, including work procedures and precautions for the work plan.

1.6 SUBMITTALS

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

B. Manufacturer's Catalog Data:

Vacuum filters
Respirators

C. Instructions: Paint removal materials. Include applicable material safety data sheets.

D. Statements Certifications and Statements:

1. Testing Laboratory: Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of lead. Provide proper documentation that persons performing the analysis have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. The laboratory shall be accredited by the American Industrial Hygiene Association (AIHA). Provide AIHA documentation along with date of accreditation/reaccreditation.

2. Lead-Containing Paint Removal Plan:

a. Submit a detailed job-specific plan of the work procedures to be used in the removal of lead-containing paint. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system.

b. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area.

c. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion on the plan.

3. Field Test Reports: Monitoring Results: Submit monitoring results to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

4. Records:
   a. Completed and signed hazardous waste manifest from treatment or disposal facility.
   b. Certification of Medical Examinations.
   c. Employee training certification.

PART 2 PRODUCTS

PAINT REMOVAL PRODUCTS: Submit applicable Material Safety Data Sheets for paint removal products used in paint removal work. Use the least toxic product, suitable for the job and acceptable to the Industrial Hygienist.

PART 3 EXECUTION

3.1 PROTECTION

A. Notification: Notify the Contracting Officer 10 days prior to the start of any paint removal work.

B. Lead Control Area Requirements.
   1. Establish a lead control area by completely enclosing with 6 mil poly containment screens around the area or structure where lead-containing paint removal operations will be performed.
   2. Contain removal operations by the use of a negative pressure full containment system with at least one change room and with HEPA filtered exhaust.

C. Protection of Existing Work to Remain: Perform paint removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition.

D. Boundary Requirements: Provide physical boundaries around the lead control area by roping off the area [designated on the drawings] or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.

E. Heating, Ventilating and Air Conditioning (HVAC) Systems: Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

F. Change Room and Shower Facilities: Provide clean change rooms and shower facilities within the physical boundary around the designated lead control area in accordance with requirements of 29 CFR 1926.62.

G. Mechanical Ventilation System:

1. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.57.
2. To the extent feasible, use fixed local exhaust ventilation connected to HEPA filters or other collection systems, approved by the industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.
3. If air from exhaust ventilation is recirculated into the work place, the system shall have a high efficiency filter with reliable back-up filter and controls to monitor the concentration of lead in the return air and to bypass the recirculation system automatically if it fails. Air may be recirculated only where exhaust to the outside is not feasible.

H. Personnel Protection: Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.

I. Warning Signs: Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.2 WORK PROCEDURES

A. Perform removal of lead-containing paint in accordance with approved lead-containing paint removal plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when lead- containing paint is removed in accordance with 29 CFR 1926.62, except as specified herein. Dispose of removed paint chips and associated waste in compliance with Environmental Protection Agency (EPA), federal, state, and local requirements.

B. Personnel Exiting Procedures:

1. Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:
   a. Vacuum themselves off.
   b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.

c. Shower.

d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.

C. Monitoring: Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1910.1025 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH:

1. The CIH or the IH Technician under the direction of the CIH shall be on the job site directing the monitoring, and inspecting the lead-containing paint removal work to ensure that the requirements of the Contract have been satisfied during the entire lead-containing paint removal operation.
2. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
3. Submit results of air monitoring samples, signed by the CIH, within 48 hours after the air samples are taken. Notify the Contracting Officer immediately of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the lead control area.

D. Monitoring During Paint Removal Work:

1. Perform personal and area monitoring during the entire paint removal operation. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately.
2. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Removal work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring daily on each shift in

which lead paint removal operations are performed in areas immediately adjacent to the lead control area.

3. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

3.3 LEAD-CONTAINING PAINT REMOVAL

A. Remove paint within the areas designated on the drawings in order to completely expose the substrate. Take whatever precautions are necessary to minimize damage to the underlying substrate.

B. Indoor Lead Paint Removal: Select paint removal processes to minimize contamination of work areas with lead-contaminated dust or other lead-contaminated debris/waste. This paint removal process should be described in the lead-containing paint removal plan. Perform manual sanding and scraping to the maximum extent feasible.

C. Mechanical Paint Removal and Blast Cleaning: Perform mechanical paint removal and blast cleaning in lead control areas using negative pressure full containments with HEPA filtered exhaust. Collect paint residue and spent grit (used abrasive) from blasting operations for disposal in accordance with EPA, state and local requirements.

D. Outside Lead Paint Removal: Select removal processes to minimize contamination of work areas with lead-contaminated dust or other lead-contaminated debris/waste. This paint removal process should be described in the lead-containing paint removal plan. Perform manual sanding and scraping to the maximum extent feasible.

3.4 SURFACE PREPARATIONS

Avoid flash rusting or other deterioration of the substrate. Provide surface preparations for painting in accordance with Section 09 91 00, PAINTING.

3.5 CLEANUP AND DISPOSAL

A. Cleanup: Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the paint removal operation has been completed, clean the area of visible lead paint contamination by vacuuming with a

HEPA filtered vacuum cleaner and wet mopping the area.

B. Testing of Lead-Containing Paint Residue and Used Abrasive Where indicated or when directed by the Contracting Officer, test lead containing paint residue and used abrasive in accordance with 40 CFR 261 for hazardous waste.

C. Disposal:

1. Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing which may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62. Dispose of lead-contaminated waste material at a state approved hazardous waste treatment, storage, or disposal facility off Government property.
2. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55-gallon drums. Properly label each drum to identify the type of waste (49 CFR 172) and the date the drum was filled. The Contracting Officer or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
3. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

D. Disposal Documentation Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262.

END OF SECTION 02 83 33.13

Division 03

Concrete

Division 03

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PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies cast-in-place structural concrete and materials and mixes for other concrete.

1.2 RELATED WORK:

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS.

C. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

D. Concrete for deep foundations: Section 31 63 26 DRILLED CAISSONS

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN:

A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by Project Manager. For all other testing refer to 01 45 29 Testing Laboratory Services.

B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology. Accompany request for approval of testing agency with a copy of Report of Latest Inspection of Laboratory Facilities by CCRL.

C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.4 TOLERANCES:

A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 mm (+0 inch) and -20 mm (-3/4 inch).

B. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 10, 13, and 16 (Nos. 3, 4, and 5) (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 mm (+0 inch) and -13 mm (-1/2 inch) where gross bar length is less than 3600 mm (12 feet), or +0 mm (+0 inch) and -20 mm (-3/4 inch) where gross bar length is 3600 mm (12 feet) or more.

C. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +20 mm (+3/4 inch) and - 6 mm (-1/4 inch). Tolerance of thickness of beams more than 300 mm (12 inch) but less than 900 mm (3 feet) is +20 mm (+3/4 inch) and -10 mm (-3/8 inch).

D. Slab Finishes: ACI 117, Section 4.5.6, F-number method in accordance with ASTM E1155, except as follows:

1. Test entire slab surface, including those areas within 600 mm (2 feet) of construction joints and vertical elements that project

through slab surface.

2. Maximum elevation change which may occur within 600 mm (2 feet) of any column or wall element is 6 mm (0.25 inches).
3. Allow sample measurement lines that are perpendicular to construction joints to extend past joint into previous placement no further than 1500 mm (5 feet).

1.5 REGULATORY REQUIREMENTS:

A. ACI SP-66 – ACI Detailing Manual.

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

C. ACI 301 – Standard Specifications for Structural Concrete.

1.6 SUBMITTALS:

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

B. Samples:

1. Portland cement: 8 pounds.
2. Fly ash: 5 pounds.

C. Shop Drawings: Reinforcing steel: Complete shop drawings

D. Mill Test Reports:

1. Reinforcing Steel.
2. Cement.

E. Manufacturer's Certificates:

1. Cementitious Materials.
2. Normal weight aggregate for structural concrete.
3. Air-entraining admixture.
4. Chemical admixtures, including chloride ion content.
5. Waterproof paper for curing concrete.
6. Liquid membrane-forming compounds for curing concrete.
7. Non-shrinking grout.
8. Liquid hardener.
9. Waterstops.
10. Expansion joint filler.
11. Adhesive binder.

F. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology and copy of report of latest CCRL, Inspection of Laboratory.

G. Test Report for Concrete Mix Designs: Trial mixes including water-cement fly ash ratio curves, concrete mix ingredients, and admixtures.

H. Shoring and Reshoring Sequence: Submit for approval a shoring and reshoring sequence for joist and beam portions, prepared by a registered Professional Engineer. As a minimum, include timing of form stripping, reshoring, number of floors to be re-shored and timing of re-shore removal to serve as an initial outline of procedures subject to modification as construction progresses. Submit revisions to sequence, whether initiated by Project Manager (see FORMWORK) or Contractor.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.

B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least (300mm) 1 foot above ground. Store bulk cement and fly ash in separate suitable bins.

C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

1.8 PRE-CONCRETE CONFERENCE:

A. General: At least 15 days prior to submittal of design mixes, conduct a meeting to review proposed methods of concrete construction to achieve the required results.

B. Agenda: Includes but is not limited to:

1. Submittals.
2. Coordination of work.
3. Availability of material.
4. Concrete mix design including admixtures.
5. Methods of placing, finishing, and curing.
6. Finish criteria required to obtain required flatness and levelness.
7. Timing of floor finish measurements.
8. Material inspection and testing.

C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing,

and curing concrete; admixture manufacturers; Project Manager; Consulting Engineer; Department of Veterans Affairs retained testing laboratories for concrete testing and finish (F-number) verification..

D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

1.9 **APPLICABLE PUBLICATIONS:**

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

B. American Concrete Institute (ACI):

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

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

211.2-98(R2004).....Standard Practice for Selecting Proportions for Structural Lightweight Concrete

214R-11.....Guide to Evaluation of Strength Test Results of Concrete

301-10.....Standard Practice for Structural Concrete

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

305.1-06.....Specification for Hot Weather Concreting

306.1-90(R2002).....Standard Specification for Cold Weather Concreting

308.1-11.....Specification for Curing Concrete

309R-05.....Guide for Consolidation of Concrete

318-11.....Building Code Requirements for Reinforced Concrete and Commentary

347-04.....Guide to Formwork for Concrete

SP-66-04.....ACI Detailing Manual

C. American National Standards Institute and American Hardboard Association (ANSI/AHA):

A135.4-2004.....Basic Hardboard

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

A82/A82M-07.....Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

A185/185M-07.....Standard Specification for Steel Welded Wire Fabric Reinforcement, Plain, for Concrete

A615/A615M-09.....Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

A653/A653M-11.....Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A706/A706M-09.....Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

A767/A767M-09.....Standard Specification for Zinc Coated (Galvanized) Steel Bars for Concrete Reinforcement

A775/A775M-07.....Standard Specification for Epoxy Coated Reinforcing Steel Bars

A820-11.....Standard Specification for Steel Fibers for Fiber Reinforced Concrete

A996/A996M-09.....Standard Specification for Rail Steel and Axle Steel Deformed Bars for Concrete Reinforcement

C31/C31M-10.....Standard Practice for Making and Curing Concrete Test Specimens in the field

C33/C33M-11A.....Standard Specification for Concrete Aggregates

C39/C39M-12.....Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C94/C94M-12.....Standard Specification for Ready Mixed Concrete

C143/C143M-10.....Standard Test Method for Slump of Hydraulic Cement Concrete

C150-11.....Standard Specification for Portland Cement

C171-07.....Standard Specification for Sheet Materials for Curing Concrete

C172-10.....Standard Practice for Sampling Freshly Mixed Concrete

C173-10.....Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C192/C192M-07.....Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

C231-10.....Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C260-10.....Standard Specification for Air Entraining Admixtures for Concrete

C309-11.....Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete

C330-09.....Standard Specification for Lightweight Aggregates for Structural Concrete

C494/C494M-11.....Standard Specification for Chemical Admixtures for Concrete

C496-06.....Splitting Tensile Strength of Cylindrical Concrete Specimens

C567-05.....Density of Structural Lightweight Concrete

C618-12.....Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

C666/C666M-03(R2008)....Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

C881/C881M-10.....Standard Specification for Epoxy Resin Base Bonding Systems for Concrete

C1107/1107M-11.....Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

C1315-11.....Standard Specification for Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete

D6-95(R2011).....Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds

D297-93(R2006).....Standard Methods for Rubber Products Chemical Analysis

D412—06AE2.....Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

D1751-04(R2008).....Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D4397-10.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

E1155-96(R2008).....Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers

E1745.....Standard Specification for plastic water vapor retarders used in contract with soil granular fill under concrete slab

E. American Welding Society (AWS):

D1.4/D1.4M-11.....Structural Welding Code - Reinforcing Steel

F. Concrete Reinforcing Steel Institute (CRSI):

Handbook 2008

G. National Cooperative Highway Research Program (NCHRP):

Report On.....Concrete Sealers for the Protection of Bridge Structures

H. U. S. Department of Commerce Product Standard (PS):

PS 1.....Construction and Industrial Plywood

PS 20.....American Softwood Lumber

I. U. S. Army Corps of Engineers Handbook for Concrete and Cement:

CRD C513.....Rubber Waterstops

CRD C572.....Polyvinyl Chloride Waterstops

PART 2 - PRODUCTS:

2.1 FORMS:

A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.

B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16mm (5/8 inch), or 20mm (3/4 inch) thick for unlined contact form. B-B High Density Concrete Form Overlay optional.

C. Metal for Concrete Rib-Type Construction: Steel (removal type) of suitable weight and form to provide required rigidity.

D. Form Lining:

1. Hardboard: ANSI/AHA A135.4, Class 2 with one (S1S) smooth side)

2. Plywood: Grade B-B Exterior (concrete-form) not less than 6 mm (1/4 inch) thick.

3. Plastic, fiberglass, or elastomeric capable of reproducing the desired pattern or texture.

E. Form Ties: Develop a minimum working strength of 13.35 kN (3000 pounds) when fully assembled. Ties shall be adjustable in length to permit tightening of forms and not have any lugs, cones, washers to act as spreader within form, nor leave a hole larger than 20 mm (3/4 inch)

diameter, or a depression in exposed concrete surface, or leave metal closer than 40 mm (1 1/2 inches) to concrete surface. Wire ties not permitted. Cutting ties back from concrete face not permitted.

2.2 MATERIALS:

A. Portland Cement: ASTM C150 Type I or II.

B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalies, and loss on ignition (LOI) not to exceed 5 percent.

C. Coarse Aggregate: ASTM C33.

1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
2. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 7.
3. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.

D. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 µm (No. 100) sieve.

E. Mixing Water: Fresh, clean, and potable.

F. Admixtures:

1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
5. Air Entraining Admixture: ASTM C260.

6. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
7. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.

G. Vapor Barrier: ASTM D4397 Class A, 0.25mm (10 mil), provide tape and mastic
accessories for seal.

H. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.

I. Welded Wire Fabric: ASTM A185.

J. Reinforcing Bars to be Welded: ASTM A706.

K. Epoxy Coated Reinforcing Bars: ASTM A775.

L. Cold Drawn Steel Wire: ASTM A82.

M. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at .8Kg/m^2 (1.5 pounds per square yard), or square mesh at .6Kg/m^2 (1.17 pounds per square yard).

N. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.

O. Expansion Joint Filler: ASTM D1751.

P. Sheet Materials for Curing Concrete: ASTM C171.

Q. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye, and shall meet the requirements of ASTM C1315. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.

R. Moisture Vapor Emissions & Alkalinity Control Sealer: 100% active colorless aqueous siliconate solution concrete surface treatment applied the day of the concrete pour in lieu of other curing methods for all concrete slabs receiving resilient flooring, such as, sheet vinyl, luxury vinyl tile, rubber, wood flooring, carpet, epoxy coatings and overlays .
ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34% solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all finish materials. MVE 15-Year Warranty

When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminates for a period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminates.

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

T. Adhesive Binder: ASTM C881.

U. Polyvinyl Chloride Waterstop: CRD C572.

V. Rubber Waterstops: CRD C513.

W. Bentonite Waterstop: Flexible strip of bentonite 25 mm x 20 mm (1 inch by 3/4 inch),, weighing 8.7 kg/m (5.85 lbs. per foot) composed of Butyl Rubber Hydrocarbon (ASTM D297), Bentonite (SS-S-210-A) and Volatile Matter (ASTM D6).

X. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

Y. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.

Z. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.

2.3 CONCRETE MIXES:

A. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.
   1. If trial mixes are used, make a set of at least 6 cylinders in accordance with ASTM C192 for test purposes from each trial mix;

test three for compressive strength at 7 days and three at 28 days.

2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, fly ash, admixtures, weight of fine and coarse aggregate per m^3 (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement, fly ash ratio, and consistency of each cylinder in terms of slump.
3. Prepare a curve showing relationship between water-cement, fly ash ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.
4. If the field experience method is used, submit complete standard deviation analysis.

B. Fly Ash Testing: Submit certificate verifying conformance with specifications initially with mix design and for each truck load of fly ash delivered from source. Notify Project Manager immediately when change in source is anticipated. Testing Laboratory used for fly ash certification testing shall participate in the Cement and Concrete Reference Laboratory (CCRL) program. Submit most recent CCRL inspection report. Prior to beginning trial mixes submit to the Project Manager the following representative samples of material to be used, properly identified source and project description and number, type of testing (complete chemical and physical), suitably packaged for shipment, and addressed as specified. Allow 60 calendar days for test results after submittal of sample.

1. Fly ash - 2.25 kg (5 pounds).
2. Portland cement - 3.5 kg (8 pounds):

   Address -Waterways Experiment Station (WES)
   3909 Halls Ferry Road
   Vicksburg, MS 39180-6199
   ATTN: Engineering Materials Group

C. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of Project Manager or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. Project Manager may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and

approval of design mix.

D. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Fly ash may be substituted for up to 20 percent of the minimum cement factor at option of Contractor. Increase this replacement to 40% for mass concrete, and reduce it to 10% for drilled piers and caissons. Fly ash shall not be used in high-early mix design.

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
	280 (470)	0.65	290 (490)	0.55
	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.

E. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II. Refer to Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS, for slump used for concrete walks, curbs, gutters, and pavements.

TABLE II - MAXIMUM SLUMP, MM (INCHES)*

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

* Slump may be increased by the use of the approved high-range water-

reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 225 mm (9 inches). The concrete shall arrive at the job site at a slump of 50 mm to 75 mm (2 inches to 3 inches). This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.

F. Air-Entrainment: Air entrainment of normal weight concrete shall conform with Table III. Determine air content by either ASTM C173 or ASTM C231.

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

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

G. High early strength concrete, made with Type III cement or Type I cement plus non-corrosive accelerator, shall have a 7-day compressive strength equal to specified minimum 28-day compressive strength for concrete type specified made with standard Portland cement.

H. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).

I. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. Air content as shown in Table III.

J. Enforcing Strength Requirements: Test as specified in Section 01 45 29, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance

with ACI 214. Should strengths shown by test specimens fall below required values, Project Manager may require any one or any combination of the following corrective actions, at no additional cost to the Government:

1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
2. Require additional curing and protection.
3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, Project Manager may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, Project Manager may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the Project Manager.

2.4 BATCHING AND MIXING:

A. General: Concrete shall be "Ready-Mixed" and comply with ACI 318 and ASTM C94, except as specified. Batch mixing at the site is permitted. Mixing process and equipment must be approved by Project Manager. With each batch of concrete, furnish certified delivery tickets listing information in Paragraph 16.1 and 16.2 of ASTM C94. Maximum delivery temperature of concrete is 38^0C (100 degrees Fahrenheit). Minimum delivery temperature as follows:

Atmospheric Temperature	Minimum Concrete Temperature
-1. degrees to 4.4 degrees C (30 degrees to 40 degrees F)	15.6 degrees C (60 degrees F.)
-17 degrees C to -1.1 degrees C (0 degrees to 30 degrees F.)	21 degrees C (70 degrees F.)

1. Services of aggregate manufacturer's representative shall be furnished during the design of trial mixes and as requested by the

Project Manager for consultation during batching, mixing, and placing operations of normal weight structural concrete. Services will be required until field controls indicate that concrete of required quality is being furnished. Representative shall be thoroughly familiar with the structural lightweight aggregate, adjustment and control of mixes to produce concrete of required quality. Representative shall assist and advise Project Manager.

PART 3 – EXECUTION

3.1 FORMWORK:

A. General: Design in accordance with ACI 347 is the responsibility of the Contractor. The Contractor shall retain a registered Professional Engineer to design the formwork, shores, and reshores.

1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and Project Manager approves their reuse.
2. Provide forms for concrete footings unless Project Manager determines forms are not necessary.
3. Corrugated fiberboard forms: Place forms on a smooth firm bed, set tight, with no buckled cartons to prevent horizontal displacement, and in a dry condition when concrete is placed.

B. Treating and Wetting: Treat or wet contact forms as follows:

1. Coat plywood and board forms with non-staining form sealer. In hot weather, cool forms by wetting with cool water just before concrete is placed.
2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
3. Use sealer on reused plywood forms as specified for new material.

C. Size and Spacing of Studs: Size and space studs, wales and other framing members for wall forms so as not to exceed safe working stress of kind of lumber used nor to develop deflection greater than 1/270 of free span of member.

D. Unlined Forms: Use plywood forms to obtain a smooth finish for concrete surfaces. Tightly butt edges of sheets to prevent leakage. Back up all vertical joints solidly and nail edges of adjacent sheets to same stud with 6d box nails spaced not over 150 mm (6 inches) apart.

E. Lined Forms: May be used in lieu of unlined plywood forms. Back up form

lining solidly with square edge board lumber securely nailed to studs with all edges in close contact to prevent bulging of lining. No joints in lining and backing may coincide. Nail abutted edges of sheets to same backing board. Nail lining at not over 200 mm (8 inches) on center along edges and with at least one nail to each square foot of surface area; nails to be 3d blued shingle or similar nails with thin flatheads.

F. Wall Form Ties: Locate wall form ties in symmetrically level horizontal rows at each line of wales and in plumb vertical tiers. Space ties to maintain true, plumb surfaces. Provide one row of ties within 150 mm (6 inches) above each construction joint. Space through-ties adjacent to horizontal and vertical construction joints not over 450 mm (18 inches) on center.

1. Tighten row of ties at bottom of form just before placing concrete and, if necessary, during placing of concrete to prevent seepage of concrete and to obtain a clean line. Ties to be entirely removed shall be loosened 24 hours after concrete is placed and shall be pulled from least important face when removed.
2. Coat surfaces of all metal that is to be removed with paraffin, cup grease or a suitable compound to facilitate removal.

G. Inserts, Sleeves, and Similar Items: Flashing reglets, steel strips, masonry ties, anchors, wood blocks, nailing strips, grounds, inserts, wire hangers, sleeves, drains, guard angles, forms for floor hinge boxes, inserts or bond blocks for elevator guide rails and supports, and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned, and built into construction, and maintained securely in place.

1. Locate inserts or hanger wires for furred and suspended ceilings only in bottom of concrete joists, or similar concrete member of overhead concrete joist construction.
2. Install sleeves, inserts and similar items for mechanical services in accordance with drawings prepared specially for mechanical services. Contractor is responsible for accuracy and completeness of drawings and shall coordinate requirements for mechanical services and equipment.
3. Do not install sleeves in beams, joists or columns except where

shown or permitted by Project Manager. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the Project Manager, and require no structural changes, at no additional cost to the Government.

4. Minimum clear distance of embedded items such as conduit and pipe is at least three times diameter of conduit or pipe, except at stub-ups and other similar locations.
5. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

H. Construction Tolerances:

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

3.2 PLACING REINFORCEMENT:

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

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

1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. Use epoxy-coated tie wire with epoxy-coated reinforcing. Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 318. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of

brick or stone supports will not be permitted.

2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.
3. Splice column steel at no points other than at footings and floor levels unless otherwise shown.

C. Spacing: Minimum clear distances between parallel bars, except in columns and multiple layers of bars in beams shall be equal to nominal diameter of bars. Minimum clear spacing is 25 mm (1 inch) or 1-1/3 times maximum size of coarse aggregate.

D. Splicing: Splices of reinforcement made only as required or shown or specified. Accomplish splicing as follows:

1. Lap splices: Do not use lap splices for bars larger than Number 36 (Number 11.

   Minimum lengths of lap as shown.

2. Welded splices: Splicing by butt-welding of reinforcement permitted providing the weld develops in tension at least 125 percent of the yield strength (fy) for the bars. Welding conform to the requirements of AWS D1.4. Welded reinforcing steel conform to the chemical analysis requirements of AWS D1.4.
   a. Submit test reports indicating the chemical analysis to establish weldability of reinforcing steel.
   b. Submit a field quality control procedure to insure proper inspection, materials and welding procedure for welded splices.
   c. Department of Veterans Affairs retained testing agency shall test a minimum of three splices, for compliance, locations selected by Project Manager.
3. Mechanical Splices: Develop in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.
   a. Initial qualification: In the presence of Project Manager, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing

laboratory will perform load test.

b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.

E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by Project Manager.

F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.

G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

3.3 VAPOR BARRIER:

A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier.

1. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
2. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.
3. Patch punctures and tears.

3.4 MOISTURE VAPOR EMISSIONS & ALKALINITY CONTROL SEALER:

A. Sealer is applied on the day of the concrete pour or as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays.

B. Manufacturer’s representative will be on the site the day of concrete pour to install or train its application and document. He shall return on every application thereafter to verify that proper procedures are followed.

1. Apply Sealer to concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain floor traffic without damage.
2. Spray apply Sealer at the rate of 20 m^2 (200 square feet) per gallon. Lightly broom product evenly over the substrate and product has completely penetrated the surface.

3. If within two (2) hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply Sealer product to these areas as soon as weather condition permits.

3.5 CONSTRUCTION JOINTS:

A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 24,000 mm (80 feet) in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by Project Manager.

B. Locate construction joints in suspended floors near the quarter-point of spans for slabs, beams or girders, unless a beam intersects a girder at center, in which case joint in girder shall be offset a distance equal to twice width of beam. Provide keys and inclined dowels as shown. Provide longitudinal keys as shown.

C. Place concrete for columns slowly and in one operation between joints. Install joints in concrete columns at underside of deepest beam or girder framing into column.

D. Allow 2 hours to elapse after column is cast before concrete of supported beam, girder or slab is placed. Place girders, beams, grade beams, column capitals, brackets, and haunches at the same time as slab unless otherwise shown.

3.6 EXPANSION JOINTS:

A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.

3.7 PLACING CONCRETE:

A. Preparation:

1. Remove hardened concrete, wood chips, shavings and other debris from forms.
2. Remove hardened concrete and foreign materials from interior surfaces of mixing and conveying equipment.
3. Have forms and reinforcement inspected and approved by Project Manager before depositing concrete.
4. Provide runways for wheeling equipment to convey concrete to point of deposit. Keep equipment on runways which are not supported by or bear on reinforcement. Provide similar runways for protection of vapor barrier on coarse fill.

B. Bonding: Before depositing new concrete on or against concrete which

has been set, thoroughly roughen and clean existing surfaces of laitance, foreign matter, and loose particles.

1. Preparing surface for applied topping:

   a. Remove laitance, mortar, oil, grease, paint, or other foreign material by sand blasting. Clean with vacuum type equipment to remove sand and other loose material.
   b. Broom clean and keep base slab wet for at least four hours before topping is applied.
   c. Use a thin coat of one part Portland cement, 1.5 parts fine sand, bonding admixture; and water at a 50: 50 ratio and mix to achieve the consistency of thick paint. Apply to a damp base slab by scrubbing with a stiff fiber brush. New concrete shall be placed while the bonding grout is still tacky.

C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete subject to approval of Project Manager.

D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.

1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.
3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be

deposited upon or against partly set concrete, after it's initial set has taken place, or after 45 minutes of elapsed time during concrete placement.

6. On bottom of members with severe congestion of reinforcement, deposit 25 mm (1 inch) layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer). Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.
7. Concrete on metal deck:
   a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.

1) The Contractor shall become familiar with deflection characteristics of structural frame to include proper amount of additional concrete due to beam/deck deflection.E.Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch) intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.
   1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
   2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.8 HOT WEATHER:

A. Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Project Manager.

3.9 COLD WEATHER:

A. Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyantes or admixtures containing more than

0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Project Manager.

3.10 PROTECTION AND CURING:

A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing, except wet curing period for high-early-strength concrete shall be not less than 3 days. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by Project Manager.

1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer’s instructions. Apply immediately after finishing. Maximum coverage $10m^2/L$ (400 square feet per gallon) on steel troweled surfaces and $7.5m^2/L$ (300 square feet per gallon) on floated or broomed surfaces for the curing/sealing compound.
2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with tape.
3. Paper: Utilize widest practical width paper and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

3.11 REMOVAL OF FORMS:

A. Remove in a manner to assure complete safety of structure after the following conditions have been met.

1. Where structure as a whole is supported on shores, forms for beams

and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.

2. Take particular care in removing forms of architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.

B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Supporting forms or shoring not removed until strength of control test cylinders have attained at least 70 percent of minimum 28-day compressive strength specified. Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.

C. Reshoring: Reshoring is required if superimposed load plus dead load of the floor exceeds the capacity of the floor at the time of loading. In addition, for joists, reshoring is required immediately after stripping operations are complete and not later than the end of the same day. Reshoring accomplished in accordance with ACI 347 at no additional cost to the Government.

3.12 CONCRETE SURFACE PREPARATION:

A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.

B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 25 mm (1 inch). Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 150 mm (6 inches) surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar.

Cement grout composed of one part Portland cement, 1.5 parts fine sand, bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.

C. Upon removal of forms, clean vertical concrete surface that is to receive bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

3.13 CONCRETE FINISHES:

A. Vertical and Overhead Surface Finishes:

1. Unfinished areas: Vertical and overhead concrete surfaces exposed in pipe basements, elevator and dumbwaiter shafts, pipe spaces, pipe trenches, above suspended ceilings, manholes, and other unfinished areas will not require additional finishing.
2. Interior and exterior exposed areas to be painted: Remove fins, burrs and similar projections on surfaces flush, and smooth by mechanical means approved by Project Manager, and by rubbing lightly with a fine abrasive stone or hone. Use ample water during rubbing without working up a lather of mortar or changing texture of concrete.
3. Interior and exterior exposed areas finished: Give a grout finish of uniform color and smooth finish treated as follows:
   a. After concrete has hardened and laitance, fins and burrs removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone stone.
   b. Apply grout composed of one part of Portland cement, one part fine sand, smaller than a 600 µm (No. 30) sieve. Work grout into surface of concrete with cork floats or fiber brushes until all pits, and honeycombs are filled.

c. After grout has hardened slightly, but while still plastic, scrape grout off with a sponge rubber float and, about 1 hour later, rub concrete vigorously with burlap to remove any excess grout remaining on surfaces.

d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish of area in same day. Make limits of finished areas at natural breaks in wall surface. Leave no grout on concrete surface overnight.

4. Textured: Finish as specified. Maximum quantity of patched area 0.2 m^2 (2 square feet) in each 93 m^2 (1000 square feet) of textured surface.

B. Slab Finishes:

1. Monitoring and Adjustment: Provide continuous cycle of placement, measurement, evaluation and adjustment of procedures to produce slabs within specified tolerances. Monitor elevations of structural steel in key locations before and after concrete placement to establish typical deflection patterns for the structural steel. Determine elevations of cast-in-place slab soffits prior to removal of shores. Provide information to Project Manager and floor consultant for evaluation and recommendations for subsequent placements.

2. Set perimeter forms to serve as screed using either optical or laser instruments. For slabs on grade, wet screeds may be used to establish initial grade during strike-off, unless Project Manager determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed, they shall be placed using grade stakes set by optical or laser instruments. Use rigid screed guides, as opposed to wet screeds, to control strike-off elevation for all types of elevated (non slab-on-grade) slabs. Divide bays into halves or thirds by hard screeds. Adjust as necessary where monitoring of previous placements indicates unshored structural steel deflections to other than a level profile.

3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.

4. Use straightedges specifically made for screeding, such as hollow

magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.

5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.
6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. Float Finish: Slabs to receive unbonded toppings, steel trowel Scratch Finish: Finish base slab to receive a bonded applied cementitious application as indicated above, except that bull floats and darbys may be used. Thoroughly coarse wire broom within two hours after placing to roughen slab surface to insure a permanent bond between base slab and applied materials. Finish, fill, mortar setting beds, or a built-up roof, and ramps, stair treads, platforms (interior and exterior), and equipment pads shall be floated to a smooth, dense uniform, sandy textured finish. During floating, while surface is still soft, check surface for flatness using a 10 foot highway straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.
8. Steel Trowel Finish: Concrete surfaces to receive resilient floor covering or carpet, monolithic floor slabs to be exposed to view in finished work, future floor roof slabs, applied toppings, and other interior surfaces for which no other finish is indicated. Steel trowel immediately following floating. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure to compact

cement paste and form a dense, smooth surface. Finished surface shall be smooth, free of trowel marks, and uniform in texture and appearance.

9. Broom Finish: Finish exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated. Brush in a direction transverse to main traffic. Match texture approved by Project Manager from sample panel.

10. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

a. Areas covered with carpeting, or not specified otherwise in b. below:

1) Slab on Grade:

a) Specified overall value F_F 25/F_L 20 b) Minimum local value F_F 17/F_L 15

2) Level suspended floors(shored until after testing) and topping slabs:

a) Specified overall value FF 25/FL 20 b) Minimum local value FF 17/FL 15

3) Unshored suspended floors:

a) Specified overall value FF 25 b) Minimum local value FF 17

4) Level tolerance such that 80 percent of all points fall within a 20 mm(3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.

b. Areas that will be exposed, receive thin-set tile or resilient flooring, or roof areas designed as future floors:

1) Slab on grade:

a) Specified overall value FF 36/FL 20 b) Minimum local value FF 24/FL 15

2) Level suspended slabs (shored until after testing) and topping slabs

a) Specified overall value FF 30/FL 20 b) Minimum local value FF 24/FL 15

3) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch)from the design elevation.

c. "Specified overall value" is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.

d. "Minimum local value" (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on the results of an individual placement and applies to a minimum local area. Minimum local area boundaries may not cross a construction joint or expansion joint. A minimum local area will be bounded by construction and/or control joints, or by column lines and/or half-column lines, whichever is smaller.

11. Measurements

a. Contractor retained testing laboratory will take measurements to verify compliance with F_F, F_L, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by testing laboratory.

b. Contractor not experienced in using F_F and F_L criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.

12. Acceptance/ Rejection:

a. If individual slab section measures less than either of specified minimum local F_F/F_L numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.

b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall F_F/F_L numbers, then whole slab shall be rejected and remedial measures shall be required.

13. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire

rejected slab areas, as directed by Project Manager, until a slab finish constructed within specified tolerances is accepted.

3.14 SURFACE TREATMENTS:

A. Use on exposed concrete floors and concrete floors to receive carpeting.

B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.

3.15 RETAINING WALLS:

A. Use air-entrained concrete.

B. Expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves installed and constructed as shown.

C. Exposed surfaces finished to match adjacent concrete surfaces, new or existing.

D. Place porous backfill as shown.

3.16 PRECAST CONCRETE ITEMS:

A. Precast concrete items, not specified elsewhere. Cast using 34.5 MPa (5000 psi) air-entrained concrete to shapes and dimensions shown. Finish to match corresponding adjacent concrete surfaces. Reinforce with steel for safe handling and erection.

END OF SECTION 03 30 00

SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

Architectural precast concrete cladding units.

Insulated, architectural precast concrete units.

B. Related Sections include the following:

Section 03 30 00 "Cast-In-Place Concrete" for installing connection anchors in concrete.

Section 05 12 00 "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.

Section 05 50 00 "Metal Fabrications" for kickers and other miscellaneous steel shapes.

1.3 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

Loads: As indicated. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements per PCI MNL 117. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of **120 deg F (67 deg C)**.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints,

reveals, and extent and location of each surface finish. Indicate details at building corners.

Indicate separate face and backup mixture locations and thicknesses.

Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.

Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.

Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.

Include plans and elevations showing unit location and sequence of erection for special conditions.

Indicate location of each architectural precast concrete unit by same identification mark placed on panel.

Indicate relationship of architectural precast concrete units to adjacent materials.

Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).

When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, and testing agency.

B. Welding certificates.

C. Material Certificates: For the following items, signed by manufacturers:

Cementitious materials.

Reinforcing materials and prestressing tendons.

Admixtures.

Structural-steel shapes and hollow structural sections.

D. Material Test Reports: For aggregates.

E. Source quality-control test reports.

F. Field quality-control test and special inspection reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load-bearing members.

B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

Participates in PCI's plant certification program at time of bidding and is designated a PCI-certified plant for Group A, Category A1 -

C. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

F. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

G. Calculated Fire-Test-Response Characteristics: Where indicated, provide architectural precast concrete units whose fire resistance has been calculated according to PCI MNL 124, "Design for Fire Resistance

of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.

H. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 2 sample panels approximately **16 sq. ft. (1.5 sq. m)** in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

Locate panels where indicated or, if not indicated, as directed by Architect.

Maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.

Demolish and remove sample panels when directed.

I. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

Build mockup as indicated on Drawings including aluminum framing, glass, sealants, and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.

Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management And Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.

F. Lift and support units only at designated points shown on Shop Drawings.

1.9 SEQUENCING

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Fabricators: Subject to compliance with requirements, fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:

Coreslab Structures (Omaha), Inc.

Enterprise Pre-cast

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration to match those used for precast concrete design reference sample. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, ASTM A 767/A 767M, Class II zinc

coated, hot-dip galvanized, and chromate wash treated after fabrication and bending.

D. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 [ASTM A 706/A 706M], deformed bars, assembled with clips.

E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

G. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.4 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416/A 416M, Grade 270, uncoated, 7-wire, low-relaxation strand.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.

Metakaolin Admixture: ASTM C 618, Class N.

Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.

Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: Uniformly graded.

Face-Mixture-Fine Aggregates: Selected, natural sand of same material as coarse aggregate, unless otherwise approved by Architect.

D. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C 330, with absorption less than 11 percent.

E. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.

Retarding Admixture: ASTM C 494/C 494M, Type B.

Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

Plasticizing and Retarding Admixture: ASTM C 1017/C 1017 M.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable Iron Castings: ASTM A 47/A 47M.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).

L. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M.

Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

N. Welding Electrodes: Comply with AWS standards.

2.7 BEARING PADS

A. Provide the following bearing pad for architectural precast concrete units:

High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.8 ACCESSORIES

A. Reglets: Specified in Section 07 60 00 "Flashing and Sheet Metal".

B. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.9 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

2.10 INSULATED PANEL ACCESSORIES

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 lb/cu. ft. (26 kg/cu. m), square with aged R-value of 5 per inch and thickness of 4".

B. Wythe Connectors: Glass-fiber and vinyl-ester polymer connectors manufactured to connect wythes of precast concrete panels.

2.11 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

Limit use of fly ash and silica fume to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

Compressive Strength (28 Days): 5000 psi (34.5 MPa) minimum.

Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

Compressive Strength (28 Days): 5000 psi (34.5 MPa).

Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft. (1842 kg/cu. m), plus or minus 3 lb/cu. ft. (48 kg/cu. m), according to ASTM C 567.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.12 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

Form joints are not permitted on faces exposed to view in the finished work.

Edge and Corner Treatment: Uniformly chamfered.

2.13 FABRICATION

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

Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 144 sq. inches. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.

Place reinforcement to maintain at least 3/4-inch (19-mm) minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

Place reinforcing steel and prestressing strand to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.

Delay detensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.

Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat- cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.

H. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than 3 inches.

J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

M. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.14 INSULATED PANEL CASTING

A. Cast and screed supported wythe over mold.

B. Place insulation boards abutting edges and ends of adjacent boards. Insert wythe connectors through insulation, and consolidate concrete around connectors according to connector manufacturer's written instructions.

C. Cast and screed top wythe to meet required finish.

2.15 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.16 FINISHES

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample and as follows:

Design Reference Sample: Provide sample number and manufacturer of sample.

Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attach.

Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

B. Finish exposed top, bottom, and back surfaces of architectural precast concrete units by smooth, steel-trowel finish.

C. Finish unexposed surfaces of architectural precast concrete units by float finish.

2.17 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and

bracing as required to maintain position, stability, and alignment as units are being permanently connected.

Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.

Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.

Unless otherwise indicated, maintain uniform joint widths of 3/4 inch (19 mm).

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.

Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.

Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.

Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.

Remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction

connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.3 ERECTION TOLERANCES

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

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections and prepare reports:
Erection of precast concrete members.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

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SECTION 04 05 13
MASONRY MORTARING

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies mortar materials and mixes.

1.2 RELATED WORK:

A. Mortar used in Section:
   1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
   2. Section 04 05 16, MASONRY GROUTING.
   3. Section 04 20 00, UNIT MASONRY.
   4. Section 04 72 00, CAST STONE MASONRY.

B. Mortar Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 TESTING LABORATORY-CONTRACTOR RETAINED

A. Engage a commercial testing laboratory approved by Project Manager to perform tests specified below.

B. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Project Manager.

1.4 TESTS

A. Test mortar and materials specified.

B. Certified test reports.

C. Identify materials by type, brand name and manufacturer or by origin.

D. Do not use materials until laboratory test reports are approved by Project Manager.

E. After tests have been made and materials approved, do not change without additional test and approval of Project Manager.

F. Testing:
   1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
   2. Mortar:
      a. Test for compressive strength and water retention; ASTM C270.
      b. Mortar compressive strengths 28 days as follows:
         Type M: Minimum 17230 kPa (2500 psi) at 28 days.
         Type S: Minimum 12400 kPa (1800 psi) at 28 days.
         Type N: Minimum 5170 kPa (750 psi) at 28 days.
   3. Cement:
      a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
      b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.

4. Sand: Test for deleterious substances, organic impurities, soundness and grading.
5. High Bond Mortar: Test for compressive strength, tensile strength, flexural strength, and brick bond strength.

G. During progress of work, testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES, takes and tests samples as specified in that section. Testing procedures and test methods in ASTM C780.

1.5 SUBMITTALS

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

B. Certificates:

1. Indicating that following items meet specifications:
   a. Portland cement.
   b. Masonry cement.
   c. Mortar cement.
   d. Hydrated lime.
   e. Fine aggregate (sand).
   g. Color admixture.

C. Laboratory Test Reports:

1. Mortar, each type.
2. Admixtures.

D. Manufacturer's Literature and Data:

1. Cement, each kind.
2. Hydrated lime.
3. Admixtures.
4. Liquid acrylic resin.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.

B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.7 APPLICABLE PUBLICATIONS

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

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

C40-04.....Organic Impurities in Fine Aggregates for Concrete

C91-05.....Masonry Cement
C109-08.....Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-MM Cube Specimens)
C144-04.....Aggregate for Masonry Mortar
C150-09.....Portland Cement
C207-06.....Hydrated Lime for Masonry Purposes
C270-10.....Mortar for Unit Masonry
C307-03(R2008).....Tensile Strength of Chemical - Resistant Mortar, Grouts, and Monolithic Surfacing
C321-00(R2005).....Bond Strength of Chemical-Resistant Mortars
C348-08.....Flexural Strength of Hydraulic Cement Mortars
C595-10.....Blended Hydraulic Cement
C780-10.....Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C979-10.....Pigments for Integrally Colored Concrete
C1329-05.....Mortar Cement

PART 2 - PRODUCTS

2.1 HYDRATED LIME

ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY MORTAR

A. ASTM C144 and as follows:
   1. Light colored sand for mortar for laying face brick.
B. Test sand for color value in accordance with ASTM C40. Sand producing color darker than specified standard is unacceptable.

2.3 BLENDED HYDRAULIC CEMENT

ASTM C595, Type IS, IP.

2.4 MASONRY CEMENT

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

2.5 MORTAR CEMEMT

A. ASTM C1329, Type N, S or M.

2.6 PORTLAND CEMENT

A. ASTM C150, Type I.

2.7 LIQUID ACRYLIC RESIN

A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.8 WATER

Potable, free of substances that are detrimental to mortar, masonry, and metal.

2.9 POINTING MORTAR

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

2.10 MASONRY MORTAR

A. Conform to ASTM C270.

B. Admixtures:

1. Do not use mortar admixtures, except for high bond mortar, and color admixtures.
2. Submit laboratory test report showing effect of proposed admixture on strength, water retention, and water repellency of mortar.
3. Do not use antifreeze compounds.

C. Colored Mortar:

1. Maintain uniform mortar color for exposed work throughout.
2. Match mortar color in approved mock-up.
3. Color of mortar for exposed work in alteration work to match color of existing mortar unless specified otherwise in section 09 06 00, SCHEDULE FOR FINISHES.

D. Color Admixtures:

1. Proportion as specified by manufacturer.
2. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

~~**2.11 HIGH BOND MORTAR**~~

~~A. Mixture by volume, one-part Portland cement, 1/4-part hydrated lime, three-parts sand, water, and liquid acrylic resin.~~

~~B. Mortar properties when tested in accordance with referenced specifications.~~

~~1. Compressive Strength, ASTM C109: Minimum 19,305 kPa (2800 psi), using 50 mm (2 inch) cubes.~~

~~2. Tensile Strength, ASTM C307: 3861 kPa Minimum (560 psi), using the 25mm (1 inch) briquettes.~~

~~3. Flexural Strength, ASTM C348: Minimum 6067 kPa (880 psi), using flexural bar.~~

~~4. Bond Strength, ASTM C321: Minimum 2965 kPa (430 psi), using crossed brick.~~

2.~~12~~ 11 COLOR ADMIXTURE

A. Pigments: ASTM C979.

B. Use mineral pigments only. Organic pigments are not acceptable.

C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING

A. Mix in a mechanically operated mortar mixer.
   1. Mix mortar for at least three minutes but not more than five minutes.

B. Measure ingredients by volume. Measure by the use of a container of known capacity.

C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.

D. Mortar that has stiffened because of loss of water through evaporations:
   1. Re-tempered by adding water to restore to proper consistency and workability.
   2. Discard mortar that has reached its initial set or has not been used within two hours.

E. Pointing Mortar:
   1. Mix dry ingredients with enough water to produce a damp mixture of workable consistency which will retain its shape when formed into a ball.
   2. Allow mortar to stand in dampened condition for one to 1-1/2 hours.
   3. Add water to bring mortar to a workable consistency prior to application.

3.2 MORTAR USE LOCATION

A. Use Type M mortar for precast concrete panels.

B. Use Type S mortar for cast stone and concrete masonry units.

C. For brick veneer over frame back up walls, use Type N portland cement-lime mortar or Type S masonry cement or mortar cement mortar.

D. Use Type N mortar for other masonry work, except as otherwise specified.

E. Use Type N mortar for tuck pointing work.

F. Use pointing mortar for items specified.

END OF SECTION 04 05 13

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SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies grout materials and mixes.

1.2 RELATED WORK:

A. Grout used in Section:
   1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
   2. Section 04 20 00, UNIT MASONRY.
   3. Section 04 72 00, CAST STONE MASONRY.

B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 TESTS:

A. Test grout and materials specified.

B. Certified test reports.

C. Identify materials by type, brand name and manufacturer or by origin.

D. Do not use materials until laboratory test reports are approved by Project Manager.

E. After tests have been made and materials approved, do not change without additional test and approval of Project Manager.

F. Testing:
   1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
   2. Grout:
      a. Test for compressive strength; ASTM C1019.
      b. Grout compressive strength of 13790 kPa (2000 psi) at 28 days.
   3. Cement:
      a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
      b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.
   4. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.4 SUBMITTALS:

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

B. Certificates:
   1. Indicating that following items meet specifications:
      a. Portland cement.
      b. Masonry cement.

c. Grout.

d. Hydrated lime.

e. Fine aggregate (sand).

f. Coarse aggregate for grout.

g. Color admixture.

C. Laboratory Test Reports:

1. Grout, each type.

2. Admixtures.

D. Manufacturer's Literature and Data:

1. Cement, each kind.

2. Hydrated lime.

3. Admixtures.

4. Liquid acrylic resin.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.

B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.6 APPLICABLE PUBLICATIONS:

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

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

C40-04.....Organic Impurities in Fine Aggregates for Concrete

C91-05.....Masonry Cement

C150-09.....Portland Cement

C207-06.....Hydrated Lime for Masonry Purposes

C404-07.....Aggregate for Masonry Grout

C476-10.....Grout for Masonry

C595-10.....Blended Hydraulic Cement

C979-10.....Pigments for Integrally Colored Concrete

C1019-11.....Sampling and Testing Grout

PART 2 - PRODUCTS

2.1 HYDRATED LIME:

ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY GROUT:

ASTM C404, Size 8.

2.3 BLENDED HYDRAULIC CEMENT:

ASTM C595, Type IS, IP.

2.4 MASONRY CEMENT:

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

2.5 PORTLAND CEMENT:

A. ASTM C150, Type I.

2.6 LIQUID ACRYLIC RESIN:

A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.7 WATER:

Potable, free of substances that are detrimental to grout, masonry, and metal.

2.8 GROUT:

A. Conform to ASTM C476 except as specified.

B. Grout type proportioned by volume as follows:

1. Fine Grout:
   a. Portland cement or blended hydraulic cement: one part.
   b. Hydrated lime: 0 to 1/10 part.
   c. Fine aggregate: 2-1/4 to three times sum of volumes of cement and lime used.
2. Coarse Grout:
   a. Portland cement or blended hydraulic cement: one part.
   b. Hydrated lime: 0 to 1/10 part.
   c. Fine aggregate: 2-1/4 to three times sum of volumes of cement and lime used.
   d. Coarse aggregate: one to two times sum of volumes of cement and lime used.
3. Sum of volumes of fine and coarse aggregates: Do not exceed four times sum of volumes of cement and lime used.

2.9 COLOR ADMIXTURE:

A. Pigments: ASTM C979.

B. Use mineral pigments only. Organic pigments are not acceptable.

C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING:

A. Mix in a mechanically operated grout mixer.

1. Mix grout for at least five minutes.

B. Measure ingredients by volume. Measure by the use of a container of known capacity.

C. Mix water with grout dry ingredients in sufficient amount to bring grout mixture to a pouring consistency.

3.2 GROUT USE LOCATIONS:

A. Use fine grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is 50 mm (2 inches) or less.

B. Use either fine grout or coarse grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is greater than 50 mm (2 inches).

C. Do not use grout for filling bond beam or lintel units.

END OF SECTION 04 05 16

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies requirements for construction of masonry unit walls.

1.2 RELATED WORK

A. Mortars and grouts: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING.

B. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.

C. Cavity insulation: Section 07 21 13, THERMAL INSULATION.

D. Weather Barriers: 07 27 27 FLUID-APPLIED MEMBRANE AIR BARRIER, VAPOR RETARDING

E. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.

F. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.

G. Color and texture of masonry units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

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

B. Samples:

1. Face brick, mock-up panel, 24 inches by 48 inches, showing full color range and texture of bricks, bond, and proposed mortar joints.
2. Concrete masonry units, when exposed in finish work.
3. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.

C. Shop Drawings:

1. Special masonry shapes.
2. Drawings, showing reinforcement, applicable dimensions and methods of hanging soffit or lintel masonry and reinforcing masonry for embedment of anchors for hung fixtures.
3. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

D. Certificates:

1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
2. Indicating that the following items meet specification requirements:

a. Face brick.

b. Solid and load-bearing concrete masonry units, including fire-resistant rated units.

3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

E. Manufacturer's Literature and Data:

1. Anchors, ties, and reinforcement.
2. Shear keys.
3. Reinforcing bars.

1.4 SAMPLE PANEL

A. Before starting masonry, lay up a sample panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA).

1. Use masonry units from random cubes of units delivered on site.
2. Include reinforcing, ties, and anchors.

B. Use sample panels approved by Project Manager for standard of workmanship of new masonry work.

C. Use sample panel to test cleaning methods.

1.5 WARRANTY

A. Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", 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-07.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
A675/A675M-03.....Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical PropertiesC34-03Structural Clay Load-Bearing Wall Tile
C55-06.....Concrete Building Brick
C56-05.....Structural Clay Non-Load-Bearing Tile
C62-05.....Building Brick (Solid Masonry Units Made From Clay or Shale)

C67-07.....Sampling and Testing Brick and Structural Clay Tile

C90-06.....Load-Bearing Concrete Masonry Units

C126-99.....Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units

C216-07.....Facing Brick (Solid Masonry Units Made From Clay or Shale)

C476-02.....Standard Specification for Grout for Masonry

C612-04.....Mineral Fiber Block and Board Thermal Insulation

C744-05.....Prefaced Concrete and Calcium Silicate Masonry Units.

D1056-07.....Flexible Cellular Materials - Sponge or Expanded Rubber

D2000-06.....Rubber Products in Automotive Applications

D2240-05.....Rubber Property - Durometer Hardness

D3574-05.....Flexible Cellular Materials-Slab, Bonded, and Molded Urethane Foams

F1667-05.....Fasteners: Nails, Spikes and Staples

C. Masonry Industry Council:

All Weather Masonry Construction Manual, 2000.

D. American Welding Society (AWS):

D1.4-05Structural Welding Code – Reinforcing Steel.

E. Federal Specifications (FS):

FF-S-107C-00.....Screws, Tapping and Drive

F. Brick Industry Association - Technical Notes on Brick Construction (BIA):

11-1986.....Guide Specifications for Brick Masonry, Part I

11A–1988.....Guide Specifications for Brick Masonry, Part II

11B–1988.....Guide Specifications for Brick Masonry, Part III Execution

11C-1998.....Guide Specification for Brick Masonry Engineered Brick Masonry, Part IV

11D-1988.....Guide Specifications for Brick Masonry Engineered Brick Masonry, Part IV continued

G. Masonry Standards Joint Committee; Specifications for Masonry Structures (ACI 530.1-05/ASCE 6-05/TMS 602-99) (MSJC).

PART 2 - PRODUCTS

2.1 BRICK

A. Face Brick:

1. ASTM C216, Grade SW, Type FBS.
2. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
3. Size:
   a. Modular

2.2 CONCRETE MASONRY UNITS

A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90, net area compressive strength 19.31 MPa (2,800 psi).

1. Unit Weight: Normal weight.
2. Fire rated units for fire rated partitions.
3. Sizes: Modular.
4. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
5. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (one inch) minimum radius rounded vertical exterior corners (bullnose units).

2.3 REINFORCEMENT:

A. Steel Reinforcing Bars: ASTM A615, deformed bars, 420 MPa (Grade 60) for bars No. 10 to No. 57 (No. 3 to No. 18), except as otherwise indicated.

B. Where 6 mm diameter (No. 2) bars are shown, provide plain, round, carbon steel bars, ASTM A675, 550 MPa (Grade 80).

C. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

D. Joint Reinforcement:

1. Form from wire complying with ASTM A951.
2. Galvanized after fabrication.
3. Width of joint reinforcement 40 mm (1 5/8-inches) less than nominal width of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcing at least 3000 mm (10 feet) in length.
6. Joint reinforcing in rolls is not acceptable.
7. Joint reinforcing that is crimped to form drip is not acceptable.
8. Maximum spacing of cross wires 400 mm (16 inches) to longitudinal wires.

9. Ladder Design:
   a. Longitudinal wires deformed 4 mm (0.16 inch) diameter wire.
   b. Cross wires 2.6 mm (0.10 inch) diameter.
10. Trussed Design:
   a. Longitudinal and cross wires not less than 4 mm (0.16 inch nominal) diameter.
   b. Longitudinal wires deformed.
11. Multiple Wythes and Cavity wall ties:
   a. Longitudinal wires 2.6 mm (0.10 inch), two in each wythe with ladder truss wires 2.6 mm (0.10 inch) overlay, welded to each longitudinal wire.
   b. Longitudinal wires 4 mm (0.16 inch) with U shape 2.6 mm (0.10 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches) minimum.

2.4 ANCHORS AND TIES

A. Adjustable Veneer Anchor for Frame Walls:
   1. Two piece, adjustable anchor and tie.
   2. Anchor and tie may be either type; use only one type throughout.
   3. Loop Type:
      a. Anchor: Screw-on galvanized steel anchor strap 2.75 mm (0.11 inch) by 19 mm (3/4 inch) wide by 225 mm (9 inches) long, with 9 mm (0.35 inch) offset and 100 mm (4 inch) adjustment. Provide 5 mm (0.20 inch) hole at each end for fasteners.
      b. Ties: Triangular tie, fabricated of 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Ties long enough to engage the anchor and be embedded not less than 50 mm (2 inches) into the bed joint of the masonry veneer.
   4. Angle Type:
      a. Anchor: Minimum 2 mm (16 gage) thick galvanized steel angle shaped anchor strap. Provide hole in vertical leg for fastener. Provide hole near end of outstanding leg to suit upstanding portion of tie.
      b. Tie: Fabricate from 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Form "L" shape to be embedded not less than 50 mm (2 inches) into the bed joint of the masonry veneer and

provide upstanding leg to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.

B. Dovetail Anchors:

1. Corrugated steel dovetail anchors formed of 1.5 mm (0.0598 inch) thick by 25 mm (1 inch) wide galvanized steel, 90 mm (3-1/2 inches) long where used to anchor 100 mm (4 inch) nominal thick masonry units, 140 mm (5-1/2 inches) long for masonry units more than 100 mm (4 inches) thick.
2. Triangular wire dovetail anchor 100 mm (4 inch) wide formed of 4 mm (9 gage) steel wire with galvanized steel dovetail insert. Anchor length to extend at least 75 mm (3 inches) into masonry, 25 mm (1 inch) into 40 mm (1-1/2 inch) thick units.
3. Form dovetail anchor slots from 0.6 mm (0.0239 inch) thick galvanized steel (with felt or fiber filler).

C. Individual ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to a rectangular shape not less than 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not permitted.
2. Adjustable Cavity Wall Ties:
   a. Adjustable wall ties may be used at Contractor's option.
   b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
   c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
   d. Form one piece to a rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into the bed joint 50 mm (2 inches).
   e. Form the other piece to a 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having a 75 mm (3 inch) long bent section for engaging the 105 mm (4-1/8 inch) wide piece to form adjustable connection.

D. Wall Ties, (Mesh or Wire):

1. Mesh wall ties formed of ASTM A82, W0.5, 2 mm, (16 gage) galvanized steel wire 13 mm by 13 mm (1/2 inch by 1/2 inch mesh, 75 mm (3 inches) wide by 200 mm (8 inches) long.
2. Rectangular wire wall ties formed of W1.4, 3 mm, (9 gage) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

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. Box Board:

1. Mineral Fiber Board: ASTM C612, Class 1.
2. 25 mm (1 inch) thickness.
3. Other spacing material having similar characteristics may be used subject to the Project Manager's approval.

C. Masonry Cleaner:

1. Detergent type cleaner selected for each type masonry used.
2. Acid cleaners are not acceptable.
3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

D. Fasteners:

1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Protection:

1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.

B. Cold Weather Protection:

1. Masonry may be laid in freezing weather when methods of protection are utilized.
2. Comply with MSJC and “Hot and Cold Weather Masonry Construction Manual”.

3.2 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:

B. Maximum variation from plumb:

1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

C. Maximum variation from level:
1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

D. Maximum variation from linear building lines:
1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
1. Minus 6 mm (1/4 inch).
2. Plus 13 mm (1/2 inch).

F. Maximum variation in prepared opening dimensions:
1. Accurate to minus 0 mm (0 inch).
2. Plus 6 mm (1/4 inch).

3.3 INSTALLATION GENERAL

A. Keep finish work free from mortar smears or spatters, and leave neat and clean.

B. Anchor masonry as specified in Paragraph, ANCHORAGE.

C. Wall Openings:
1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
2. If items are not available when walls are built, prepare openings for subsequent installation.

D. Tooling Joints:
1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
2. Tool while mortar is soft enough to be compressed into joints and not raked out.
3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.
4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Partition Height:
1. Extend partitions at least 100 mm (4 inches) above suspended ceiling or to overhead construction where no ceiling occurs.

2. Extend following partitions to overhead construction.
   a. Where noted smoke partitions, FHP (full height partition), and FP (fire partition) and smoke partitions (SP) on drawings.
   b. Both walls at expansion joints.
   c. Corridor walls.
   d. Walls at stairway and stair halls, elevators, dumbwaiters, trash and laundry chute shafts, and other vertical shafts.
   e. Walls at refrigerator space.
   f. Reinforced masonry partitions
3. Extend finish masonry partitions at least four-inches above suspended ceiling and continue with concrete masonry units or structural clay tile to overhead construction:

F. Lintels:
1. Lintels are not required for openings less than 1000 mm (3 feet 4 inches) wide that have hollow metal frames.
2. Openings 1025 mm (3 feet 5 inches) wide to 1600 m (5 feet 4 inches) wide with no structural steel lintel or frames, require a lintel formed of concrete masonry lintel or bond beam units filled with grout per ASTM C476 and reinforced with 1- #15m (1-#5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
3. Precast lintels of 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.
4. Use steel lintels, for openings over 1600 m (5 feet 4 inches) wide, brick masonry, and elevator openings unless shown otherwise.
5. Doors having overhead concealed door closers require a steel lintel, and a pocket for closer box.
6. Length for minimum bearing of 100 mm (4 inches) at ends.
7. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

G. Wall, Furring, and Partition Units:
1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
2. Align head joints of alternate vertical courses.

3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Use no piece shorter than 100 mm (4 inches) long.
5. On interior partitions provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
6. Use not less than 100 mm (4 inches) nominal thick masonry for free standing furring unless shown otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

H. Use not less than 100 mm (4 inches) nominal thick masonry for fireproofing steel columns unless shown otherwise.

I. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

J. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

K. 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.

3.4 ANCHORAGE

A. Veneer to Concrete Walls:

1. Install dovetail slots in concrete vertically at 600 mm (2 feet) on centers.
2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
3. Anchor new masonry facing to existing concrete with corrugated wall ties spaced at 400 mm, (16 inch) maximum vertical intervals, and at 600 mm (2 feet) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.

B. Masonry Facing to Backup and Cavity Wall Ties:

1. Use individual ties for new work.
2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 600 mm (2 feet) horizontally.
3. At openings, provide additional ties spaced not more than 900 mm (3 feet) apart vertically around perimeter of opening, and within 300 mm (12 inches) from edge of opening.
4. Anchor new masonry facing to existing masonry with corrugated wall ties spaced at 400 mm (16 inch) maximum vertical intervals and at every second masonry unit horizontally. Fasten ties to masonry with masonry nails.
5. Option: Use joint reinforcing for multiple wythes and cavity wall ties spaced not more than 400 mm (16 inches) vertically.
6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals not to exceed 600 mm (24 inches) on center horizontally, and 400 mm (16 inches) on center vertically. Lay ties in the same line vertically in order to facilitate vibrating of the grout pours.

C. Anchorage of Abutting Masonry:

1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (2 foot) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.
3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with corrugated wall ties. Extend ties at least 100 mm (4 inches) into joints of new masonry. Fastened to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.

D. Masonry Furring:
   1. Anchor masonry furring less than 100 mm (4 inches) nominal thick to masonry walls or to concrete with corrugated wall ties or dovetail anchors.
   2. Space not over 600 mm (2 feet) on centers in both directions.

E. Anchorage to Steel Beams or Columns:
   1. Use adjustable beam anchors on each flange.
   2. At columns weld the 6 mm (1/4 inch) steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

3.5 REINFORCEMENT

A. Joint Reinforcement:
   1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
   2. Reinforcing may be used in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
   3. Brick veneer over frame backing walls does not require joint reinforcement.
   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 for anchorage of masonry to concrete structure.
   6. Joint reinforcement is required in every other course of stack bond CMU masonry.
   7. Wherever brick masonry is backed up with stacked bond masonry, joint reinforcement is required in every other course of CMU backup, and in corresponding joint of facing brick.

B. Steel Reinforcing Bars:
   1. Install in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for lintels and bond beam horizontal reinforcement. Install in wall cavities of reinforced masonry walls where shown.
   2. Use grade 60 bars if not specified otherwise.
   3. Bond Beams:

a. Form Bond beams of load-bearing concrete masonry units filled with ASTM C476 grout and reinforced with 2-#15m (#5) reinforcing steel unless shown otherwise. Do not cut reinforcement.

b. Brake bond beams only at expansion joints and at control joints, if shown.

3.6 BRICK EXPANSION AND CMU CONTROL JOINTS.

A. Provide brick expansion (BEJ) and CMU control (CJ) joints where shown on drawings.

B. Keep joint free of mortar and other debris.

C. Where joints occur in masonry walls.

1. Install preformed compressible joint filler in brick wythe.
2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
3. Install filler, backer rod, and sealant on exposed faces.

D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.

E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.

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

3.7 BUILDING EXPANSION AND SEISMIC JOINTS

A. Keep joint free of mortar. Remove mortar and other debris.

B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.

C. Where joints are on exposed faces, provide depth for backer rod and sealant as specified in Section 07 92 00, JOINT SEALANTS, unless shown otherwise.

3.8 ISOLATION SEAL

A. Where full height walls or partitions lie parallel or perpendicular to and under structural beams or shelf angles, provide a separation between walls or partitions and bottom of beams or shelf angles not less than the masonry joint thickness unless shown otherwise.

B. Insert in the separation, a continuous full width strip of non-combustible type compressible joint filler.

C. Where exposed in finish work, cut back filler material in the joint enough to allow for the joint to be filled with sealant material specified in Section 07 92 00, JOINT SEALANTS.

3.9 BRICKWORK

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

B. Laying:

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

C. Joints:

1. Exterior and interior joint widths: Lay for three equal joints in 200 mm (8 inches) vertically, unless shown otherwise.
2. Rake joints for pointing with colored mortar when colored mortar is not full depth.

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.

E. Solid Exterior Walls:

1. Build with 100 mm (4 inches) of nominal thick facing brick, backed up with concrete masonry units or cast-in-place concrete.

2. Construct solid brick jambs not less than 20 mm (.8 inches) wide at exterior wall openings and at recesses, except where exposed concrete unit backup is shown.
3. Do not use full bonding headers.
4. Parging:
   a. For solid masonry walls, lay backup to height of six brick courses, parge backup with 13 mm (1/2 inch) of mortar troweled smooth; then lay exterior wythe to height of backup.
   b. Make parging continuous over backup, and extend 150 mm (six inches) onto adjacent concrete or masonry.
   c. Parge, with mortar, the ends and backs for recesses in exterior walls to a thickness of 13 mm (1/2 inch).
   d. Parge with mortar to true even surface the inside surface of exterior walls to receive insulation.

F. Cavity Type Exterior Walls:
1. Keep air space clean of mortar accumulations and debris.
   a. Clean cavity by use of hard rubber, wood or metal channel strips having soft material on sides contacting wythes.
   b. Lift strips with wires before placing next courses of horizontal joint reinforcement or individual ties or adjustable cavity wall ties.
2. Lay the interior wythe of the masonry wall full height where dampproofing is required on cavity face. Coordinate to install dampproofing prior to laying outer wythe.
3. Insulated Cavity Type Exterior Walls:
   a. Install the insulation against the cavity face of inner masonry wythe.
   b. Place insulation between rows of ties or joint reinforcing or bond to masonry surface with a bonding agent as recommended by the manufacturer of the insulation.
   c. Lay the outer masonry wythe up with an air space between insulation and masonry units.
4. Veneer Framed Walls:
   a. Build with 4 inches of face brick over sheathed stud wall with air space.
   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, and corner units.
2. 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, except where stack bond is required.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
7. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
8. 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).
9. Do not wedge the masonry against the steel reinforcing. Minimum 1/2 inch clear distance between reinforcing and masonry units.
10. Install deformed reinforcing bars of sizes shown.
11. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
12. Steel reinforcement in place before grouting.
13. Minimum clear distance between parallel bars: One bar diameter.

14. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacings noted.
15. Support vertical bars near each end and at intermediate intervals not exceeding 192 bar diameters.
16. Reinforcement shall be fully encased by grout or concrete.
17. 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.
18. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
19. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.
20. Cavity and joint horizontal reinforcement may be placed as the masonry work progresses.

3.11 GROUTING

A. Preparation:
   1. Clean grout space of mortar droppings before placing grout.
   2. Close cleanouts.
   3. Install vertical solid masonry dams across grout space for full height of wall at intervals of not more than 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
   4. Verify reinforcing bars are in cells of units or between wythes as shown.

B. Placing:
   1. Place grout by hand bucket, concrete hopper, or grout pump.
   2. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
   3. Do not slush with mortar or use mortar with grout.
   4. Interruptions:
      a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inch) below top of last masonry course.
      b. Grout from dam to dam on high lift method.
      c. A longitudinal run of masonry may be stopped off only by raking back one-half a masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Puddling Method:

1. Double wythe masonry constructed grouted in lifts not to exceed 300 mm (12 inches) or less than 50 mm (2 inches) wide.
2. Consolidate by puddling with a grout stick during and immediately after placing.
3. Grout the cores of concrete masonry units containing the reinforcing bars solid as the masonry work progresses.

D. Low Lift Method:

1. Construct masonry to a height of 1.5 m (5 ft) maximum before grouting.
2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

E. High Lift Method:

1. Do not pour grout until masonry wall has properly cured a minimum of 4 hours.
2. Place grout in lifts not exceeding 1.5 m (5 ft).
3. Exception:
   Where the following conditions are met, place grout in lifts not exceeding 3.86 m (12.67 ft).
   a. The masonry has cured for at least 4 hours.
   b. The grout slump is maintained between 254 and 279 mm (10 and 11 in).
   c. No intermediate reinforced bond beams are placed between the top and the bottom of the pour height.
4. When vibrating succeeding lifts, extend vibrator 12 to 18 inches into the preceding lift to close any shrinkage cracks or separation from the masonry units.

3.12 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on the Contract Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.

C. Splice reinforcement bars where shown; do not splice at other places unless accepted by the Project Manager. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

D. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.

E. 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.

F. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 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.

G. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

H. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.13 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. Do not wet concrete masonry units (CMU).

B. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 10 mm (3/8 inch) joints.

C. Where solid CMU units are shown, lay with full mortar head and bed joints.

D. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

E. Grouting:
1. Use “Fine Grout” per ASTM C476 for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
2. Use “Coarse Grout” per ASTM C476 for filling 100 mm (4 inch) spaces or larger in both horizontal directions.
3. Grouting Technique: Use low-lift grouting technique subject to requirements which follow.

F. Low-Lift Grouting:
1. Provide minimum clear dimension of 50 mm (2 inches) and clear area of 5160 mm^2 (8 square inches) in vertical cores to be grouted.
2. Place vertical reinforcement prior to grouting of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 3 m (10 feet).
3. Lay CMU to maximum pour height. Do not exceed 1.5 m (5 foot) height, or if bond beam occurs below 1.5 m (5 foot) height, stop pour 38 mm (1-1/2 in) below top of bond beam.
4. Pour grout using chute container with spout or pump hose. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 38 mm (1-1/2 inches) below top course of pour.
5. Bond Beams: Stop grout in vertical cells 38 mm (1-1/2 inches) below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

3.14 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.

END OF SECTION 04 20 00

SECTION 04 72 00
CAST STONE MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies manufactured concrete units to simulate a natural stone.

B. Installation of cast stone units.

1.2 RELATED WORK

A. Setting and pointing mortar: Section 04 05 13, MASONRY MORTARING.

B. Joint sealant and application: Section 07 92 00, JOINT SEALANTS.

1.3 SUBMITTALS

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

B. Samples:

1. Cast stone, sample of each size and shape.

C. Shop Drawings:

1. Cast stone showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.
2. Setting drawings with setting mark.

D. Certificates: Test results indicating that the cast stone meets specification requirements and proof of plant certification.

E. Submit manufacturers test results of cast stone previously made by manufacturer.

F. Laboratory Data: Description of testing laboratories facilities and qualifications of its principals and key personnel.

G. List of jobs furnished by the manufacturer, which were similar in scope and at least three (3) years of age.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store cast stone under waterproof covers on planking clear of ground.

B. Protect from handling, dirt, stain, and water damage.

C. Mark production units with the identification marks as shown on the shop drawings.

D. Package units and protect them from staining or damage during shipping and storage.

E. Provide an itemized list of product to support the bill of lading.

1.5 WARRANTY

Warranty exterior masonry walls against moisture leaks, any defects and subject to terms of "Warranty of Construction", except that warranty period shall be two years.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. Cast Stone Institute Technical Manual and Cast Stone Institute standard specifications.

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

A167-99 (2004).....Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A185-07.....Steel, Welded Wire Fabric, Plain for Concrete

A615/A615M-08.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

C33-07.....Concrete Aggregates

C150-07.....Portland Cement

C503-08.....Marble Dimension Stone (Exterior)

C568-08.....Limestone Dimension Stone

C615-03.....Granite Dimension Stone

C616-08.....Quartz-Based Dimension Stone

C979-05.....Pigments for Integrally Colored Concrete

C1194-06.....Compressive Strength of Architectural Cast Stone

C1195-03.....Absorption of Architectural Cast Stone

C1364-07.....Architectural Cast Stone.

D2244-07.....Calculation of Color Differences from Instrumentally Measured Color Coordinates.

1.7 QUALITY ASSURANCE

A. The Manufacturer:

1. Must have three (3) years minimum continuous operating experience and have facilities for manufacturing cast stone as described herein. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.
2. Must be a member of the Cast Stone Institute.
3. Must have a certified plant (certification by the Cast Stone Institute).

B. Stone setter: Must have three (3) years experience setting cast or natural building stone.

1.8 MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than + 1/8 in. (3 mm) from approved dimension.

B. Length of units shall not deviate by more than length/360 or + 1/8 in. (3mm), whichever is greater, not to exceed + 1/4 in. (6 mm). Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp bow or twist of units shall not exceed length/360 or + 1/8 in. (3 mm), whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in. (9 mm) maximum deviation.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CAST STONE

A. Comply with ASTM C 1364

B. Physical properties: Provide the following:

1. Compressive Strength - ASTM C 1194: 6,500 psi(45 Mpa) minimum for products at 28 days.
2. Absorption – ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products as 28 days.
3. Air Content – ASTM C173 or C231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for vibrant dry tamp (VDT) products.
4. Freeze thaw - ASTM C 1364L The cumulative percent weight loss (CPWL) shall be less than 5% after 300 cycles of freezing and thawing.
5. Linear Shrinkage - ASTM C 426L Shrinkage shall not exceed 0.065%.

2.2 RAW MATERIALS

A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.

B. Coarse aggregates – Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the vibrant dry tamp (VDT) casting method.

C. Fine aggregates – Manufactured or natural sands, ASTM C 33, except for gradation.

D. Colors – Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures- Comply with the following:

1. ASTM C 260 for air-entraining admixtures.
2. ASTM C 494/C 495 M Types A-G for water reducing, retarding, accelerating and high range admixtures.
3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water - Potable

G. Reinforcing bars:
1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH

A. Match sample on file.

B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in^2 ($25mm^2$) and not obvious under direct daylight illumination at a 5 ft. (1.5m) distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.

D. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
1. Total color difference – not greater than 6 units.
2. Total hue difference-not greater than 2 units.

2.4 REINFORCING

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

1. Minimum reinforcing shall be 0.25 percent of the cross section area.

B. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

C. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6m) distance.

D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

E. Remove cement film, if required, from exposed surface prior to packaging for shipment.

2.5 CURING

A. Cure units in a warm curing chamber 100 F (37.8 C) at 95 percent relative humidity for approximately 12hours, or cure in a 95 percent moist environment at a minimum 70F (21.1 C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350-degree-days (i.e. 7 days @ 50F (10.0 C) or 5 days @ 70F (21 C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.2 SETTING TOLERANCES

A. Comply with Cast Stone Institute SM Technical Manual.

B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.

C. Joints, plus – 1/6 in. (1.5 mm), minus – 1/8 in. (3 mm).

3.3 JOINTING

A. Joint size:

1. At stone/brick joints 3/8 in. (9.5 cm).
2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
3. Stone/stone joint exposed on top 3/8 in. (.5 mm).

B. Joint Materials:

1. Mortar, Type N, ASTM C 270.

2. Use a full bed of mortar at all bed joints.

3. Flush vertical joints full with mortar.
4. Leave all joints with exposed tops or under relieving angles open for sealant.
5. Leave head joints in coping and projecting components open for sealant.

C. Location of joints:
1. As shown on shop drawings.
2. At control and expansion joints unless otherwise shown.

3.4 SETTING

A. Drench units with clean water prior to setting.
B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
C. Set units in full bed of mortar, unless otherwise detailed.
D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.
E. Remove excess mortar from unit faces immediately after setting.
F. Tuck point unit joints to a slight concave profile.

3.5 JOINT PROTECTION

A. Comply with requirements of Section 07 92 00, JOINT SEALANTS.
B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.
B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
C. Consult with manufacturer for appropriate cleaners.

3.7 INSPECTION AND ACCEPTANCE

A. Inspect finished installation according to Bulletin #36 published by the Cast Stone Institute.

END OF SECTION 04 72 00

Division 05

Metals

Division 05

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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: (12, 14A, 14C)
2. Roof Tie-off Davits
3. Guards Loose Lintels
4. Safety Nosings
5. Ladders
6. Railings
7. Masonry support frames and embedments

1.2 RELATED WORK

A. Railings attached to steel stairs: Section 05 51 00, METAL STAIRS.

B. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Prime and finish painting: Section 09 91 00, PAINTING.

D. 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. Manufacturer's Literature and Data: Grating, each type, manhole covers, and safety nosing.

C. Shop Drawings:

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

D. Manufacturer's Certificates:

1. Anodized finish as specified.
2. Live load designs as specified.

E. Design Calculations for specified live loads including dead loads.

F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each product type shall be the same and be made by the same manufacturer.

C. Assembled product to the greatest extent possible before delivery to the site.

D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

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

B. American Society of Mechanical Engineers (ASME):

B18.6.1-81(R1997).....Wood Screws

B18.2.2-87(R2005).....Square and Hex Nuts

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

A36/A36M-12.....Structural Steel

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

A48-03(R2012).....Gray Iron Castings

A53-12.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123-02.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A240/A240M-14 Standard Specification for

A167-99(R2004).....Stainless and Heat-Resisting Chromium-NickelStainless

Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A269-10.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A307-07.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A312/A312M-06.....Seamless, Welded, and Heavily Cold Worked

Austenitic Stainless Steel Pipes

A391/A391M-07(R2012).....Grade 80 Alloy Steel Chain

A653/A653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

A786/A786M-09.....Rolled Steel Floor Plate

B221-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B456-11.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

B632-08.....Aluminum-Alloy Rolled Tread Plate

C1107-13.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

D3656-13.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

F436-11.....Hardened Steel Washers

F468-06(R2012).....Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws and Studs for General Use

F593-13.....Stainless Steel Bolts, Hex Cap Screws, and Studs

F1667-11.....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):

D1.1-04.....Structural Welding Code Steel D1.2-03.....Structural Welding Code Aluminum D1.3-08.....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)

AMP521-01.....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 DESIGN CRITERIA

A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

B. Ladders and Rungs: 120 kg (250 pounds) at any point.

C. Railings and Handrails: 900 N (200 pounds) in any direction at any point and 50 plf non concurrent load.

D. Gratings: 500 kg/m^2 (100 pounds per square foot). Use 136 kg (300 pounds) for concentrated loads.

E. Manhole Covers: 1200 kg/m^2 (250 pounds per square foot).

2.2 MATERIALS

A. Structural Steel: ASTM A36.

B. Stainless Steel: ASTM A240, Type 302 or 304.

C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.

D. Floor Plate:

1. Steel ASTM A786.
2. Aluminum: ASTM B632.

E. Steel Pipe: ASTM A53.

1. Galvanized for exterior locations.
2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.

F. Cast-Iron: ASTM A48, Class 30, commercial pattern.

G. Malleable Iron Castings: A47.

H. Primer Paint: As specified in Section 09 91 00, PAINTING.

I. Stainless Steel Tubing: ASTM A269, type 302 or 304.

J. Modular Channel Units:

1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
2. Form channel within turned pyramid shaped clamping ridges on each side.
3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws

and nuts with zinc coating.

5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

K. Grout: ASTM C1107, pourable type.

L. Insect Screening: ASTM D3656.

2.3 HARDWARE

A. Rough Hardware:

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

B. Fasteners:

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

2.4 FABRICATION GENERAL

A. Material

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

B. Size:

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

C. Connections

1. Except as otherwise specified, connections may be made by welding,

riveting or bolting.

2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where

applicable square and in same plane.

d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.

e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.

f. Prepare members for the installation and fitting of hardware.

g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.

h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.

2. Welding:

a. Weld in accordance with AWS.

b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.

c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.

d. Finish welded joints to match finish of adjacent surface.

3. Joining:

a. Miter or butt members at corners.

b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.

4. Anchors:

a. Anchors are needed for window washing.

5. Cutting and Fitting:

a. Accurately cut, machine and fit joints, corners, copes, and miters.

b. Fit removable members to be easily removed.

c. Design and construct field connections in the most practical place for appearance and ease of installation.

d. Fit pieces together as required.

e. Fabricate connections for ease of assembly and disassembly without use of special tools.

f. Joints firm when assembled.

g. Conceal joining, fitting and welding on exposed work as far as practical.

h. Do not show rivets and screws prominently on the exposed face.

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

F. Finish:

1. Finish exposed surfaces in accordance with NAAMM AMP 500 Metal Finishes Manual.

2. Steel and Iron: NAAMM AMP 504.

a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.

b. Surfaces exposed in the finished work:

1) Finish smooth rough surfaces and remove projections.

2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.

c. Shop Prime Painting:

1) Surfaces of Ferrous metal:

a) Items not specified to have other coatings.

b) Galvanized surfaces specified to have prime paint.

c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.

d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.

e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.

2) Non ferrous metals: Comply with MAAMM-500 series.

3. Stainless Steel: NAAMM AMP-504 Finish No. 4.

4. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.

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.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

C. For Trapeze Bars:

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

D. Supports for Accordion Partition Tracks and Items at Various Conditions at Suspended Ceilings:

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

2.6 ROOF GUARD RAILS

A. Furnish roof guard rails shown on drawings.

B. Steel for roof guard rails shall be galvanized.

C. Roof guard rails and their connections to the structure have been

designed for the loads indicated on the drawings.

2.7 GRATINGS

A. Fabricate gratings to support live loads specified and a concentrated load as specified.

B. Provide clearance at all sides to permit easy removal of grating.

C. Make cutouts in gratings with 6 mm (1/4 inch) minimum to 25 mm (one inch) maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.

D. Fabricate in sections not to exceed 2.3 m^2 (25 square feet) in area and 90 kg (200 pounds) in weight.

E. Fabricate sections of grating with end-banding bars.

F. Fabricate angle frames and supports, including anchorage as shown.

1. Fabricate intermediate supporting members from "T's" or angles.
2. Locate intermediate supports to support grating section edges.
3. Fabricate frame to finish flush with top of grating.
4. Locate anchors at ends and not over 600 mm (24 inches) o.c.
5. Butt or miter, and weld angle frame at corners.

G. Steel Bar Gratings:

1. Fabricate grating using steel bars, frames, supports and other members shown in accordance with Metal Bar Grating Manual.
2. Galvanize steel members after fabrication in accordance with ASTM A123, G-90 for exterior gratings, gratings in concrete floors, and interior grating where specified.
3. Interior gratings: Prime paint unless specified galvanized.
4. Use serrated bars for exterior gratings.

2.8 LOOSE LINTELS

A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.

B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.

C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as specified or shown.

D. Provide bearing plates for lintels where shown.

E. 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.

F. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.

G. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.

2.9 SAFETY NOSINGS

A. Fed. Spec. RR-T-650, Type C.

1. Aluminum: Class 2, Style 2.
2. Cast iron: Class 4.

B. Fabricate nosings approximately 100 mm (4 inches) wide with not more than 9 mm (3/8 inch) nose.

C. Provide nosings with integral type anchors spaced not more than 100 mm (4 inches) from each end and intermediate anchors spaced approximately 375 mm (15 inches) on center.

D. Fabricate nosings to extend within 100 mm (4 inches) of ends of concrete stair treads except where shown to extend full width.

E. Fabricate nosings to extend full width between stringers of metal stairs and full width of door openings.

2.10 LADDERS

A. Steel Ladders:

1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
5. Galvanize exterior ladders after fabrication, ASTM A123, G-90.

B. Ladder Rungs:

1. Fabricate from 25 mm (one inch) diameter steel bars.
2. Fabricate so that rungs will extend at least 100 mm (4 inches) into wall with ends turned 50 mm (2 inches), project out from wall 175 mm (7 inches), be 400 mm (16 inches) wide and be designed so that foot cannot slide off end.
3. Galvanized after fabrication, ASTM A123, G-90 rungs for exterior use

and for access to pits.

2.11 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.
6. Interior Post Anchors:
   a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
   b. Weld or thread flanged fitting to posts at base.
   c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
   d. Provide sliding flange base plate on posts secured with set screws.
   e. Weld flange base plate to removable posts set in sleeves.

C. Handrails:

1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:

1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.

4. Form handrail brackets from malleable iron.
5. Fabricate removable sections with posts at end of section.
6. Removable Rails:
   a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
   b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
   c. Continuously weld brackets to post.
   d. Provide slotted bolt holes in rail bracket.
   e. Weld bolt heads flush with top of rail.
   f. Weld flanged fitting to post where posts are installed in sleeves.

2.12 MASONRY SUPPORT FRAMES AND EMBEDMENTS

A. Furnish masonry support frames and embedments shown on the drawings.
B. All exposed steel shall be galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
B. Items set into concrete or masonry.
   1. Provide temporary bracing for such items until concrete or masonry is set.
   2. Place in accordance with setting drawings and instructions.
   3. Build strap anchors, into masonry as work progresses.
C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
D. Field weld in accordance with AWS.
   1. Design and finish as specified for shop welding.
   2. Use continuous weld unless specified otherwise.
E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.

F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.

H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

A. Anchorage to structure.

1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
2. Secure 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.

C. Supports for accordian partition:

1. Install assembly where shown after ceiling suspension grid is installed.
2. Drill angle for bolt and weld nut to angle prior to installation of tile.

D. Supports for Trapeze Bars:

1. Secure plates to overhead construction with fasteners as shown.
2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.
   a. Install closure plates in channel between eye bolts.
   b. Install eyebolts in channel.

3.3 DOOR FRAMES

A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.

B. Level and plumb frame; brace in position required.

C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.

D. Set frames in formwork for frames cast into concrete.

E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

3.**4 GRATINGS**

A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.

B. Set frame in formwork before concrete is placed.

C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.

D. Secure removable supporting members in place with stainless steel bolts.

E. Bolt gratings to supports.

3.5 STEEL LINTELS

A. Use lintel sizes and combinations shown or specified.

B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.

C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.**3.6 SAFETY NOSINGS**

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

1. Exterior concrete steps.
2. Door sills of areaway entrances curbs.
3. Exposed edges of curbs of door sills at transformer and service rooms.
4. Interior concrete steps, including concrete filled treads of metal stairs of service stairs.

B. Install flush with horizontal and vertical surfaces.

C. Install nosing to within 100 mm (4 inches) of ends of concrete stair

treads, except where shown to extend full width.

D. Extend nosings full width of door openings.

E. Extend nosings, full width between stringers of metal stairs, and terminate at point of curvature of steps having short radius curved ends.

3.7 LADDERS

A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.

B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.

1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.

C. Ladder Rungs:

1. Set step portion of rung 150 mm (6 inches) from wall.
2. Space rungs approximately 300 mm (12 inches) on centers.
3. Where only one rung is required, locate it 400 mm (16 inches) above the floor.

3.8 RAILINGS

A. Steel Posts:

1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
2. Install sleeves in concrete formwork.
3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
5. Secure sliding flanged fittings to posts at base with set screws.
6. Secure fixed flanged fittings to concrete with expansion bolts.
7. Secure posts to steel with welds.

B. Anchor to Walls:

1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.

a. Anchor steel plate to concrete or solid masonry with expansion bolts.

b. Anchor steel plate to hollow masonry with toggle bolts.

2. Anchor flanged fitting with toggle bolt to steel support in frame walls.

C. Handrails:

1. Anchor brackets for metal handrails as detailed.
2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.
3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

3.9 MASONRY SUPPORT FRAMES AND EMBEDMENTS

A. Install masonry support frames and embedments as indicated on drawings.

B. Provide adequate bracing for masonry walls during construction until support frame is completely installed and masonry has reached its design strength.

C. Install support frames tight to constructed masonry to transfer loads from wall into concrete frame.

3.10 STEEL COMPONENTS FOR MILLWORK ITEMS

A. Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.11 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.

END OF SECTION 05 50 00

SECTION 05 51 00
METAL STAIRS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies steel stairs with railings.

B. Types:

1. Closed riser stairs with concrete filled treads and platforms.
2. Industrial stairs: Closed riser stairs.

1.2 RALATED WORK

A. Concrete fill for treads and platforms: Section 03 30 00, CAST-IN-PLACE CONCRETE.

B. Wall handrails and railings for other than steel stairs: Section 05 50 00, METAL FABRICATIONS.

C. Requirements for shop painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

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

B. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.

1.4 APPLICATION PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.

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

A36/A36M-08.....Structural Steel

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

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

A53-10.....Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless

A307-10.....Carbon Steel Bolts and Studs, 60000 psi Tensile Strength

A653/653M-10.....Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process

A563-07.....Carbon and Alloy Steel Nuts

A1008-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy

A786/A786M-09.....Rolled Steel Floor Plates

A1011-10.....Steel, Sheet and Strip, Strip, Hot-Rolled Carbon, Structural, High-Strength, Low-Alloy

C. American Welding Society (AWS):

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

D1.3-08.....Structural Welding Code-Sheet Steel

D. The National Association of Architectural Metal Manufactures (NAAMM) Manuals:

AMP521-01.....Pipe Railing Manual, Including Round Tube

E. American Iron and Steel Institute (AISI):

2001.....Design of Cold-Formed Steel Structural Members

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Design stairs to support a live load of 500 kg/m^2 (100 pounds per square foot).

B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.

C. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point and 50 PLF non concurrent load.

2.2 MATERIALS

A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.

B. Steel Grating: Metal bar type grating NAAMM BG.

C. Sheet Steel: ASTM A1008.

D. Structural Steel: ASTM A36.

E. Steel Floor Plate: ASTM 786.

F. Steel Decking: Form from zinc coated steel conforming to ASTM A446, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.

G. Steel Plate: ASTM A1011.

H. Iron Castings: ASTM A48, Class 30.

I. Malleable Iron Castings: ASTM A47.

2.3 FABRICATION GENERAL

A. Fasteners:

1. Conceal bolts and screws wherever possible.
2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.

B. Welding:

1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.
2. Where possible, locate welds on unexposed side.
3. Grind exposed welds smooth and true to contour of welded member.
4. Remove welding splatter.

C. Remove sharp edges and burrs.

D. Fit stringers to head channel and close ends with steel plates welded in place where shown.

E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.

F. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09 91 00, PAINTING.

2.4 RAILINGS

A. Fabricate railings, including handrails, from steel pipe with flush.

1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
2. Wall handrails are provided under Section 05 50 00, METAL FABRICATIONS.

B. Return ends of handrail to wall and close free end.

C. Provide standard terminal castings where fastened to newel.

D. Space intermediate posts not over four feet on center between end post.

E. Fabricate handrail brackets from cast malleable iron.

F. Provide standard terminal fittings at ends of post and rails.

2.5 CLOSED RISER STAIRS

A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.

B. Fabricate pans for treads and platforms, and risers from sheet steel.

C. Form risers with sanitary cove.

D. Fabricate stringers, headers, and other supporting members from structural steel.

E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

2.6 INDUSTRIAL STAIRS

A. Provide treads, platforms, railings, stringers and other supporting members as shown.

PART 3 - EXECUTION

3.1 STAIR INSTALLATION

A. Provide hangers and struts required to support the loads imposed.

B. Perform job site welding and bolting as specified for shop fabrication.

C. Set stairs and other members in position and secure to structure as shown.

D. Install stairs plumb, level and true to line.

E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.

3.2 RAILING INSTALLATION

A. Install standard terminal fittings at ends of posts and rails.

B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.

C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).

D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

3.3 FIELD PRIME PAINTING

A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.

B. Touch-up abraded areas with same primer paint used for shop priming.

C. Touch up abraded galvanized areas with zinc rich paint as specified in section 09 91 00, PAINTING.

END OF SECTION 05 51 00

Division 06

Wood, Plastics, and Composites

Division 06

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, and light wood construction.

1.2 RELATED WORK:

A. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.

B. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.

1.3 SUMBITTALS:

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

B. Shop Drawings showing framing connection details, fasteners, connections and dimensions.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect lumber and other products from dampness both during and after delivery at site.

B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

C. Stack plywood and other board products so as to prevent warping.

D. Locate stacks on well drained areas, supported at least 150 mm (6 inches) above grade and cover with well ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.5 APPLICABLE PUBLICATIONS:

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

B. American Forest and Paper Association (AFPA):
National Design Specification for Wood Construction
NDS-05.....Conventional Wood Frame Construction

C. American Institute of Timber Construction (AITC):
A190.1-02.....Structural Glued Laminated Timber

D. American Society of Mechanical Engineers (ASME):
B18.2.1A-96(R2005).....Square and Hex Bolts and Screws
B18.2.2-87(R2005).....Square and Hex Nuts
B18.6.1-81 (R97).....Wood Screws
B18.6.4-98(R2005).....Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws

E. American Plywood Association (APA):

E30-03.....Engineered Wood Construction Guide

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

A47-99(R2004).....Ferritic Malleable Iron Castings

A48-03.....Gray Iron Castings

A653/A653M-07.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C954-04.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (2.24 mm) to 0.112-inch (2.84 mm) in thickness

C1002-04.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs

D143-94(R2004).....Small Clear Specimens of Timber, Method of Testing

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

D2559-04.....Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions

D3498-03.....Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems

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

F1667-05.....Nails, Spikes, and Staples

G. Federal Specifications (Fed. Spec.):

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

H. Commercial Item Description (CID):

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

I. Military Specification (Mil. Spec.):

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

J. Truss Plate Institute (TPI):

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

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

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

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

PART 2 - PRODUCTS

2.1 LUMBER:

A. Unless otherwise specified, each piece of lumber bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
   1. Identifying marks in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
   2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Lumber Other Than Structural:
   1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
   2. Framing lumber: Minimum extreme fiber stress in bending of 1100.
   3. Furring, blocking, nailers and similar items 4 inches and narrower Standard Grade; and, members 6 inches and wider, Number 2 Grade.

C. Sizes:
   1. Conforming to Prod. Std., PS20.
   2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

D. Moisture Content:
   1. At time of delivery and maintained at the site.
   2. Boards and lumber 2 inches and less in thickness: 19 percent or less.
   3. Lumber over 2 inches thick: 25 percent or less.

E. Fire Retardant Treatment:
   1. Mil Spec. MIL-L-19140 with piece of treated material bearing identification of testing agency and showing performance rating.
   2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

F. Preservative Treatment:
   1. Do not treat Heart Redwood and Western Red Cedar.
   2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less

than 24 inches from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members used in connection with roofing and flashing materials.

3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with ASTM D1760, except any process involving the use of Chromated Copper arsenate (CCA) for pressure treating wood is not permitted.

2.2 PLYWOOD

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

2.3 ROUGH HARDWARE AND ADHESIVES:

A. Anchor Bolts:
   1. ASME B18.2.1 and ANSI B18.2.2 galvanized, 1/2 inch unless shown otherwise.
   2. Extend at least 8 inches into masonry or concrete with ends bent 2 inches.
B. Miscellaneous Bolts: Expansion Bolts: C1D, A-A-55615; lag bolt, long enough to extend at least 2-1/2 inches into masonry or concrete. Use 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 1-1/4 inches long, 8d and deformed or annular ring shank.

F. Framing and Timber Connectors:

1. Fabricate of ASTM A446, Grade A; steel sheet not less than 0.052 inch thick unless specified otherwise. Apply standard plating to steel timber connectors after punching, forming and assembly of parts.

2. Framing Angles: Angle designed with bendable legs to provide three way anchors.

3. Straps:

a. Designed to provide wind and seismic ties with sizes as shown or specified.

b. Strap ties not less than 1-1/4 inches wide.

c. Punched for fastener.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

A. Conform to applicable requirements of the following:

1. AFPA National Design Specification for Wood Construction for timber connectors.

2. AITC Timber Construction Manual for heavy timber construction.

3. AFPA WCD-number 1, Manual for House Framing for nailing and framing unless specified otherwise.

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

5. ASTM F 499 for wood underlayment.

6. TPI for metal plate connected wood trusses.

B. Fasteners:

1. Nails.

a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA Manual for House Framing where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.

b. Use special nails with framing connectors.

c. For sheathing and subflooring, select length of nails sufficient to extend 1 inch into supports.

d. Use eight penny or larger nails for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber.

e. Use 16 penny or larger nails for nailing through 2 inch thick lumber.

f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.

2. Bolts:

a. Fit bolt heads and nuts bearing on wood with washers.

b. Countersink bolt heads flush with the surface of nailers.

c. Embed in concrete and solid masonry or use expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.

d. Use toggle bolts to hollow masonry or sheet metal.

e. Use bolts to steel over 0.112 inch, 11 gage in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 24 inch intervals between end bolts. Use clips to beam flanges.

3. Drill Screws to steel less than 0.112 inch thick.

a. ASTM C1002 for steel less than 0.033 inch thick.

b. ASTM C 954 for steel over 0.033 inch thick.

4. Power actuated drive pins may be used where practical to anchor to solid masonry, concrete, or steel.

5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Use metal plugs, inserts or similar fastening.

6. Screws to Join Wood:

a. Where shown or option to nails.

b. ASTM C1002, sized to provide not less than 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 4 feet on centers between ends and within 6 inches of end. Stagger bolts from side to side on plates over 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 24 inches between ends.
   c. Stagger nails from side to side of wood member over 5 inches in width.

END OF SECTION 06 10 00

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SECTION 06 16 63
CEMENTITIOUS SHEATHING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies cement board sheathing applied to frame wall construction, ready to receive subsequent finishes.

1.2 SUBMITTALS

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

B. Samples: 1.Cement board panels, 200 mm by 200 mm (8 inches by 8 inches), minimum size.

2. Fasteners, each type used.

3. Reinforcing tape for joints 300 mm (12 inches) long.

4. Water barrier backing, 300 mm (12 inches) square.

C. Product Data:

1. Cement board sheathing.

2. Reinforcing tape.

3. Fasteners.

1.3 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact.

B. Store materials so as to prevent damage or contamination.

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 Society for Testing and Materials (ASTM):

C954-10.....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.

C1325-08.....Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units

D226-09.....Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

D4586-07.....Asphalt Roof Cement, Asbestos-Free

C. Federal Specifications (FS):

UU-B-790.....Building Paper, Vegetable Fiber INT AMD 1 (Kraft, Waterproofed, Water Repellant and Fire Resistant)

D. Gypsum Association:

GA253.....Application of Gypsum Sheathing.

PART 2 - PRODUCTS

2.1 CEMENT BOARD SHEATHING

A. Conform to ASTM C1325, except as follows.

B. Property Minimum Average Value

1. Flame Spread	5
2. Smoke Density	0
3. Thickness	13 mm (1/2 inch)
4. Minimum Width	800 mm (32 inches)
6. Flexural Strength wet and dry	6895 kpa (1000 psi)
7. Fastener Holding wet and dry	33 kpa (125 pounds)

2.2 ACCESSORY MATERIALS

A. Steel Drill Screws: ASTM C954. Modified for flat head. Bugle head not acceptable.

B. Organic Felt: ASTM D226, Type II, 13.6 kg (30 lb).

C. Roof Cement: ASTM D4586

D. Joint Reinforcing Tape:

1. Minimum 100 mm (4-inches) wide open mesh alkali resistant.
2. Glass fiber mesh polymer coated as recommended by Cement Board manufacturer.

E. Water Barrier: FS UU-B-790. Type I (Barrier paper), Grade D (Water-vapor permeable). Other products meeting or exceeding the Federal specification for a water barrier with water vapor permeability are acceptable.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Do not install units when temperature is below 4.5 degrees Celsius (40 degrees F).

B. Do not install joint reinforcing tape when temperature is below 10 degrees Celsius (50 degrees F).

3.2 INSTALLATION

A. Remove wrapping and separate to allow air circulation for not less than seven days before installation.

B. Installing Water Barrier over Framing Members:

1. Apply roof cement or tape to framing members sufficient to adhere and support water barrier.
2. Use either organic felt or water barrier.

3. Apply barrier shingle fashion with horizontal joints lapped not less than 50 mm (2 inches). Lap end joints over framing, not less than 100 mm (4 inches) cemented together with roof cement, stagger end joints.
4. Do not leave over 300 mm (12-inch) wide strip exposed when work is stopped.
5. Coordinate with installation of flashing to lap water barrier over flashing. Install weeps every 600 mm (24 inches) or as detailed, directly above flashing. Provide for clear exit of water to exterior.
6. Repair torn or cut barrier with barrier patch spanning framing space cemented to surface along top and side edges.

C. Installing Cement Board Units:
1. Apply cement board sheathing immediately over water barrier in accordance with GA-253, with rounded edges and rough side to exterior, except as specified otherwise.
2. Secure units to framing members with screws spaced not more than 200 mm (8 inches) on center and not closer than 13 mm (1/2-inch) from the edge of the unit.
3. Install screws so that the screw heads do not penetrate the surface of unit.
4. Install 13 mm (1/2-inch) wide horizontal control joints at floors and vertical control joints not over 4.87 m (16 feet) on center unless shown otherwise, maintain alignment.
5. Stop units at edges of building expansion joints.
6. Minimum bearing over framing members: 19 mm (3/4-inch.)

D. Joint and Surface Treatment: Apply joint reinforcing tape over joints, exposed edges, and corners using adhesive recommended by manufacturer.

E. Leave surface flush and ready to receive subsequent finishes.

3.3 PROTECTION AND REPAIR

A. Protect board with temporary coverings against moisture until subsequent finish is applied.

B. Patch and repair damaged surface prior to application of subsequent finish.
1. Fill cracks.
2. Replace loose, spalling or missing joint finish.
3. Replace broken or damaged boards.

END OF SECTION 16 16 63

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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.

- Counter or Work Tops

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. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.

D. Section 12 31 00, MANUFACTURED METAL CASEWORK

E. Other Countertops: Division 12, FURNISHINGS.

F. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

1.3 SUBMITTALS

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

B. Shop Drawings:

1. Millwork items – Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
2. Show construction and installation.

C. Samples:

Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).

D. Certificates:

1. Indicating moisture content of materials meet the requirements specified.

E. Manufacturer's literature and data:

1. Finish hardware
2. Sinks with fittings
3. Electrical components

1.4 DELIVERY, STORAGE AND HANDLING

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

B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Project

Manager. 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):

B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

E84-10.....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

A156.11-10.....Cabinet Locks

A156.16-08.....Auxiliary Hardware

E. Hardwood Plywood and Veneer Association (HPVA):

HP1-09.....Hardwood and Decorative Plywood

F. National Particleboard Association (NPA):

A208.1-09.....Wood Particleboard

G. Architectural Woodwork Institute (AWI):

AWI-09.....Architectural Woodwork Quality Standards and Quality Certification Program

H. National Electrical Manufacturers Association (NEMA):

LD 3-05.....High-Pressure Decorative Laminates

I. U.S. Department of Commerce, Product Standard (PS):

PS20-10.....American Softwood Lumber Standard

J. Military Specification (Mil. Spec):

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

K. 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.

4. Plastic Laminate Plywood Cores:

   a. Exterior Type, and species group.

   b. Veneer Grade: A-C.

5. Shelving Plywood:

   a. Interior Type, any species group.

   b. Veneer Grade: A-B or B-C.

6. Other: As specified for item.

B. Hardwood Plywood:

1. HPVA: HP.1

2. Species of face veneer shall be as shown or as specified in connection with each particular item.

3. Inside of Building:

   a. Use Type II (interior) A grade veneer for transparent finish.

   b. Use Type II (interior) Sound Grade veneer for paint finish.

2.3 PARTICLEBOARD

A. NPA A208.1

B. Plastic Laminate Particleboard Cores:

1. Use Type 1, Grade 1-M-3, or Type 2, Grade 2-M-2, unless otherwise specified.

2. Use Type 2, Grade 2-M-2, exterior bond, for tops with sinks.

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

2.4 PLASTIC LAMINATE

A. NEMA LD-3.

B. Exposed decorative surfaces including countertops, both sides of cabinet doors, and for items having plastic laminate finish. General Purpose, Type HGL.

C. Cabinet Interiors including Shelving: Both of following options to comply with NEMA, CLS as a minimum.

1. Plastic laminate clad plywood or particle board.

D. Backing sheet on bottom of plastic laminate covered wood tops: Backer, Type HGP.

E. Post Forming Fabrication, Decorative Surfaces: Post forming, Type HGP.

2.5 BUILDING BOARD (HARDBOARD)

A. ANSI/AHA A135.4, 6 mm (1/4 inch) thick unless specified otherwise.

B. Perforated hardboard (Pegboard): Type 1, Tempered perforated 6 mm (1/4 inch) diameter holes, on 25 mm (1 inch) centers each way, smooth surface one side.

2.6 ADHESIVE

A. For Plastic Laminate: Fed. Spec. A-A-1936.

B. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

C. For Exterior Millwork: Unextended melamine resin, phenol resin, or resorcinol resin.

2.7 STAINLESS STEEL

ASTM A167, Type 302 or 304.

2.8 ALUMINUM CAST

ASTM B26

2.9 ALUMINUM EXTRUDED

ASTM B221

2.10 HARDWARE

A. Rough Hardware:

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

B. Finish Hardware

1. Cabinet Hardware: ANSI A156.9.
   a. Door/Drawer Pulls: B02011. Door in seismic zones: B03182.
   b. Drawer Slides: B05051 for drawers over 150 mm (6 inches) deep, B05052 for drawers 75 mm to 150 mm 3 to 6 inches) deep, and B05053 for drawers less than 75 mm (3 inches) deep.
   c. Adjustable Shelf Standards: B4061 with shelf rest B04083.
   d. Concealed Hinges: B1601, minimum 110 degree opening.
   e. Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.
   f. Cabinet Door Catch: B0371 or B03172.
   g. Vertical Slotted Shelf Standard: B04103 with shelf brackets B04113, sized for shelf depth.

2. Cabinet Locks: ANSI A156.11.
   a. Drawers and Hinged Door: E07262.
3. Auxiliary Hardware: ANSI A156.16.
   a. Shelf Bracket: B04041, japanned or enameled finish.
4. Fabricated Wall Bench Supports:
   a. Steel Angles: ASTM A36 steel with chrome finish, or ASTM A167, stainless steel with countersunk wood screws, holes at 64 mm (2-1/2 inches) on center on horizontal member.
   b. Use 38 mm by 38 mm by 5 mm (1-1/2 by 1-1/2 by 3/16 inch) angle thick drilled for screw and bolt holes unless shown otherwise. Drill 6 mm (1/4 inch) holes for anchors on vertical member, not more than 200 mm (8 inches) on center between ends or corners.
   c. Stainless steel bars brackets: ASTM A167, fabricated to shapes shown, Number 4 finish. Use 50 mm by 5 mm (2 inch by 3/16 inch) bars unless shown otherwise. Drill for anchors and screws. Drill countersunk wood screw holes at 64 mm (2-1/2 inches) on center on horizontal members and not less than two 13 mm (1/4 inch) hole for anchors on vertical member.
   for anchors on vertical member.
5. Edge Strips Moldings:
   a. Driven type "T" shape with serrated retaining stem; vinyl plastic to match plastic laminate color, stainless steel, or 3 mm (1/8 inch) thick extruded aluminum.
   b. Stainless steel or extruded aluminum channels.
   c. Stainless steel, number 4 finish; aluminum, mechanical applied medium satin finish, clear anodized 0.1 mm (0.4 mils) thick.
6. Rubber or Vinyl molding
   a. Rubber or vinyl standard stock and in longest lengths practicable.
   b. Design for closures at joints with walls and adhesive anchorage.
   c. Adhesive as recommended by molding manufacturer.
7. Primers: Manufacturer's standard primer for steel providing baked enamel finish.

2.11 MOISTURE CONTENT

A. Moisture content of lumber and millwork at time of delivery to site.
   1. Interior finish lumber, trim, and millwork 32 mm (1-1/4 inches) or less in nominal thickness: 12 percent on 85 percent of the pieces

and 15 percent on the remainder.

2. Exterior treated or untreated finish lumber and trim 100 mm (4 inches) or less in nominal thickness: 15 percent.
3. Moisture content of other materials shall be in accordance with the standards under which the products are produced.

2.12 FIRE RETARDANT TREATMENT

A. Where wood members and plywood are specified to be fire retardant treated, the treatment shall be in accordance with Mil. Spec. MIL-L19140.

B. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings.

C. Each piece of treated material shall bear identification of the testing agency and shall indicate performance in accordance with such rating of flame spread and smoke developed.

D. Treat wood for maximum flame spread of 25 and smoke developed of 25.

E. Fire Resistant Softwood Plywood:
   1. Use Grade A, Exterior, plywood for treatment.
   2. Meet the following requirements when tested in accordance with ASTM E84.
      a. Flame spread: 0 to 25.
      b. Smoke developed: 100 maximum

F. Fire Resistant Hardwood Plywood:
   1. Core: Fire retardant treated softwood plywood.
   2. Hardwood face and back veneers untreated,
   3. Factory seal panel edges, to prevent loss of fire retardant salts.

2.13 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.
   c. Provide plastic backing sheet on underside of countertops, vanity tops, thru-wall counter and sills including back splashes and end splashes of countertops.
   d. Use backing sheet on concealed large panel surface when decorative face does not occur.

B. Seats and Benches:
   1. Fabricate from 50 mm (2 inch) stock strips of plain-sawed White Oak, or Maple.
   2. Solid seats securely glued together of spliced, doweled, or double tongued and grooved wood pieces. Where open joints are indicated, work each wood piece from solid stock.
   3. Round top edges and corners where exposed.

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. Plastic laminate covered, 19 mm (3/4 inch) thick plywood or particle board core with edges and ends having plastic molded edge strips. Size, finish and number as shown.
   4. Rod or Closet Bar: L03131. Combination Garment and Shelf Support, intermediate support for closet bar: B04051 for rods over 1800 mm (6 feet) long.

D. Pegboard:

1. Perforated hardboard sheet size as shown.
2. Spacing strip: 13 mm by 13 mm (1/2 by 1/2 inch); glued to hardboard sheet.
   a. Locate at perimeter of sheet edge.
   b. Locate material intermediate spacing strips at 800 mm (32 inches) o.c.
3. Use 19 mm (3/4 inch) one quarter round edge trim to cover exposed edge and finish flush with hardboard surface. Glue to spacing strip and hard board.

E. Counter or Work Tops:
1. Fabrication with plastic laminate over 32 mm (1-1/4 inch) thick core unless shown otherwise.
   a. Use decorative laminate for exposed edges of tops 38 mm (1-1/2 inches) wide and on back splash and end splash. Use plastic or metal edges for top edges less than 38 mm (1-1/2 inches) wide.
   b. Assemble back splash and end splash to counter top.
   c. Use one piece counters for straight runs.
   d. Miter corners for field joints with overlapping blocking on underside of joint.
2. Fabricate wood counter for work benches as shown.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain work areas and storage areas to a minimum temperature of 21^0C (70^0F) for not less than 10 days before and during installation of interior millwork.

B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2 INSTALLATION

A. General:
1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.
2. Secure trim with fine finishing nails, screws, or glue as required.
3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.

4. Seal cut edges of preservative and fire retardant treated wood materials with a certified acceptable sealer.
5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
6. Plumb and level items unless shown otherwise.
7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.

B. Seats and Benches:
1. Use stainless steel countersunk screws to secure wood seats to brackets, angle, or pipe supports.
2. Use stainless steel or chrome plated steel bolts for anchorage to walls. Use 6 mm (1/4 inch) toggle bolts in steel stud walls and hollow masonry. Use 6 mm (1/4 inch) expansion bolts in solid masonry or concrete.
3. Wall Benches: Support within 150 mm (6 inches) near ends and not over 900 mm (3 feet) on centers with stainless steel bar brackets under bench secured to seat and wall.
4. Corner Seats: Support on continuous angles secured to seat and walls.
5. Freestanding Benches: Support within 200 mm (8 inches) of ends and not over 900 mm (3 feet) on centers with pipe bench supports.

C. Pegboard or Perforated Hardboard:
1. Install board with chromium plated steel round-head toggle bolts or other fasteners capable of supporting board when loaded at 122 kg/m^2 (25 psf) of board.
2. Install board with spacers to allow hooks and accessories to be inserted and removed.
3. Install 6 mm (1/4 inch) round trim at perimeter to finish flush with face of board and close space between wall and hardboard.

D. 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.

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Division 07

Thermal and Moisture Protection

Division 07

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SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Roof tear-off, roof re-cover preparation, removal of base flashings.

B. Existing Membrane Roofing System: EPDM roofing membrane, with related insulation, surfacing, and components and accessories between deck and roofing membrane.

1.2 RELATED WORK

A. Use of the premises and phasing requirements: Section 01 00 00 GENERAL REQUIREMENTS.

B. Temporary construction and environmental-protection measures for reroofing preparation: Section 01 00 00 GENERAL REQUIREMENTS

C. HVAC equipment removal and reinstallation: Division 23 sections.

D. Electrical equipment disconnection and reconnection: Division 26 sections.

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 FX-1-01(R2006)Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. ASTM International (ASTM):

C208-08.....Cellulosic Fiber Insulating Board C728-05.....Perlite Thermal Insulation Board C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

C1278/C1278M-07.....Standard Specification for Fiber-Reinforced Gypsum Panel

D1079-09.....Standard Terminology Relating to Roofing and Waterproofing

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

1.4 MATERIALS OWNERSHIP

A. Assume ownership of demolished materials and remove from Project site and dispose of legally, unless indicated to be reused, reinstalled, or otherwise to remain Owner's property.

1.5 DEFINITIONS

A. Refer to ASTM D1079 and NRCA "The NRCA Roofing and Waterproofing Manual" for definition of terms.

1.6 QUALITY CONTROL

A. Requirements of Division 07 roofing section for qualifications of roofing system and roofing insulation Installer; work of this section shall be performed by same Installer.

1. Where Project requirements include removal of asbestos-containing material, Installer must be legally qualified to perform the required work.
2. Where Project requirements include work affecting existing roofing system to remain under warranty, Installer must be approved by warrantor of existing roofing system.

B. Regulatory Requirements: Comply with governing EPA notification regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Reroofing Conference: Conduct conference at Project site.

1. Meet with Project Manager; Architect-Engineer; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing.
2. Review methods and procedures related to roofing system tear-off and replacement

1.7 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Recover boards.

C. List of proposed infill materials.

D. Fastener pull-out test report.

E. Photographs or Videotape: Document existing conditions of adjacent construction including site improvements.

F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a licensed landfill facility.

G. Qualification Data: For Installer.

1. Certificate indicating Installer is approved by warrantor of existing roofing system.

1.8 PROJECT CONDITIONS

A. Owner will occupy portions of building below reroofing area. Conduct reroofing so Owner's operations will not be disrupted.

1. Coordinate work activities daily with Owner.
2. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

B. Protect building and landscaping from damage.

C. Maintain access to existing walkways and adjacent occupied facilities.

D. Available Information: The following are available for Contractor reference:

1. Contractor is responsible for interpretation and conclusions based upon available information.

E. Weather Limitations: Proceed with reroofing preparation only when weather conditions permit Work to proceed without water entering existing roofing system or building.

F. Hazardous Materials: A report on the presence of hazardous materials is available to Contractor for review and use.

1. Examine report to become aware of locations where hazardous materials are present.
2. Hazardous material remediation is specified elsewhere in the Contract Documents.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces affected by reroofing, by methods and with materials acceptable to warrantor.

1. Notify warrantor of existing roofing system before proceeding, and upon completion of reroofing.

2. Obtain documentation verifying that existing roofing system has been inspected by warrantor and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 INFILL MATERIALS

A. Use infill materials matching existing membrane roofing system materials.

2.4 AUXILIARY REROOFING MATERIALS

A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer and compatible with components of existing and new membrane roofing system.

B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "RoofNav."

C. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07 60 00 FLASHING AND SHEET METAL.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing membrane roofing system that is indicated not to be reroofed.

1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
2. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Comply with Owner's requirements for maintaining fire watch when temporarily disabling smoke detectors.

C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding.
2. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

A. General: Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Remove pavers and accessories from roofing membrane. Store and protect pavers and accessories for reuse. Discard cracked pavers.

C. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.
   1. Remove fasteners from deck.

D. Partial Roof Tear-Off: Where indicated, remove existing roofing membrane and other membrane roofing system components down to the deck.
   1. Remove fasteners from deck.

3.3 DECK PREPARATION

A. Inspect deck after tear-off or partial tear-off of membrane roofing system.

B. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263. Do not proceed with roofing work if moisture condenses under the plastic sheet.

C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect-Engineer. Do not proceed with installation until directed by Architect-Engineer.

3.4 INFILL MATERIALS INSTALLATION

A. Immediately after removal of selected portions of existing membrane roofing system, and inspection and repair, if needed, of deck, fill in the tear-off areas to match existing membrane roofing system construction.
   1. Installation of infill materials is specified in Section 07 22 00, ROOF AND DECK INSULATION.

2. Install new roofing membrane patch over roof infill area. If new roofing membrane is installed the same day tear-off is made, roofing membrane patch is not required.

3.5 ROOF RE-COVER PREPARATION

1. Broom clean existing substrate.
2. Remove materials that are wet or damp. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

3.6 EXISTING BASE FLASHINGS

A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
   1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.7 FASTENER PULL-OUT TESTING

A. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to SPRI FX-1, and submit test report to Architect-Engineer before installing new membrane roofing system.
   1. Obtain Architect-Engineer's approval to proceed with specified fastening pattern. Architect-Engineer may furnish revised fastening pattern commensurate with pull-out test results.

3.8 RECOVER BOARD INSTALLATION

A. Install recover boards over roof insulation with long joints in continuous straight lines and end joints staggered between rows. Loosely butt recover boards together and fasten to deck.
   1. Fasten recover boards to resist wind-uplift pressure at corners, perimeter, and field of roof specified in Section 07 22 00 ROOF AND DECK INSULATION.
   2. Install additional fasteners near board corners and edges as necessary to conform boards to substrate and to adjacent boards.

3.9 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
   1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

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SECTION 07 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies thermal and acoustical insulation for buildings.

B. Acoustical insulation is identified by thickness and words "Acoustical Insulation".

1.2 RELATED WORK

A. Insulation in connection with roofing and waterproofing: Section 07 22 00, ROOF AND DECK INSULATION.

B. Safing insulation: Section 07 84 00, FIRESTOPPING.

C. Weather Barriers: 07 27 27 FLUID-APPLIED MEMBRANE AIR BARRIER, VAPOR RETARDING

1.3 SUBMITTALS:

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

B. Manufacturer's Literature and Data:

1. Insulation, each type used
2. Adhesive, each type used.
3. Tape

C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.4 STORAGE AND HANDLING:

A. Store insulation materials in weathertight enclosure.

B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.5 APPLICABLE PUBLICATIONS:

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

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

C270-08.....Mortar for Unit Masonry

C516-08.....Vermiculite Loose Fill Thermal Insulation

C549-06.....Perlite Loose Fill Insulation

C552-07.....Cellular Glass Thermal Insulation.

C553-08.....Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

C578-08.....Rigid, Cellular Polystyrene Thermal Insulation

C591-08.....Unfaced Preformed Rigid Cellular

Polyisocynurate Thermal Insulation
C612-04.....Mineral Fiber Block and Board Thermal Insulation
C665-06.....Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C728-05.....Perlite Thermal Insulation Board
C954-07.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness
C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
D312-00(R2006).....Asphalt Used in Roofing
E84-08.....Surface Burning Characteristics of Building Materials
F1667-05.....Driven Fasteners: Nails, Spikes and Staples.

PART 2 - PRODUCTS

2.1 INSULATION – GENERAL:

A. Where thermal resistance ("R" value) is specified or shown for insulation, the thickness shown on the drawings is nominal. Use only insulation with actual thickness that is not less than that required to provide the thermal resistance specified.

B. Where "R" value is not specified for insulation, use the thickness shown on the drawings.

C. Where more than one type of insulation is specified, the type of insulation for each use is optional, except use only one type of insulation in any particular area.

D. Insulation Products shall comply with following minimum content standards for recovered materials:

Material Type	Percent by Weight
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 MASONRY CAVITY WALL INSULATION:

A. Polyisocyanurate Board: ASTM C591, Type I, faced with a vapor retarder having a perm rating of not more than 0.5. Aged R-value of 5.7/inch.

2.3 PERIMETER INSULATION IN CONTACT WITH SOIL:

A. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX where covered by soil or concrete.

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

2.4 EXTERIOR FRAMING OR FURRING INSULATION:

A. 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.

2.5 ACOUSTICAL INSULATION:

A. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semirigid (4.5 pound nominal density).

B. Mineral Fiber Batt or Blankets: ASTM C665. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.

C. Thickness as shown; of widths and lengths to fit tight against framing.

2.6 RIGID INSULATION:

A. On the inside face of exterior walls, spandrel beams, floors, bottom of slabs, and where shown.

2.7 FASTENERS:

A. Staples or Nails: ASTM F1667, zinc-coated, size and type best suited

for purpose.

B. Screws: ASTM C954 or C1002, size and length best suited for purpose with washer not less than 2 inches in diameter.

C. Impaling Pins: Steel pins with head not less than 2 inches) in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

2.8 ADHESIVE:

A. As recommended by the manufacturer of the insulation.

B. Asphalt: ASTM D312, Type III or IV.

C. Mortar: ASTM C270, Type 0.

2.9 TAPE:

A. Pressure sensitive adhesive on one face.

B. Perm rating of not more than 0.50.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.

B. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.

C. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.

D. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

3.2 MASONRY CAVITY WALLS:

A. Mount insulation on exterior faces of inner wythes of masonry cavity walls and brick faced concrete walls. Fill joints with same material used for bonding.

B. Bond polystyrene board to surfaces with adhesive or Portland cement mortar mixed and applied in accordance with recommendations of insulation manufacturer.

C. Bond mineral fiberboard, polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive as recommended by insulation manufacturer.

D. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

3.3 PERIMETER INSULATION:

A. Vertical insulation:

1. Fill joints of insulation with same material used for bonding.
2. Bond polystyrene board to surfaces with adhesive or Portland cement mortar mixed and applied in accordance with recommendations of insulation manufacturer.
3. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

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.

3.4 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 (6 inches) apart.

E. Roof Rafter Insulation or Floor Joist Insulation: Place mineral fiber blankets between framing to provide not less than a 50 mm (2 inch) air space between insulation and roof sheathing or subfloor.

3.5 RIGID INSULATION ON SURFACE OF EXTERIOR WALLS, FLOORS, AND UNDERSIDE OF FLOORS:

A. Bond to solid vertical surfaces with adhesive as recommended by insulation manufacturer. Fill joints with adhesive cement.

3.6 ACOUSTICAL INSULATION:

A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.

B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind

outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.

C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
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 semirigid insulation is used which is not full thickness of cavity, adhere to one side of cavity maintaining continuity of insulation and covering penetrations or embedments in insulation.

END OF SECTION 07 21 13

SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Roof and deck insulation, substrate board, vapor retarder, and cover board on new construction ready to receive roofing or waterproofing membrane.

B. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.

B. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.

C. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.

D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings

C. ASTM International (ASTM):

C208-08.....Cellulosic Fiber Insulating Board

C552-07.....Cellular Glass Thermal Insulation

C726-05.....Mineral Fiber Roof Insulation Board

C728-05.....Perlite Thermal Insulation Board

C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

C1278/C1278M-07.....Standard Specification for Fiber-Reinforced Gypsum Panel

C1289-10.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

C1396/C1396M-09.....Standard Specification for Gypsum Board

D41-05.....Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

D312-06.....Asphalt Used in Roofing

D1970-09.....Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

D2178-04.....Asphalt Glass Felt Used in Roofing and Waterproofing

D2822-05.....Asphalt Roof Cement

D4586-07.....Standard Specification for Asphalt Roof Cement, Asbestos-Free

E84-09.....Standard Test Method for Surface Burning Characteristics of Building Material

F1667-05.....Driven Fasteners: Nails, Spikes, and Staples

D. National Roofing Contractors Association: Roofing and Waterproofing Manual

E. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)

F. 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.

1.5 QUALITY CONTROL

A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.

B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.

C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.

D. Requirements of roofing system uplift pressure design for specified roofing system.

E. Requirements of applicable FM Approval for specified roofing system insulation attachment.

1.6 SUBMITTALS

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

B. Product Data:

1. Asphalt and adhesive materials, each type.
2. Roofing cement, each type.
3. Roof insulation, each type.
4. Substrate board, each type.
5. Cover board, each type.
6. Fastening requirements.
7. Insulation span data for flutes of metal decks.

C. Shop Drawings: Include plans, sections, details, and attachments.

1. Nailers, cants, and terminations.
2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

D. Samples:

1. Roof insulation, each type.
2. Nails and fasteners, each type.

E. Certificates:

1. Indicating type, thermal conductance, and minimum and average thickness of insulation.

F. Laboratory Test Reports: Thermal values of insulation products.

G. Layout of tapered roof system showing units required.

H. 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.

3. Insulation tested as part of a roof construction assembly shall bear UL label attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.1 ADHESIVE MATERIALS

A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Plastic Foam Adhesives: 50 g/L.
   b. Multipurpose Construction Adhesives: 70 g/L.
   c. Fiberglass Adhesives: 80 g/L.
   d. Contact Adhesives:80 g/L.
   e. Other Adhesives: 250 g/L.
   f. Nonmembrane Roof Sealants: 300 g/L.
   g. Sealant Primers for Nonporous Substrates: 250 g/L.
   h. Sealant Primers for Porous Substrates: 775 g/L.

B. Primer: ASTM D41.

C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, ; or, D4586, Type I or Type II.

2.2 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.

B. 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."

C. Vapor Retarder:

1. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).

D. Substrate Board:

1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, Type X, 16 mm (5/8 inch) thick, factory primed.

E. Cover Board:

1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 6 mm (1/4 inch) thick, factory primed.

2.4 FASTENERS

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening substrate board to roof deck.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

A. Comply with requirements of Division 07 roofing section.

3.3 SUBSTRATE BOARD INSTALLATION

A. Fasten substrate board to top flanges of steel deck to resist uplift pressures according to roofing system manufacturers instructions and requirements of FM Approvals listing for specified roofing system.

3.4 VAPOR RETARDER INSTALLATION

A. General:
   1. Install continuous vapor retarder on roof decks where indicated.
   2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
   3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.
   4. Seal penetrations with roof cement.

B. Cast in Place Concrete Decks, Except Insulating Concrete:
   1. Prime deck as specified.
   2. Apply two plies of asphalt saturated felt mopped down to deck.

C. Precast Concrete Unit Decks Without Concrete Topping:
   1. Prime deck as specified.
   2. Apply two plies of asphalt saturated felt.
   3. Mop to deck, keeping bitumen 100 mm (four inches) away from joints of precast units. Bridge joints with felt. Mop between plies as specified.

D. Steel Deck:
   1. Material and method of application of roofing systems used on metal decks shall meet the requirements of FM Approvals for Class I-A Insulated Steel Roof Deck.
   2. Attach substrate board and subsequent components to meet the requirements of FM Approval's "RoofNav" listing for specified system meeting Fire/Windstorm Classification indicated in Division 07 roofing section.
   3. Locate the long dimension edge joints to have solid bearing on top of decking ribs; do not cantilever over rib openings or flutes.

3.5 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:
   1. Install roof insulation in accordance with roofing system manufacturer's written instructions.
   2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.

3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.
4. Cant Strips: Install wood cant strips specified in Division 06 Section ROUGH CARPENTRY at junctures of roofing system with vertical construction.
5. Use same insulation as existing for roof repair and alterations unless specified otherwise.

B. Insulation Thickness:
1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.
3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).
5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).

C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tight against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

H. Installation Method:

1. Mechanically Fastened and Adhered Insulation:
   a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
   b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.
2. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Adhered Insulation" requirements.

END OF SECTION 07 22 00

SECTION 07 24 00
INTERIOR INSULATION AND FINISH SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

Exterior Finish Systems specified in this section consist of a Direct Exterior Finish Systems (DEFS), Exterior Insulation and Finish System (EIFS) all of which are applied over cement board sheathing.

1.2 RELATED WORK

A. Cement Board: Section 06 16 63, CEMENTITIOUS SHEATHING.

B. Weather Barriers: 07 27 27 FLUID-APPLIED MEMBRANE AIR BARRIER, VAPOR RETARDING

1.3 SUBMITTALS

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

B. Samples:

Two 300 mm (one-foot) square samples of the EIFS finishes over cement board identical to the proposed installation in thickness, color, texture insulation and workmanship.

C. Test Reports and Manufacturer's Literature

1. Manufacturer's literature and instructions for installation of the system. Include manufacturer's recommended details for corner treatment, sills, soffits, dentils, quoins, lintels, openings and other special applications.
2. Summary of test results by the Exterior Finish System manufacturer to substantiate compliance with the specified performance requirements. Furnish complete test reports as required.
3. Statement by Exterior Finish System manufacturer that all components of the system proposed for use on this project are approved by that manufacturer.
4. Statement by the Installer of the Exterior Finish System that they are experienced with the installation, having done at least three (3) projects using this system and can furnish names and locations of these projects if required.

1.4 DELIVERY AND STORAGE

A. Deliver materials in unopened packages with manufacturer's labels intact, legible and grade seals unbroken.

B. Store and handle in strict compliance with manufacturer's instructions. Protect from damage.

C. Remove from premises any damaged or deteriorated material.

1.5 ENVIRONMENTAL CONDITIONS

A. Unless a higher temperature is required by the system manufacturer, the ambient air temperature shall be 7 degrees Celsius (45 degrees F) or greater and rising at the time of installation of the system and shall be predicted to remain at 7 degrees Celsius (45 degrees F) or greater for at least 24 hours after installation.

1.6 WARRANTY

A. Exterior Finish system shall be warranted against water leakage past the weather resistive barrier and other defects in materials and workmanship, and shall be subject to the terms of Article “Warranty of Construction”, except that the warranty period shall be ten years.

1.7 APPLICABLE PUBLICATIONS

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

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

B117-09.....Operating Salt Spray (Fog) Apparatus

C67-09.....Sampling and Testing Brick and Structural Clay Tile

C177-10.....Steady-State Heat Flux measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C297-10.....Flatwise Tensile Strength of Sandwich Constructions

C578-10.....Rigid, Cellular Polystyrene Thermal Insulation

C666-03(R2008).....Resistance of Concrete to Rapid Freezing and Thawing

C920-11.....Elastomeric Joint Sealants

D968-10.....Abrasion Resistance of Organic Coatings by Falling Abrasive

D2794-93(R2010).....Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

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

E96-10.....Water Vapor Transmission of Materials

E108-10.....Fire Tests of Roof Coverings

E330-02(R2010).....Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

E331-00.....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

G90-10.....Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

C. Exterior Insulation Manufacturers Association (EIMA)

101.86-1992.....Resistance of Exterior Insulation and Finish Systems to the Effects of Rapid Deformation (Impact)

PART 2 PRODUCTS

2.1 EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

A. Description: The PB system consists of Type I molded rigid polystyrene insulation adhesively adhered to the sheathing and finished with a glass-fiber-mesh reinforced based-coat and a textured finish coat.

B. Performance Requirements:

TEST	TEST METHOD	REQUIREMENT
Flame Spread (Test samples shall include base coat, fabric, finish mounted on non- combustible substrate)	ASTM E84	Flame spread of 25 or less. Smoke developed rating 450 or less.
Full Scale Wall Fire Test	ASTM E108	No significant surface flaming or propagation of vertical or lateral flames
Impact Resistance (Sample shall be cured. Finish, base coat and fabric over 25mm (1 inch) insulation typical of project application)	EIMA 101.86 (Hemispherical Head Test)	Standard Impact Resistance 2.83 to 5.54J (25-49 inch-lbs)
Structural Performance (Test panels 1200 mm x 1200 mm (4 feet by 4 feet) typical of project application)	ASTM E330	No permanent deformation, delamination or deterioration for positive and negative pressures as required.

Water Penetration	ASTM E331	No Water penetration
Abrasion Resistance	ASTM D968	500 liters of sand-slight smoothing - no loss of film integrity
Accelerated Weathering	ASTM G90	2000 hours. No deterioration
Salt Spray Resistance	ASTM B117	Withstand 300 hours. No deleterious effects.
Water Vapor	ASTM E96	Not more than 18 grains an hour per square foot.
Absorption-Freeze-Thaw (Pre-weighed 100 mm x 200 mm (4" by 8") specimens; 25 mm (1") insulation, faced with finish coat cured and stored in air; tested with edges and back open.)	ASTM C67 50 Cycles: 20 hrs. at - 9 deg C ; 4-hr. thaw in water	After 50 cycles – Total weight gain of not more than 6.2 grams. No checking splitting, or cracking.

C. Adhesive: Manufacturers standard product including primer as required compatible with sheathing.

D. Insulation:

1. Thermal Resistance: Thermal resistance (R-value), as indicated, measured by ASTM C177.
2. Insulating Material: ASTM C578, as recommended by EIFS manufacturer and treated to be compatible with EIFS components. Age insulation a minimum of 6 weeks prior to installation.
3. Provide Type I Molded Expanded Polystyrene (MEPS) insulation board for Type PB systems, in sizes as required except no larger than 600 mm X 1200 mm (24 X 48 inches) boards, and not more than 100 mm (4 inches) in thickness.

E. Create a means of drainage between the insulation board and cement board sheathing.

F. All penetrations and terminations shall be flashed.

G. Mechanical Anchors: As recommended by the EIFS manufacturer.

H. Accessories: Conform to the recommendations of the EIFS manufacturer, including trim, edging, anchors, expansion joints, and other items required for proper installation of the EIFS. All metal items and fasteners to be corrosion resistant.

I. Reinforcing Fabric: Balanced, open weave, glass fiber fabric made from twisted multi-end strands specifically treated for compatibility with the other materials of the system. Minimum weight 4.3 oz/sq. yd.

J. Base Coat: For PB system, manufacturer's standard product. Minimum thickness of 1-1/2 times reinforcing fabric thickness but not less than 2.4 mm (3/32 inches) wet thickness.

K. Finish Coat: For PB system, manufacturer's standard product. Minimum thickness 1.6 mm (1/16 inch), complying with Performance Requirements in paragraph B.

L. Sealant: ASTM C 920; material having a minimum joint movement of 50% with 100% recovery. Type, grade and use shall be as recommended by the sealant manufacturer. When required, primer, bond breaker and backer rods shall be non-staining as recommended by the sealant manufacturer. Do not use absorptive materials as backer rods.

PART 3 EXECUTION

3.1 INSPECTION

Examine substrate, opening supports and conditions under which this work is to be performed. Notify Project Manager in writing of conditions detrimental to the proper completion of this work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 CONTROL JOINTS

A. See drawings for location of building control joints and surface control joints. Install surface control joints as follows:

B. Direct Exterior Finish: Install at 6 meters (20 feet) o.c. maximum in either direction, erecting the continuous vertical joints first at building expansion joints, intersection of dissimilar substrates or finishing materials where concentrated stresses or movement is anticipated. Leave a 13 mm (1/2") minimum continuous gap between board panels to receive control joint.

3.3 SEALANTS:

A. Apply according to manufacturer's recommendations and the following:

B. Exterior Insulation and Finish System: Apply sealant per EIFS manufacturer's recommendation. Do not seal locations intended for water drainage.

3.4 ACCESSORIES:

Install according to manufacturer's recommendation.

3.5 FINISH:

A. EXTERIOR INSULATION AND FINISH SYSTEM:

1. Insulation Board: Place horizontally from level base line. Stagger vertical joints and interlock at corners. Butt joints tightly. Provide flush surfaces at joints. Offset insulation board joints from joints in sheathing by at least 200 mm (8 inches). Do not align joints with corners of doors, windows and other openings. Do not leave insulation board exposed longer than recommended by insulation manufacturer.
2. Mechanical Fasteners: Fasten with manufacturer's standard anchors, spaced as recommended by manufacturer, but not more than 600 mm (2 feet) horizontally and vertically.
3. Sanding: Sand entire surface of insulation before application of base coat to improve bonding of basecoat, level high joints and remove dirt and weathering damage. Do not pre-fill low areas with basecoat.
4. Base Coat and Reinforcing Fabric: Trowel apply to the insulation a uniform thickness of base coat as recommended by the system manufacturer but not less than 1-1/2 times the reinforcing fabric thickness with a minimum of 2.4 mm (3/32 inch). Install reinforcing fabric in accordance with manufacturer's instructions. Provide diagonal reinforcement at opening corners, backwrapping, and any other reinforcement recommended by EIFS manufacturer. The fabric shall not be visible beneath the surface of the basecoat after installation. Cure the basecoat for a minimum of 24 hours before application of the finish coat.
5. Finish: Inspect basecoat for damage or defects and repair prior to application of finish coat. Trowel apply finish coat according to manufacturer's recommendations but a minimum of 1.6 mm (1/16 inch). Texture finish as required. Provide finish surfaces that are plumb and plane with no greater deviation than 1:500 (1/4 inch in 10 feet).

3.6 CLEAN UP:

A. Upon completion, remove all scaffolding, equipment, materials and debris from site. Remove all temporary protection installed to facilitate installation of system.

END OF SECTION 07 24 00

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies fluid-applied vapor-retarding membrane air barrier material and accessories used for exterior above grade wall assembly air barriers and their extension and connection to adjacent air barrier components in roof and opening construction to provide a durable, continuous, air- and moisture- impermeable full-building system.

1.2 RELATED WORK

A. General quality assurance and quality control requirements: Section 01 45 29 TESTING LABORATORY SERVICES.

B. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.

C. Masonry units serving as substrate for membrane air barriers, including preparation of surface: Section 04 20 00 UNIT MASONRY.

D. Flashing components of factory finished roofing and wall systems to which membrane air barriers will transition: Division 07 roofing and wall system sections.

E. Other flashing components to which membrane air barriers will transition: Section 07 60 00 FLASHING AND SHEET METAL.

F. Joint Sealants: Section 07 92 00, JOINT SEALANTS.

G. Division 08 exterior openings sections for opening transitions providing airtight seal between membrane air barrier and [aluminum-framed entrances and storefronts] [aluminum windows] [glazed aluminum curtain walls] [louvers and vents].

H. Wall sheathings serving as substrate for membrane air barriers: Section 09 29 00 GYPSUM BOARD.

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.

1. 1. Air Barrier Association of America (ABAA): Quality Assurance Program

2. American Society of Testing and Materials (ASTM):

C920-10.....Standard Specification for Elastomeric Joint Sealants

C1193-09.....Standard Guide for Use of Joint Sealants
D412-06.....Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
D2369-10.....Standard Test Method for Volatile Content of Coatings
E96/E96M-05.....Standard Test Methods for Water Vapor Transmission of Materials
E162-09.....Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
E783-02.....Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
E1186-03(2009).....Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
E2178-03.....Standard Test Method for Air Permeance of Building Materials
E2357-05.....Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

3. U.S. Environmental Protection Agency (EPA):
40 CFR 59, Subpart D....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

4. SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD):
1168-89(2003).....Adhesive and Sealant Applications

1.4 PERFORMANCE REQUIREMENTS

A. General: Membrane air barrier shall be capable of performing as a continuous vapor-impermeable air barrier and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Membrane air barriers shall accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.

B. Air-Barrier Assembly Air Leakage: Maximum 0.2 L/s x sq. m of surface area at 75 Pa (0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft.)per ASTM E 2357.

D. Material Compatibility: Provide membrane air barrier materials that are compatible with one another and with adjacent materials under

conditions of service and application required, as demonstrated by membrane air barrier manufacturer based on testing and field experience.

1.5 QUALIFICATIONS:

A. Approvals: Approval by Contracting Officer is required of products and services of proposed manufacturers, and installers, and will be based upon submission by Contractor that:

B. Manufacturer Qualifications: Manufacturer regularly and presently manufactures fluid-applied membrane air barrier material meeting section requirements as one of its principal products.

1. Manufacturer's product submitted has been in satisfactory and efficient operation on five similar installations for at least five years.
   a. Submit list of installations, include name and location of project and name of owner.
2. Accreditation: Manufacturer is accredited by the Air Barrier Association of America.

C. Installer Qualifications: Installer has technical qualifications, experience, certifications, trained personnel, membrane air barrier manufacturer's approval, and facilities to install specified items.

1. Accreditation: Installer shall be accredited by the Air Barrier Association of America (ABAA) and whose installers are certified in accordance with the site Quality Assurance Program used by ABAA.
2. Installer's applicators shall be trained and certified by manufacturer of air barrier system.
3. Installer's full time on-site field supervisor shall have completed three projects of similar scope within last year, be able to communicate verbally with Contractor, Architect, third party testing agency, and employees.
   a. Certification: Installer's supervisor shall hold Sealant, Waterproofing, and Restoration Institute (SWRI) Wall Coating Validation Program Certificate, or similar qualification acceptable to Project Mangager.
   b. Accreditation: Installer's supervisor shall be a Level 3 Accredited Installer by the ABAA.

D. Third Party Testing Agency Qualifications: Testing laboratory accredited by International Accreditation Service, Inc. or American Association for Laboratory Accreditation.

1. Testing agencies personnel shall be experienced in the installation of specified air barrier system and qualified to perform observation and inspection specified in Field Quality Control Article to determine Installer’s compliance with the requirements of this Project.
2. Accreditation: Contractor's third party testing agency performing Field Quality Control testing and inspection shall also be certified by ABAA to perform ABAA Quality Assurance Program installer audits.

1.6 SUBMITTALS:

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

B. Manufacturer's Literature and Data:
1. Fluid-applied membrane air barrier.
2. Primer.
3. Mastic.
4. Counterflashing strip.
5. Modified bituminous strip.
6. Sprayed polyurethane foam sealant.
7. Opening transition assembly.
8. Joint sealant.
9. Printed installation instructions for conditions specified.

C. Certificates:
1. Indicating membrane air barrier manufacturer's qualifications as specified.
2. Indicating approval of installer by membrane air barrier manufacturer.
3. Indicating qualifications of installer and installer's personnel.
4. Indicating air barrier manufacturer's determination that proposed materials are chemically and adhesively compatible with adjacent materials.
5. Indicating products meet project limitations on VOC content.
6. Submit third party testing agencies qualifications showing that they are able to perform the tests as indicated in the specification.

D. Inspection Reports: Daily reports of third party testing agency and reports of testing and inspection agency. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.7 COORDINATION:

A. Coordinate installation of work of this Section with adjacent and related work to ensure provision of continuous, unbroken, durable air barrier system.

B. Installation Audit: Incorporate audit requirements of ABAA QAP. Coordinate and cooperate with ABAA auditors. Ensure air barrier assembly remains exposed to facilitate inspection, testing, and correction activities.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to job in manufacturer's original unopened containers.

B. Do not store material in areas where temperature is lower than 10 degrees C (50 degrees F,) or where prolonged temperature is above 32 degrees C (90 degrees F).

1.9 ENVIRONMENTAL REQUIREMENTS:

Ambient Surface and Material Conditions: Not less than 4 degrees C (40 degrees F), during application of waterproofing, visibly dry, and complying with manufacturer's written instructions.

1.10 WARRANTY:

Warrant membrane air barrier installation against air and moisture leaks subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period is two years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain membrane air barrier materials and accessories from single manufacturer.

B. VOC Content: Maximum 250 g/L per 40 CFR 59, Subpart D (EPA Method 24).

2.2 MEMBRANE AIR BARRIER:

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane, meeting the following:

1. Air Permeance, ASTM E 2178: 0.02 L/s x sq. m of surface area at 75-Pa (0.004 cfm/sq. ft of surface area at 1.57-lbf/sq. ft.)pressure difference.
2. Vapor Permeance, ASTM E 96/E96M: Maximum 5.8 ng/Pa x s x sq. m (0.1 perm).
3. Elongation, Ultimate, ASTM D 412, Die C: 500 percent, minimum.

4. Combustion Characteristics: Flame spread, not greater than 25; smoke developed, not greater than 450, ASTM E 84.
5. Thickness of Membrane Air Barrier: Not less than 1.0 mm (40 mils)dry film thickness, applied in single continuous coat.

2.3 ACCESSORY MATERIALS:

A. Primer: Liquid waterborne primer meeting VOC requirements, recommended for substrate by membrane air barrier manufacturer.

B. Counterflashing Sheet: Modified bituminous, minimum 1.0-mm- (40-mil-thick self-adhering composite sheet consisting of minimum 0.8 mm (32 mils) of rubberized asphalt laminated to polyethylene film.

C. Substrate Patching Material: Manufacturer's standard trowel-grade filler material.

D. Sprayed Polyurethane Foam Sealant: Foamed-in-place, 24- to 32-kg.cu. m (1.5- to 2.0-lb/cu. ft) density, with flame-spread index of 25 or less per ASTM E 162.

E. Flexible Opening Transition: Cured low-modulus silicone extrusion with reinforcing ribs, sized to fit opening widths, designed for adhesion to or insertion into aluminum framing extrusions, and compatible with air barrier system materials and accessories.

F. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, approved by membrane air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Surface Condition: Before applying membrane air barrier materials, ensure substrates are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion.

B. Verify concrete surfaces have cured for time period recommended by membrane air barrier manufacturer, free from release agents, concrete curing agents, and other contaminates.

C. Verify masonry joints are flush and filled with mortar.

3.2 INTERFACE WITH OTHER WORK

A. Commencement of Work: Commence work once membrane air barrier substrates are adequately protected from weather and will remain protected during remainder of construction.

B. Sequencing of Work: Coordinate sequencing of work with work of other sections that form portions of building envelope air barrier to ensure that flashings and transition materials can be properly installed.

C. Subsequent Work: Coordinate work with work of other sections installed subsequent to membrane air barrier to ensure complete inspection of installed membrane air barrier and sealing of membrane air barrier penetrations necessitated by subsequent work.

3.3 AIR BARRIER INSTALLATION

A. General: Prepare substrates and install and apply air barrier components in accordance with air barrier manufacturer's written instructions consistent with manufacturer's qualifying tested assemblies.

1. Compliance: Prepare substrates and install and apply air barrier components in accordance with requirements of ABAA QAP.

3.4 PREPARATION

A. Prepare and treat substrate in accordance with membrane air barrier manufacturer's written instructions.

B. Mask adjacent finished surfaces.

C. Remove contaminants and film-forming coatings from concrete.

D. Remove projections and excess materials and fill voids with substrate patching material.

E. Prepare and treat joints and cracks in substrate per ASTM C 1193 and membrane air barrier manufacturer's written instructions.

F. Apply primer to substrates.

3.5 APPLICATION OF TRANSITION STRIPS

A. Install transition strips and accessory materials according to membrane air barrier manufacturer's written instructions.

B. Connect and seal membrane air barrier material to adjacent components of building air barrier system, including, but not limited to, roofing system air barrier, exterior glazing and window systems, curtain wall systems, door framing, and other openings.

C. Flexible Opening Transition: Prime concealed perimeter frame surfaces of windows, storefronts, curtain walls, louvers, and doors. Apply flexible opening transition and attach or adhere in accordance with air barrier manufacturer's written instructions.

1. Fill gaps at perimeter of openings with foam sealant.

D. Penetrations: Fill gaps at perimeter of penetrations with foam sealant. Seal transition strips around penetrating objects with termination mastic.

E. Flashings: Seal top of through-wall flashings to membrane air barrier with continuous transitions strip of type recommended by membrane air barrier manufacturer for type of flashing.

3.6 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. Apply fluid membrane air barrier material in full contact with substrate to produce a continuous seal with transition strips according to membrane air barrier manufacturers written instructions.

1. Apply fluid membrane in thickness recommended by manufacturer, but not less than thickness specified in this section.

B. Leave membrane air barrier exposed until tested and inspected by a third party testing agency and approved by Project Manager.

C. Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

3.7 TESTING:

A. Third Party Testing Agency: Contractor shall engage a qualified third party testing agency to perform tests and inspections, including documenting of membrane air barrier prior to concealment.

1. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements, including the following:
2. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.

9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.
15. Inspections and testing shall be carried out at the following rate:
    a. Up to 10,000 square feet (930 square meters) – one inspection
    b. 10,001 – 35,000 square feet (931 – 3,250 square meters) – two inspections
    c. 35,001 – 75,000 square feet (3,251 – 6,970 square meters) – three inspections
    d. 75,001 - 125,000 square feet (6,971 – 11,610 square meters) – four inspections
    e. 125,001 – 200,000 square feet (11,611 – 18,580 square meters) – five inspections
    f. Over 200,00 square feet (18,580 square meters) – six inspections.
16. Forward written inspection reports to the Project Mangager within 5 working days of the inspection and test being performed.
17. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

B. Inspections shall include:
1. Compatibility of materials within membrane air barrier system and with adjacent materials.
2. Suitability of substrate and support for membrane air barrier materials.
3. Suitability of conditions under which membrane air barrier will be applied.
4. Adequacy of substrate priming.
5. Proper application and joint and edge treatment of transition strips, flexible opening transitions, and accessory materials.
6. Continuity and gap-free installation of membrane air barrier, transition strips, and accessory materials.

C. Testing shall include:

1. Qualitative air-leakage testing per ASTM E 1186.
   a. Acceptable testing methods include:
      1. Building depressurization/pressurization with infrared scanning practice
      2. Smoke tracer in conjunction with building depressurization/pressurization practice
      3. Building depressurization/pressurization with airflow measuring device or anemometer practice
2. Quantitative air-leakage testing per ASTM E 783.
   a. The number of items to be tested shall be included (usually 25%). If half of the tests fail, 100% of the doors and windows shall be tested.

D. Audit: Provide installer audit by ABAA. Coordinate scheduling of work and associated audit inspections. Cooperate with ABAA's testing agency. Allow access to work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site inspections by ABAA to verify conformance with the manufacturer's instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

3.7 CLEANING AND PROTECTION

A. Clean spills, stains, and overspray resulting application utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.

B. Protect membrane air barrier from damage from subsequent work. Protect membrane materials from exposure to UV light in excess of that acceptable to membrane air barrier manufacturer; replace overexposed materials and retest.

END OF SECTION 07 27 27

SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

A. Ethylene Propylene Diene Monomer (EPDM) sheet roofing adhered to roof deck.

B. Fire rated roof system.

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. Metal cap flashings, copings, fascias, and expansion joints: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 QUALITY ASSURANCE

A. Approved applicator by the membrane roofing system manufacturer, and certified by the manufacturer as having the necessary expertise to install the specific system.

B. Pre-Roofing Meeting:

1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and Project Manager,
2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
3. Inspect roof deck at this time to:
   a. Verify that work of other trades which penetrates roof deck is completed.
   b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
   c. Examine samples and installation instructions of manufacturer.
   d. Perform pull out test of fasteners (See paragraph 3.2).

1.4 SUBMITTALS

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

B. Applicators approval certification by manufacturer.

C. Shop Drawings:
   1. Sheet membrane layout.
   2. Fastener pattern, layout, and spacing requirements.
   3. Termination details.
D. Manufacturers installation instructions revised for project.
E. Samples:
   1. Sheet membrane: One 150 mm (6 inch) square piece.
   2. Sheet flashing: One 150 mm (6 inch) square piece.
   3. Fasteners: Two, each type.
   4. Welded seam: Two 300 mm (12 inch) square samples of welded seams to represent quality of field welded seams.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials as specified by manufacturer.
B. Store volatile materials separate from other materials with separation to prevent fire from damaging the work, or other materials.

1.6 WARRANTY

A. Roofing work subject to the terms of the Article “Warranty of Construction”, except extend the warranty period to five years.

1.7 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
B. American Society for Testing and Materials (ASTM):
   A167-99 (R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
   B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
   D751-06.....Coated Fabrics
   D2103-05.....Polyethylene Film and Sheeting
   D2240-05.....Rubber Property - Durometer Hardness
   D3884-07.....Abrasive Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
   D4637-04.....EPDM Sheet Used in Single-Ply Roof Membrane
   D4586-07.....Asphalt Roof Cement, Asbestos Free
   E96-05.....Water Vapor Transmission of Materials
   E108-07.....Fire Tests of Roof Coverings
   G21-96 (R2002).....Resistance of Synthetic Polymeric Materials to Fungi
C. National Roofing Contractors Association (NRCA):

Fifth Edition - 05.....The NRCA Roofing and Waterproofing Manual.

D. Federal Specifications (Fed. Spec.)

FF-S-107C(2).....Screws, Tapping and Drive

FF-S-111D(1).....Screw, Wood

UU-B-790A.....Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant)

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

Annual Issue.....Approval Guide Building Materials

F. Underwriters Laboratories, Inc (UL):

Annual Issue.....Building Materials Directory

Annual Issue.....Fire Resistance Directory

G. Warnock Hersey (WH):

Annual Issue.....Certification Listings

PART 2 - PRODUCTS

2.1 EPDM SHEET ROOFING

A. Conform to ASTM D4637, Type I, Grade 1, white color.

B. Additional Properties:

PROPERTY	TEST METHOD	REQUIREMENT
Shore A Hardness	ASTM D2240	55 to 75 Durometer
Water Vapor Permeance	ASTM E96	Minimum 0.14 perms Water Method
Fungi Resistance	ASTM G21	After 21 days, no sustained growth or discoloration.
Fire Resistance	ASTM E108 Class A	No Combustion Beyond Flame/Heat Source

C. Thickness:

1. Use 1.14 mm (0.045-inch) thick sheet for adhered system.

D. Pipe Boots:

1. Molded EDPM designed for flashing of round penetrations, 200 mm (8 inch) minimum height.
2. Color same as roof membrane.

2.2 EPDM FLASHING SHEET

A. Conform to ASTM D4637, Type I, Grade 1, Class U, unreinforced, color, same as roof membrane modified as specified for flashing.

B. Self curing EPDM flashing, adaptable to irregular shapes and surfaces.

C. Minimum thickness 1.5 mm (0.060-inch).

2.3 MISCELLANEOUS ROOFING MEMBRANE MATERIALS

A. Sheet roofing manufacturers specified products.

B. Splice Adhesive: For roofing and flashing sheet.

C. Lap Sealant: Liquid EPDM rubber for roofing sheet exposed lap edge.

D. Bonding Adhesives: Neoprene, compatible with roofing membrane, flashing membrane, insulation, metals, concrete, and masonry for bonding roofing and flashing sheet to substrate.

E. Fastener Sealer: One part elastomeric adhesive sealant.

F. Temporary Closure Sealers (Night Sealant): Polyurethane two part sealer.

G. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.

H. Asphalt Roof Cement: ASTM D4586.

2.4 FASTENERS

A. Pipe Compression Clamp or Drawband:

1. Stainless steel or cadmium plated steel drawband.
2. Worm drive clamp device.

B. Surface mounted base flashing clamp strip:

1. Stainless steel strip, ASTM A167, type 302 or 304, dead soft temper, minimum 0.5 mm (0.018-inch) thick.
2. Aluminum strip: ASTM B209 24 mm (.094-inch) thick.
3. For exposed location, form strips with 6 mm (1/4 inch) wide top edge bent out 45 degrees (for sealant) from 40 mm (1-1/2 inch) wide material; 2400 mm (8 feet) maximum length with slotted 6 mm x 10 mm (1/4 by 3/8-inch) holes punched at 200 mm (8 inch) centers, centered between bend and bottom edges.
4. For locations covered by cap flashings, form strips 30 mm (1-1/4 inch) wide, 2400 mm (8 feet) maximum length with slotted holes 6 mm x 10 mm (1/4 by 3/8 inch) punched at 200 mm (8 inch) centers, centered on strip width.

C. Fasteners and washers required for securing pavers together with straps and to walls or other anchorage.

1. Straps for securing pavers together:
   a. Stainless steel strap: ASTM A167, type 302 or 304, minimum 0.46 mm (0.018 inch) thick.
   b. Aluminum strap: ASTM B209, minimum 2.39 mm (0.094 inch) thick.
   c. Rounded corners on straps.

d. Form straps 38 mm (1-1/2 inches) wide, 3 m (10 feet) maximum length with 6mm x 10 mm (1/4 by 3/8) inch punched slotted holes at 100 mm (4 inch) centers centered on width of strap. Punch hole size 2 mm (1/16 inch) larger than fastener shank when shank is thicker than 5 mm (3/16 inch).

D. Fasteners or Connectors for Pavers:

1. For NCMA Roofcap Pavers extruded interlocking hollow shape polyethylene connector:

a. Material shall conform to ASTM D1248, Type 1, low density, Class C, black weather resistant, Grade E6, tensile strength 15 Mpa (2200 psi), shore D hardness of 4, brittleness low temperature - 82°C (180°F), softening temperature above 80°C (176°F).

b. Length: 50 mm (2 inches), with center stop and insert leg with ribs to resist withdrawal; minimum 1.3 mm (0.05 inch) thick.

2. Fasteners for pavers straps:

a. Stainless steel as recommended by manufacturer of paver in which fastener is anchored.

b. Fasteners that are not acceptable include:

1) Impact or power actuated fasteners.

2) Fasteners that do not require a predrilled pilot hole.

3) Fasteners with lead or white metal anchors.

4) Plastic anchors not stabilized against ultraviolet light.

2.5 VAPOR RETARDER OR SEPARATION SHEETS

A. Polyethylene film: ASTM D2103, 0.2 mm (6 mils) thick.

B. Building Paper: Fed. Spec. UU-B-790.

1. Water vapor resistance: Type I, Grade A, Style 4, reinforced.

2. Water vapor permeable: Type I, Grade D, Style 4, reinforced.

2.6 FLEXIBLE TUBING

A. Closed cell neoprene, butyl polyethylene, vinyl, or polyethylene tube or rod.

B. Diameter approximately 1-1/2 times joint width.

2.7 WALKWAY PADS

A. Rubber walkway pad approximately 450 mm x 450 mm (30 by 30 inches) square or manufacturers standard size with rounded corners.

B. Approximately 13 mm (1/2 inch) thick.

C. Ultraviolet light stabilized.

2.8 PROTECTION MAT OR SEPARATION SHEETS

A. Protection Mat:

1. Water pervious; either woven or non-woven pervious sheet of long chain polymeric filaments or yarns such as polypropylene, black polyethylene, polyester, or polyamide; or, polyvinylidene-chloride formed into a pattern with distinct and measurable openings.
2. Filter fabric equivalent opening size (EOS): Not finer than the U.S.A. Standard Sieve Number 120 and not coarser than the U.S.A. Standard Sieve Number 100. EOS is defined as the number of the U.S.A. Standard Sieve having openings closest in size to the filter cloth openings.
3. Edges of fabric selvaged or otherwise finished to prevent raveling.
4. Abrasion resistance:
   a. After being abraded in conformance with ASTM D3884 using rubber-hose abrasive wheels with one kg load per wheel and 1000 revolutions, perform tensile strength test as specified in ASTM D1682, paragraph.
   b. Result; 25 kg (55 pounds) minimum in any principle direction.
5. Puncture strength:
   a. ASTM D751 - tension testing machine with ring clamp; steel ball replaced with a 8 mm (5/16 inch) diameter solid steel cylinder with a hemispherical tip centered within the ring clamp.
   b. Result; 57 kg (125 pounds) minimum.
6. Non-degrading under a wet or humid condition within minimum 4°C (40°F) to maximum 66°C (150°F) when exposed to ultraviolet light.
7. Minimum sheet width: 2400 mm (8 feet).

2.9 PAVERS

A. Weighing not less than 15 pounds per square foot.

B. Interlocking Concrete Paving Units: Manufactured using normal weight aggregate.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not apply if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless protection provided to distribute loads less than one-half compression resistance of roofing system materials.

1. Curbs, blocking, edge strips, and other components to which roofing and base flashing is attached in place ready to receive insulation and, roofing.
2. Coordinate roof operation with sheet metal work and roof insulation work so that insulation and flashing are installed concurrently to permit continuous roofing operations.
3. Complete installation of flashing, insulation, and roofing in the same day except for the area where temporary protection is required when work is stopped.

B. Phased construction is not permitted. The complete installation of roofing system is required in the same day except for area where temporary protection is required when work is stopped. Complete installation includes pavers and ballast for ballasted systems.

C. Dry out surfaces that become wet from any cause during progress of the work before roofing work is resumed.

D. Apply materials only to dry substrates.

E. Except for temporary protection specified, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, fog, ice, or frost) is present in any amount in or on the materials.
   1. Do not apply materials to substrate having temperature of 4°C (40 degrees F) or less, or when materials applied with the roof require higher application temperature.
   2. Do not apply materials when the temperature is below 4°C (40 degrees F).

F. Temporary Protection:
   1. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.
   2. Temporarily seal exposed surfaces of insulation within the roofing membrane.
   3. Do not leave insulation surfaces or edges exposed.
   4. Use polyethylene film or building paper to separate roof sheet from bituminous materials.
   5. Apply the temporary seal and water cut off by extending the roof membrane beyond the insulation and securely embedding the edge of the roof membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide

strip of temporary closure sealant (night sealant) and weight edge with sandbags, to prevent displacement; space sandbags not over 2400 mm (8 foot) centers. Check daily to insure temporary seal remains watertight. Reseal open areas and weight down.

6. Before the work resumes, cut off and discard portions of the roof membrane in contact with roof cement or bituminous materials.
   a. Cut not less than 150 mm (6 inches) back from bituminous coated edges or surfaces.
   b. Remove temporary polyethylene film or building paper.
7. Remove and discard sandbags contaminated with bituminous products.
8. For roof areas that are to remain intact and that are subject to foot traffic and damage, provide temporary wood walkways with notches in sleepers to permit free drainage.
9. Provide 2 mm (6 mil) polyethylene sheeting or building paper cover over roofing membrane under temporary wood walkways and adjacent areas. Round all edges and corners of wood bearing on roof surface.

3.2 PREPARATION

A. Remove dirt, debris, and surface moisture. Cover or fill voids greater than 6 mm (1/4 inch) wide to provide solid support for roof membrane.

B. Install separation sheet over bituminous material on deck surface lapping edges and ends 150 mm (6 inches) or as recommended by roof membrane manufacturer.
   1. Do not install of separation sheet beyond what can be covered by roofing membrane each day.
   2. Use polyethylene, or building paper, that will be compatible with seaming method.
   3. Insure separation sheet completely isolates bituminous materials from EPDM roofing membrane.
   4. Turn up at penetrations, or other surfaces where bituminous materials occur, to cover bituminous product.
   5. Turn down over edges of blocking at perimeters to cover blocking.

3.3 INSTALLATION OF ROOFING AND FLASHING

A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with EPDM roofing membrane.

B. If possible, install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.

C. If possible, start at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet. Coordinate with roof insulation installation.

D. Position the membrane so it is free of buckles and wrinkles.

E. Roll sheet out on deck; inspect for defects as sheet is being rolled out and remove defective areas:

1. Allow 30 minutes for relaxing before proceeding.
2. Lap edges and ends of sheets 75 mm (3 inches) or more as recommended by the manufacturer. Clean lap surfaces as specified by manufacturer.
3. Adhesively splice laps. Apply pressure as required. Seam strength of laps as required by ASTM D4637.
4. Check seams to ensure continuous adhesion and correct defects.
5. Finish edges of laps with a continuous beveled bead of lap sealant to sheet edges to provide smooth transition as specified by manufacturer.
6. Finish seams as the membrane is being installed (same day).
7. Anchor perimeter to deck or wall as specified.

F. Membrane Perimeter Anchorage:

1. Install batten strip or steel stress plate with fasteners at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated in accordance with membrane manufacturer's instructions on top of roof membrane to wall or deck.
2. Mechanically fastened as follows:
   a. Top of mechanical fastener set flush with top surface of the nailing strip or stress plate.
   b. Space mechanical fasteners a maximum 300 mm (12 inches) on center.
   c. Start 25 mm (1 inch) from the end of the nailing strip when used.
   d. When strip is cut round edge and corners before installing.
   e. Set fasteners in lap sealant and cover fastener head with fastener sealer including batten strip or stress plate.
   f. Stop fastening strip where the use of the nailing strip interferes with the flow of the surface water, separate by a 150 mm (6 inch) space, then start again.
   g. After mechanically fastening cover and seal with a 225 mm (9 inch) wide strip of flashing sheet. Use splice adhesive on all laps and finish edge with sealant as specified.

h. At gravel stops turn the membrane down over the front edge of the blocking, cant, or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; with fasteners spaced not over 150 mm (6 inches) on centers.

i. At parapet walls intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 150 mm (6 inches) on center or as shown in NRCA manual (Fifth Edition)

G. Adhered System:

1. Apply bonding adhesive in quantities required by roof membrane manufacturer.
2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's application instruction, roll the membrane into the adhesive in manner that minimizes voids and wrinkles.
4. Repeat for other half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

H. Install flashings as the membrane is being installed (same day). If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.

I. Flashing Roof Drains:

1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
   a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.
   b. Do not allow the roof cement to come in contact with the EPDM roof membrane.
   c. Adhere the EPDM roof membrane to the metal flashing with the membrane manufacturer's recommended bonding adhesive.
2. Turn down the metal drain flashing and EPDM roof membrane into the drain body and install clamping ring and stainer.

J. Installing EPDM Base Flashing and Pipe Flashing:

1. Install EPDM flashing membranes to pipes, walls or curbs to a height not less than 200 mm (8 inches) above roof surfaces and 100 mm (4 inches) on roof membranes. Install in accordance with NRCA manual:
   a. Adhere flashing to pipe, wall or curb with bonding adhesive.

b. Form inside and outside corners of EPDM flashing membrane in accordance with NRCA manual (Fifth Edition). Form pipe flashing in accordance with NRCA manual (Fifth Edition).

c. Lap ends not less than 100 mm (4 inches).

d. Adhesively splice flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.

2. Anchor top of flashing to walls or curbs with fasteners spaced not over 150 mm (6 inches) on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.

3. Apply sealant to top edge of flashing.

3.5 WALKWAY PADS

A. Clean membrane where pads are applied.

B. Adhere pads to membrane with splicing cement.

C. Allow not less than 1 inch break between pads and 2 inch maximum break.

3.6 FIELD QUALITY CONTROL

A. Examine and probe seams in the membrane and flashing in the presence of the Project Manager and Membrane Manufacturer's Inspector.

B. Probe the edges of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal bonds, voids, skips, and fishmouths.

C. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through the seams where directed by the Project Manager.

1. Cut one sample for every 450 m (1500 linear feet) of seams.

2. Cut the samples perpendicular to the longitudinal direction of the seams.

3. Failure of the samples to maintain the standard of quality within a reasonable tolerance of the approved samples will be cause for rejection of the work.

D. Repair areas of welded seams where samples have been taken or marginal bond voids or skips occur.

E. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

3.7 TEMPORARY ROOF

A. Install temporary roof when sequences of work or weather does not permit installation of a completed permanent roof system or roof would

be subject to phasing of roof work, construction traffic, scaffolds, and work over roof area.

B. Use of 1.15 mm (0.045-inch) thick non-reinforced EPDM membrane or other temporary membrane as approved.

C. Secure membrane to deck with mechanical fasteners or temporary ballast not exceeding deck dead load capacity.

D. Repair cuts, tears, and punctures with patches to keep system watertight.

E. Install permanent roof system within one year.

END OF SECTION 07 53 23

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, break metal and formed and insulated expansion joint covers are specified in this section.

1.2 RELATED WORK

A. Single ply base flashing system: Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING.

B. Sealant compound and installation: Section 07 92 00, JOINT SEALANTS.

C. Color of factory coated metal and anodized aluminum: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Paint materials and application: Section 09 91 00, PAINTING.

E. Flashing of Roof Drains: Section 22 05 19, METERS AND GAGES FOR PLUMBING PIPING; Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING; Section 22 11 00, FACILITY WATER DISTRIBUTION; Section 22 13 00, FACILITY SANITARY SEWERAGE; Section 22 14 00, FACILITY STORM DRAINAGE.

1.3 SUBMITTALS

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

B. Shop Drawings:
Flashings
Copings
Scuppers
Expansion joints
Break Metal

C. Manufacturer's Literature and Data:
Two-piece counterflashing
Thru wall flashing
Expansion joint cover, each type
Nonreinforced, elastomeric sheeting
Copper clad stainless steel
Polyethylene coated copper
Bituminous coated copper
Copper covered paper

D. Certificates: Stating that aluminum has been given - specified finish.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below for a part of this specification to the extent referenced. The 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. ASTM International (ASTM):

A240/A240M-14.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A653/A653M-11.....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process

B32-08.....Solder Metal

B209-10.....Aluminum and Aluminum-Alloy Sheet and Plate

B370-12.....Copper Sheet and Strip for Building Construction

D173-03(R2011).....Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing

D412-06(R2013).....Vulcanized Rubber and Thermoplastic Elastomers-Tension

D1187-97(R2011).....Asphalt Base Emulsions for Use as Protective Coatings for Metal

D1784-11.....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

C. American National Standards Institute/Single Ply Roofing Institute (ANSI/SPRI):

ES-1-2003.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual (2003 Edition).

E. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

F. American Architectural Manufacturers Association (AAMA):

605-98.....Voluntary Specification for High Performance

Organic Coatings on Architectural Extrusions Panels

G. Federal Specification (Fed. Spec):

A-A-1925A.....Shield, Expansion; (Nail Anchors)

UU-B-790A.....Building Paper, Vegetable Fiber

H. International Building Code(IBC):

Current Edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.

B. Stainless Steel: ASTM A240, Type 302B, dead soft temper.

C. Copper ASTM B370, cold-rolled temper.

D. 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.

E. 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.

F. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.

G. 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.

H. Galvanized Sheet: ASTM, A653.

I. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same

size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

J. 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).

K. Bituminous Paint: ASTM D1187, Type I.

L. 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.

M. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

N. Insect Screening: ASTM D3656, 18 by 18 regular mesh.

O. Roof Cement: ASTM D4586.

2.2 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.

2.3 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, nonreinforced elastomeric sheeting 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 galvanized steel, 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 or minimum 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) thick stainless steel, 1.25mm (0.050 inch) thick aluminum.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 1 Kg (32 oz) copper, 0.8 mm (0.031 inch) thick stainless steel, 1.6 mm (0.0625 inch) thick aluminum.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:
1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC 2009.

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.

2.4 FINISH

A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
C. Finish exposed metal surfaces as follows, unless specified otherwise:
1. Copper: Mill finish.
2. Stainless Steel: Finish No. 2B or 2D.
3. Aluminum:
a. 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.
b. Fluorocarbon Finish: AAMA 620, high performance organic coating.

4. Steel and Galvanized Steel:
   a. Manufacturer's finish:
      1) Baked on prime coat over a phosphate coating.
      2) Baked-on prime and finish coat over a phosphate coating.
      3) Fluorocarbon Finish: AAMA 605, high performance organic coating.

2.5 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, elastomeric shelling, or copper clad stainless steel.
   2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
   3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.

C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
   1. Use same metal and thickness as counter flashing.
   2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
   3. Form exposed portion as snap lock receiver for counter flashing upper edge.

D. Window Sill Flashing and Lintel Flashing:
   1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
   2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
   3. Turn up back edge as shown.
   4. Form exposed portion with drip as specified or receiver.

E. 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.

2.6 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. Aluminum unless specified otherwise.

B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
   1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
   2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
   3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
   4. Manufactured assemblies may be used.
   5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
   6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.

C. One-piece Counterflashing:
   1. Back edge turned up and fabricate to lock into reglet in concrete.
   2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).

D. Two-Piece Counterflashing:
   1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
   2. Counterflashing upper edge designed to snap lock into receiver.

E. Surface Mounted Counterflashing; one or two piece:
   1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.

2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

F. Pipe Counterflashing:
1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.
3. Fabricate draw band of same metal as counter flashing. Use 0.6 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.

G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

2.12 **REGLETS**

A. Fabricate reglets of one of the following materials:
1. 0.4 Kg (16 ounce) copper.
2. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
3. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
4. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.

B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.

C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the

concrete.

D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.

E. Fabricate mitered corners, fittings, and special shapes as may be required by details.

F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.13 SCUPPERS

A. Fabricate scuppers OF .6 MM (03031) aluminum with minimum of 4 inch wide flange unless otherwise noted..

B. Provide flange at top on through wall scupper to extend to top of base flashing.

C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.

D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.

E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.

F. Fabricate gravel stop bar of 25 mm x 25 mm (one by one inch) angle strip soldered to bottom of scupper.

G. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.

H. Solder joints watertight.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover

holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.

5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
    a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
    b. Paint dissimilar metal with a coat of bituminous paint.
    c. Apply an approved caulking material between aluminum and dissimilar metal.

15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
    a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
    b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.

11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
14. Continue flashing around columns:
    a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
    b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).

B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.

C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).

D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.

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.

I. Flashing at Masonry, Stone, or Precast Concrete Copings:
1. Install flashing with drips on both wall faces unless shown otherwise.
2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. General:
1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.

5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.

B. One Piece Counterflashing:
1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
3. Where flashing is surface mounted on flat surfaces.
   a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
      1) Locate fasteners in masonry mortar joints.
      2) Use screws to sheet metal or wood.
   b. Fill joint at top with sealant.
4. Where flashing or hood is mounted on pipe.
   a. Secure with draw band tight against pipe.
   b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
   c. Completely fill joint at top with sealant.

C. Two-Piece Counterflashing:
1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.
2. Surface applied type receiver:
   a. Secure to face construction in accordance, with manufacturers instructions.
   b. Completely fill space at the top edge of receiver with sealant.
3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.

D. Where vented edge occur install so lower edge of counterflashing is against base flashing.

E. When counter flashing is a component of other flashing install as shown.

3.5 REGLETS

A. Install reglets in a manner to provide a watertight installation.

B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.

C. Butt and align end joints or each section of reglet and securely hold in position until concrete or mortar are hardened:

1. Coordinate reglets for anchorage into concrete with formwork construction.
2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.6 COPINGS

A. General:

1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.

B. Aluminum Coping:

1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
2. Install joint covers, centered at each joint, and securely lock in place.

3.7 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.

END OF SECTION 07 60 00

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies roof hatches; equipment supports; gravity ventilators; and metal grating roof walkway system.

1.2 RELATED WORK

A. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.

B. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL

A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.

B. Each accessory type shall be the same and be made by the same manufacturer.

C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS

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

B. Samples: Representative sample panel of color anodized aluminum not less than 100 mm X 100 mm (four by four inches), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.

C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.

D. Manufacturer's Literature and Data: Each item specified.

E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.

B. Federal Specifications (Fed. Spec.):

RR-G-1602D.....Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)

C. American Society for Testing and Material (ASTM):

A653/A653M-11.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process

B209/209M-10.....Aluminum and Aluminum Alloy-Sheet and Plate

B221/221M-13.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

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

D1187-97(R2011).....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):

2605-13.....High Performance Organic Coatings on Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum, Extruded: ASTM B221/B221M.

B. Aluminum Sheet: ASTM B209/B209M.

C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.

D. Metal Grating for Roof Walkway: Fed. Spec. RR-G-1602.

2.2 ROOF HATCH (SCUTTLE)

A. Fabricate from aluminum with mill finish.

B. Curb and Cover:

1. Exterior facing: Minimum 2.3 mm (0.09 inch) thick sheet aluminum.
2. Interior facing: Minimum 1 mm (0.04 inch) thick sheet aluminum.
3. Minimum of 25 mm (one inch) thick mineral fiber insulation between facings of cover and over exterior face of curb.
4. Form exterior curb facing with an integral three inch wide roof flange and cap flashing minimum 2.3 mm (0.09 inch) thick sheet aluminum.
5. Make curb 300 mm (12 inches) high.
6. Form cover to lap curb and cap flashing.
7. Size opening as shown.

C. Hardware:

1. Provide spring snap latch with inside and outside operating handles and padlock hasp on inside. Provide two snap latches when hinge side

is over 2100 mm (7 feet) long.

2. Provide pintle hinges.
3. Provide automatic hold open and operating arm with enclosed torsion or compression spring lifting mechanism.
4. Covers shall automatically lock in the open position at not less than 70 degrees.
5. Provide weatherstripping at cover closure.
6. Galvanize all hardware items.

D. Assembly:

1. Completely shop assemble roof scuttle.
2. Fully weld all joints exposed to the weather and built into the roofing.
3. Finish weld smooth where exposed.
4. Operation with minimum force to open and close.

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).

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.

END OF SECTION 07 71 00

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies copings, gravel stops, fascias, and expansion joints.

1.2 RELATED WORK

A. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES

B. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.

C. General insulation: Section 07 21 13, THERMAL INSULATION

D. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL

A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.

B. Each accessory type shall be the same and be made by the same manufacturer.

C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS

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

B. Samples: Representative sample panel of color anodized aluminum not less than 100 mm X 100 mm (four by four inches), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.

C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.

D. Manufacturer's Literature and Data: Each item specified.

E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.

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

B209/209M-07.....Aluminum and Aluminum Alloy-Sheet and Plate

B221/221M-08.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

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

D1187-97 (R2002).....Asphalt-Base Emulsions for Use as Protective Coatings for Metal

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

D. 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.

D. Insulation: ASTM C612, Class 1 or 2.

E. Asphalt Coating: ASTM D 1187, Type I, quick setting.

2.2 COPINGS

A. Fabricate of aluminum not less than 3.2 mm (0.125 inch) thick; 16 oz copper 0.5 mm (0.018 inch thick stainless steel).

B. Turn outer edges down each face of wall as shown.

C. Maximum lengths of 3000 mm (10 feet).

D. Shop fabricate external and internal corners as one piece assemblies with not less than 300 mm (12 inch) leg lengths.

E. Copings shall be Category 5 FM rated.

F. Provide 100 mm (four inch) wide 0.8 mm (0.032 inch) thick watertight joint covers.

G. Provide anchor gutter bar of 0.8 mm (0.032 inch) thick with anchor holes formed for underside of joint.

H. Provide concealed guttered splice plate of 0.8 mm (0.032 inch) thick with butyl or other resilient seal strips anchored to splice plate for underside of joint. Use galvanized steel anchor plate providing compression spring anchoring of coping cover.

I. Finish: Anodized.

2.3 EXTRUDED ALUMINUM FASCIAS

A. Fabricate of aluminum not less than 2 mm (0.078 inch) thick.

B. Turn fascia down face of wall and up above roof as shown.

C. Maximum lengths of 3000 mm (10-feet).

D. Shop fabricate external and internal corners as one piece assemblies with not less than 300 mm (12 inch) leg lengths.

E. Provide 100 mm (four inch) wide 2 mm (0.078 inch) thick watertight joint covers with 150 mm (six inch) wide 0.8 mm (0.030 inch) thick underside joint flashing.

2.4 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM

A. The fascia-cant system consists of three pieces, an extruded aluminum fascia, a galvanized steel cant, and an aluminum compression clamp.

B. Furnish in stock lengths of not more than 3000 mm (10 feet) long.

C. Form fascia from not less than 2 mm (0.070 inch) thick aluminum. Provide four inch wide 0.8 mm (0.032-inch) thick concealed sheet aluminum joint cover plates in back of fascia.

D. Form cant strip from galvanized steel not less than 0.8 mm (0.0299 inch) thick, to profile shown and design to hold lower edge of the fascia.

E. Form compression clamp of not less than 0.8 mm (0.032 inch) thick aluminum designed to hold the top edge of the fascia and the built-up flashing.

F. Internal and external corners:

1. Factory fabricate and fully weld mitered joints.
2. Furnish corner sections in manufacturers standard sizes with not less than 300 mm (12 inch) leg lengths.

G. Factory fabricated scupper assemblies:

1. Fabricate scupper assembly with extended plates to match fascia-cant in 500 mm (20 inch) minimum lengths.
2. Extend outlet opening not less than 50 mm (two inches) with drip edge.
3. Fabricate with stainless steel cores or sleeve to drain water from toe of cant and flash into built-up roofing with 100 mm (4 inch) wide flange.

H. Finish on aluminum: anodized as specified.

2.5 EXTRUDED ALUMINUM ROOF EXPANSION JOINT COVERS

A. Fabricate in 3000 mm (10 foot) lengths with fastener openings slotting for expansion not over 600 mm (24 inch) centers.

B. Provide four-way expansion, for joint widths shown.

C. Mill finish on aluminum.

D. Form waterstop or moisture seals of continuous sheets of neoprene, not less than 0.8 mm (0.032 inch) thick.

E. Fabricate corners as one piece assembly with mitered and welded joint and least dimension legs not less than 300 mm (12 inches) long.

F. Factory fabricate end caps and transitions to insure waterproof assembly.

G. Three piece assembly:

1. Roof expansion joint cover system consists of an extruded aluminum cover, extruded frame or curb vertical section, galvanized steel cant, and aluminum compression clamp counter flashing, complete with moisture seals. Form cover and vertical section from extruded aluminum, 2 mm (0.080 inch) minimum thickness with spring stainless steel tension or pivot bar.
2. Form cant from galvanized steel not less than 0.8 (0.029 inch) thick formed to profile shown.
3. Form splice plates of not less than 0.8 mm (0.032 inch) thick aluminum sheet.
4. Form counter flashing member of 1.3 mm (0.050 inch) thick sheet aluminum, secured with screws to the top edge of the vertical section and providing compression clamp over base flashing.
5. Provide compression gasket separating cover from curb bearing.

H. Two piece assembly:

1. Roof expansion joint system consists of an extruded aluminum cover combination extruded aluminum frame or curb with integral adjustable counter flashing flange, and moisture seals.
2. Form cover from extruded aluminum 2 mm (0.078 inch) minimum thickness.
3. Form cover anchor system of stainless steel pivot bar.
4. Form frame assembly of not less than 2 mm (0.076 inch) aluminum except for flashing portion.
5. Provide compression gasket separating cover from curb at bearing.

2.6 FINISH

A. In accordance with NAAMM Amp 500-505.

B. Aluminum Colored Finish: AA-C22A42 (anodized or AA0C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1, Architectural, 0.7 mils thick.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof accessories where shown.

B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.

C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.

D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.

E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

F. Fascias:

1. Install fascia with butt joints with approximately 6 mm (1/4 inch) space for expansion.
2. Over each joint provide cover plates of sheet aluminum, complete with concealed sheet aluminum flashing, centered under each joint.
3. Lap cover plates and concealed flashing over the gravel stop and fascia not less than four inches.
4. Extend concealed flashing over built-up roofing, embed in roof cement and turn down over face of blocking at roof edge.

G. Aluminum Coping:

1. Install sections of coping with approximately 6 mm (1/4-inch) space between ends of sections.
2. Center joint gutter bar and covers at joints and securely lock in place.
3. When snap-on system is used insure front and back edges are locked in place.

H. Fascia-Cant System:

1. Install galvanized steel cant; coordinate with roofing work and after completion of roofing work install extruded aluminum fascia, concealed joint cover plate, and aluminum compression clamp, where shown.
2. Install system to allow for expansion and contraction with 6 mm (1/4 inch) space between extruded aluminum members and galvanized steel cant as required by manufacturer of system.
3. Offset joints in extruded aluminum members from galvanized steel cant joints.

I. Expansion Joint Covers:

1. Install to terminate base flashing 200 mm (8 inches) above roof.

2. Install moisture seals to drain water to outlets that do not permit water to enter buildings construction.
3. Use stainless steel screws when exposed.
4. Three piece assembly:
   a. Install curb section with screws to wood blocking, allowing 6 mm (1/4 inch) at butt joints between sections with splice plate at joint.
   b. Install cant to wood blocking by nailing along horizontal flange every 150 mm (6 inches), with galvanized roofing nails 25 mm (one inch) long.
   c. After completion of base flashing install cap flashing and compression clamp and fasten to the curb or metal cant with stainless steel self-tapping screws with neoprene washers under head spaced approximately 450 mm (18 inches) on center.
   d. Install expansion joint cover with a 6 mm (1/4 inch) wide end joints.
   e. Install over end joint a cover plate complete with concealed aluminum flashing, centered under each joint. Fabricate flashing to lap cover not less than four inches.
5. Two piece assembly:
   a. Install curb section with screws allowing 6 mm (1/4 inch) space at end joints with splice plate at joint.
   b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
   c. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 600 mm (24 inches) on center.
   d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).

3.2 PROTECTION OF ALUMINUM

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.

B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.3 ADJUSTING

Adjust expansion joints to close tightly and be watertight; insuring maximum allowance for building movement.

3.4 PROTECTION

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

END OF SECTION 07 72 00

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SECTION 07 81 60
INTERIOR INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Preparing surfaces to receive fireproofing.

B. Protection of adjacent surfaces from over spraying.

1.2 RELATED WORK

A. Section 05 12 00 - Structural Steel.

1.3 REFERENCES

A. ASTM D 256 - Impact Resistance Test.

B. ASTM D 638 - Tensile Strength.

C. ASTM D 695 - Standard Test Method for Compressive Strength.

D. ASTM D 790 - Standard Test Method for Flexural Strength.

E. ASTM D 1002 - Standard Test Method for Bond Strength.

F. ASTM D 1044 - Standard Test Method for Abrasion Resistance Test.

G. ASTM D 4541 - Bond Strength.

H ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM E 119 - Fire Tests of Building Construction and Materials.

J. U.L., Inc. - Fire Resistance Directory.

K. SSPC-SP-1 Solvent Cleaning - Steel Structures Painting Council (SSPC).

L. SSPC-SP-2 Hand Tool Cleaning - Steel Structures Painting Council (SSPC).

M. SSPC-SP-3 Power Tool Cleaning - Steel Structures Painting Council (SSPC).

N. SSPC-SP-6 Commercial Blast Cleaning - Steel Structures Painting Council (SSPC).

1.4 PERFORMANCE REQUIREMENTS

A. Intumescent fireproofing system to provide a fire rating of two hours.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01 33 23 - Shop Drawings, Product data and Samples.

B. Submit manufacturer's installation instruction, repair and patching instructions.

C. Submit Manufacturer's certificate products meet or exceed specified requirements.

D. Submit test reports.

E. Submit certified test reports indicating the following:

1. Fire test reports of fireproofing application to substrate materials similar to project conditions.
2. U.L. Design Listings from U.L., Inc.

F. Submit applicator's current certification, by product manufacturer, as a factory trained and manufacturer approved installer of this product.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.

B. Applicator: Company specializing in applying the work of this Section with minimum 3 years documented experience and approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings.

B. Submit certification of acceptability of fireproofing materials to authority having jurisdiction and to Architect.

1.8 ENVIRONMENTAL REQUIREMENTS

A. When temperature is less than 40F, follow manufacturer’s field instructions for cold weather installation. So not apply when surface temperature is less than 5 degrees F above the dew point.

B. Provide ventilation in areas to receive fireproofing during and 72 hours, minimum, after application, to dry materials and dissipate solvent odors. Ventilate application area to exterior window with negative air machines as needed to achieve six (6) changes per hour.

C. Maintain non-toxic, unpolluted working area. Provide temporary enclosure to prevent spray from contaminating air.

D. Field applied materials shall be trowel applied at connections. The remaining sections shall be shop applied spray applied.

1.9 SEQUENCING AND SCHEDULING

A. Sequence work in conjunction with placement of storefront system and canopy components.

1.10 WARRANTY

A. Provide one year manufacturer’s warranty.

B. Provide one year applicator’s warranty.

C. Warranty: Fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering. Reinstall or repair such defects or failures.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN MANUFACTURERS

A. Albi Manufacturing, East Berlin, CT (860) 828-0571; “ALBI CLAD TF.”

B. Carboline Company, St. Louis, MO 800-848-4645; A/D Firefilm III.

2.2 MATERIALS

A. Intumescent Fireproofing: Single component, water based, factory mixed, asbestos free, intumescent material blended for uniform texture; conforming to the following requirements:

1. Bond Strength: ANSI/ASTM E 736, 40 psi when set and dry.
2. Bond Impact: ASTM E 760, no cracking, flaking, or delamination.
3. Dry Density: ASTM E 605, minimum average density of 85 lb/cu ft. with minimum individual density of 85 lb/cu ft.
4. Surface Burning Characteristics, ASTM E84:
   a. Flame Spread:
   b. Smoke Developed:
5. Compressive Strength: Minimum 300 psi.

B. Primer type recommended or approved by fireproofing manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive work.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is complete.

D. Verify that voids and cracks in substrate are filled, and projections are removed where fireproofing is exposed to view as a finish material.

E. Beginning of installation means applicator accepts existing substrate.

3.2 PREPARATION

A. Work in accordance with SSPC guidelines SSPC-SP-1, SSPC-SP-2 or SSPC-SP-3 as appropriate to prepare sub-strate.

B. Clean substrate of dirt, dust, grease, oil, loose material, or other matter which may effect bond of fireproofing.

C. Seal all penetrations or open ended fireproofing termination by chamfering at a 45 degree angle and sealing with high heat silicone sealant.

D. Install reinforcement over structural members as indicated on Drawings, or U.L. Fire Resistance Directory Listings.

3.3 PROTECTION

A. Protect floor areas from this Work by completely covering with tarps or 4 mil polyethylene sheets.

B. Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting.

C. Close off and seal ductwork in areas where fireproofing is being applied.

3.4 APPLICATION

A. Apply primer and fireproofing in accordance with manufacturer’s instructions. Do not apply to surfaces which would prohibit proper adhesions.

B. Apply primer according to primer manufacturer’s recommendations. Provide primer “cut-back” three inches for bolted connections and 12 inches for welded connections.

C. Apply fireproofing in sufficient thickness to achieve rating, with as many passes necessary to cover with monolithic blanket of uniform hardness, density and texture. Spray, and roll smooth the finished surface.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed using manufacturer’s guidelines under by contractor-provided testing agency.

B. Inspections will be performed to verify compliance with requirements.

C. Patch fireproofing, which has been cut away to facilitate work of other trades, so as to maintain complete coverage of full thickness on appropriate substrate.

D. Correct unacceptable Work and provide further inspection to verify compliance with requirements, at no cost.

3.6 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not specifically required to be fireproofed.

3.7 SCHEDULE OF FIREPROOFING

A. Steel Columns - U.L. Ratings: 2 hours.

END OF SECTION 07 81 60

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. Sealants and application: Section 07 92 00, JOINT SEALANTS.

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

A. Firestopping work subject to the terms of the Article “Warranty of Construction”, except extend the warranty period to five years.

1.6 QUALITY ASSURANCE

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

1.7 APPLICABLE PUBLICATIONS

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

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

E84-07.....Surface Burning Characteristics of Building Materials

E814-06.....Fire Tests of Through-Penetration Fire Stops

C. Factory Mutual Engineering and Research Corporation (FM):
Annual Issue Approval Guide Building Materials

D. Underwriters Laboratories, Inc. (UL):
Annual Issue Building Materials Directory
Annual Issue Fire Resistance Directory
1479-03.....Fire Tests of Through-Penetration Firestops

E. Warnock Hersey (WH):
Annual Issue Certification Listings

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.

B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m^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 Project Manager.

C. Clean up spills of liquid type materials.

END OF SECTION 07 84 00

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. Sealing of site work concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

B. Masonry control and expansion joint: Section 04 20 00, UNIT MASONRY.

C. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.

D. Glazing: Section 08 80 00, GLAZING.

E. Glazed aluminum curtain wall: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.

F. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.

G. 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. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.

1.4 SUBMITTALS:

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

B. Manufacturer's installation instructions for each product used.

C. Cured samples of exposed sealants for each color where required to match adjacent material.

D. Manufacturer's Literature and Data:

1. Caulking compound
2. Primers

3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

1.5 PROJECT CONDITIONS:

A. Environmental Limitations:

1. Do not proceed with installation of joint sealants under following conditions:

a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 °C (40 °F).

b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 DELIVERY, HANDLING, AND STORAGE:

A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.

B. Carefully handle and store to prevent inclusion of foreign materials.

C. Do not subject to sustained temperatures exceeding 5° C (40° F) or less than 32° C (90° F).

1.7 DEFINITIONS:

A. Definitions of terms in accordance with ASTM C717 and as specified.

B. Back-up Rod: A type of sealant backing.

C. Bond Breakers: A type of sealant backing.

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

1.8 WARRANTY:

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

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

concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1.9 APPLICABLE PUBLICATIONS:

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

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

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

C612-04.....Mineral Fiber Block and Board Thermal Insulation.

C717-07.....Standard Terminology of Building Seals and Sealants.

C834-05.....Latex Sealants.

C919-02.....Use of Sealants in Acoustical Applications.

C920-05.....Elastomeric Joint Sealants.

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

C1193-05.....Standard Guide for Use of Joint Sealants.

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

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

E84-08.....Surface Burning Characteristics of Building Materials.

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

PART 2 - PRODUCTS

2.1 SEALANTS:

A. S-1:

1. ASTM C920, polyurethane or polysulfide.
2. Type M.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 20-40

B. S-2:

1. ASTM C920, polyurethane or polysulfide.
2. Type M.

3. Class 25.
4. Grade P.
5. Shore A hardness of 25-40.

C. S-3:
1. ASTM C920, polyurethane or polysulfide.
2. Type S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade NS.
5. Shore A hardness of 15-25.
6. Minimum elongation of 700 percent.

D. S-4:
1. ASTM C920 polyurethane or polysulfide.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-40.

E. S-5:
1. ASTM C920, polyurethane or polysulfide.
2. Type S.
3. Class 25.
4. Grade P.
5. Shore hardness of 15-45.

F. S-6:
1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class: Joint movement range of plus 100 percent to minus 50 percent.
4. Grade NS.
5. Shore A hardness of 15-20.
6. Minimum elongation of 1200 percent.

G. S-7:
1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

H. S-8:
1. ASTM C920, silicone, acetoxy cure.

2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

I. S-9:
1. ASTM C920 silicone.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

J. S-10:
1. ASTMC C920, coal tar extended fuel resistance polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 15-20.

K. S-11:
1. ASTM C920 polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

L. S-12:
1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

2.2 CAULKING COMPOUND:

A. C-1: ASTM C834, acrylic latex.

B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

2.3 COLOR:

A. Sealants used with exposed masonry shall match color of mortar joints.

B. Sealants used with unpainted concrete shall match color of adjacent concrete.

C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.

D. Caulking shall be light gray or white, unless specified otherwise.

2.4 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Type C: Closed-cell material with a surface skin.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32° C (minus 26° F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 FILLER:

A. Mineral fiber board: ASTM C612, Class 1.

B. Thickness same as joint width.

C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

A. As recommended by manufacturer of caulking or sealant material.

B. Stain free type.

2.7 CLEANERS-NON POUROUS SURFACES:

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.

B. Coordinate for repair and resolution of unsound substrate materials.

C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

A. Prepare joints in accordance with manufacturer's instructions and SWRI.

B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.

1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

C. Do not cut or damage joint edges.

D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
   1. Apply primer prior to installation of back-up rod or bond breaker tape.
   2. Use brush or other approved means that will reach all parts of joints.
F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION:

A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
F. Take all necessary steps to prevent three sided adhesion of sealants.

3.4 SEALANT DEPTHS AND GEOMETRY:

A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

A. General:
   1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).
   2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
   3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
   4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
   5. Avoid dropping or smearing compound on adjacent surfaces.

6. Fill joints solidly with compound and finish compound smooth.
7. Tool joints to concave surface unless shown or specified otherwise.
8. Finish paving or floor joints flush unless joint is otherwise detailed.
9. Apply compounds with nozzle size to fit joint width.
10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.

B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.

C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.7 CLEANING:

A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.

B. After filling and finishing joints, remove masking tape.

C. Leave adjacent surfaces in a clean and unstained condition.

3.8 LOCATIONS:

A. Exterior Building Joints, Horizontal and Vertical:

1. Metal to Metal: Type S-1, S-2
2. Metal to Masonry or Stone: Type S-1
3. Masonry to Masonry or Stone: Type S-1

4. Threshold Setting Bed: Type S-1, S-3, S-4
5. Masonry Expansion and Control Joints: Type S-6
6. Wood to Masonry: Type S-1
7. Cast Stone to Cast Stone: Type S-1

B. Metal Reglets and Flashings:
1. Flashings to Wall: Type S-6
2. Metal to Metal: Type S-6

C. Sanitary Joints:
1. Walls to Plumbing Fixtures: Type S-9
2. Counter Tops to Walls: Type S-9
3. Pipe Penetrations: Type S-9

D. Horizontal Traffic Joints:
1. Concrete Paving, Unit Pavers: Type S-11 or S-12

E. Interior Caulking:
1. Typical Narrow Joint 6 mm (1/4 inch) or less at Walls and Adjacent Components: Types C-1, C-2 and C-3.
2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Types C-1, C-2 and C-3.
3. Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1, C-2 and C-3.
4. Perimeter of Lead Faced Control Windows and Plaster or Gypsum Wallboard Walls: Types C-1, C-2 and C-3.
5. Exposed Isolation Joints at Top of Full Height Walls: Types C-1, C-2 and C-3.
6. Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
7. Concealed Acoustic Sealant Type S-4, C-1, C-2 and C-3.

END OF SECTION 07 92 00

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies floor, wall and ceiling and building expansion joint assemblies.

B. Types of assemblies:

Metal Plate Cover

Elastomeric Joint Covers

Preformed Elastomeric Sealant Joint

1.2 RELATED WORK

A. Sheet Metal Expansion Joint Seals: Section 07 60 00, FLASHING AND SHEET METAL.

B. Roof Expansion Joint Cover Assemblies: Section 07 72 00, ROOF ACCESORIES.

C. Color of Elastomer Inserts, Filler Strips, Exterior Wall Seals and Metal Finishes: Section 09 06 00, SCHEDULE FOR FINISHES

D. Steel Plate Expansion Joint Covers: Section 05 50 00, METAL FABRICATIONS.

1.3 QUALITY ASSURANCE

A. Project Conditions:

1. Check actual locations of walls and other construction, to which work must fit, by accurate field measurements before fabrication.
2. Show recorded measurements on final shop drawings.

B. Fire tests performed by Factory Mutual, Underwriters Laboratories, Inc., Warnock Hersey or other approved independent testing laboratory.

1.4 DELIVERY STORAGE AND HANDLING

A. Take care in handling of materials so as not to injure finished surface and components.

B. Store materials under cover in a dry and clean location off the ground.

C. Remove materials which are damaged or otherwise not suitable for installation from job site and replace with acceptable materials.

1.5 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Submit copies of manufacturer's current literature and data for each item specified.

2. Clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for ultraviolet exposure.

C. Certificates: Material test reports from approved independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements specified.

D. Shop Drawings:

1. Showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joiners with other type assemblies, special end conditions, anchorages, fasteners, and relationship to adjoining work and finishes.
2. Include description of materials and finishes and installation instructions.

E. Samples:

1. Samples of each type and color of metal finish on metal of same thickness and alloy used in work.
2. Samples of each type and color of flexible seal used in work.

1.6 APPLICABLE PUBLICATIONS

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

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

A36/A36M-08.....Structural Steel

A240/A240M-14.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A283/A283M-07.....Low and Intermediate Tensile Strength Carbon Steel Plates

A786/A786M-05(R2009)....Rolled Steel Floor Plates

B36/B36M-08.....Brass, Plate, Sheet, Strip, and Rolled Bar

B121-01(R2006).....Leaded Brass Plate, Sheet, Strip and Rolled Bar

B209M-07.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221M-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

B455-10.....Copper-Zinc Lead Alloy (Leaded Brass) Extruded Shapes

C864-05.....Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

C920-11.....Elastomeric Joint Sealants

D1187-97 (R2002).....Asphalt Base Emulsions for Use as Protective Coatings for Metal

D2287-96 (R2010).....Non-rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

E119-10.....Fire Tests of Building Construction and Materials

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

C. Federal Specifications (Fed. Spec):

TT-P-645B.....Primer, Paint, Zinc-Molybdate, Alkyd Type

D. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series.....Metal Finishes Manual.

E. National Fire Protection Association (NFPA):

251-06.....Tests of Fire Endurance of Building Construction and Materials

F. Underwriters Laboratories Inc. (UL):

263-11.....Fire Tests of Building Construction and Materials

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A240, Type 302 or 304.

B. Structural Steel Shapes: ASTM A36.

C. Steel Plate: ASTM A283, Grade C.

D. Aluminum:

1. Extruded: ASTM B221, alloy 6063-T5.
2. Plate and Sheet: ASTM B209, alloy 6061-T6.

E. Elastomeric Sealant:

1. ASTM C920, polyurethane.
2. Type.
3. Class 25.
4. Grade P or NS.
5. Shore A hardness 25, unless specified otherwise.

F. Thermoplastic Rubber:

1. ASTM C864.
2. Dense Neoprene or other material standard with expansion joint

manufacturers having the same physical properties.

G. Vinyl Invertor Sealant Waterstops: Manufacturers' standard shapes and grade.

H. Fire Barrier:

1. Designed for indicated or required dynamic structural movement without material degradation or fatigue.
2. Tested in maximum joint width condition as a component of an expansion joint cover assembly in accordance with UL 263 NFPA 251, or ASTM E119 and E814, including hose steam test at full-rated period.

I. Accessories:

1. Manufacturer's standard anchors, fasteners, set screws, spaces, flexible secondary water stops or seals and filler materials, drain tubes, adhesive and other accessories as indicated or required for complete installations.
2. Compatible with materials in contact.
3. Water stops.

2.2 FABRICATION

A. General:

1. Use ceiling and wall expansion joint cover assemblies of same design as floor to wall and floor to floor expansion joint cover assemblies. Unless shown otherwise.
2. Provide expansion joint cover assemblies of design, basic profile, materials and operation indicated required to accommodate joint size variations in adjacent surfaces, and as required for anticipated structural movement.
3. Deliver to job site ready for use and fabricated in as large sections and assemblies as practical. Assemblies identical to submitted and reviewed shop drawings, samples and certificates.
4. Furnish units in longest practicable lengths to minimize number of end joints. Provide mitered corners where joint changes directions or abuts other materials.
5. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other assemblies.
6. Fire Performance Characteristics:
   a. Provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per ASTM

E119 and E814, NFPA 251, or UL 263 including hose stream test at full-rated period.

b. Fire rating: Not less than rating of adjacent floor or wall construction.

7. Fire Barrier Systems:
   a. Material to carry label of approved independent testing laboratory, and be subject to follow-up system for quality assurance.
   b. Include thermal insulation where necessary, in accordance with above tests, with factory cut miters and transitions.
   c. For joint widths up to and including 150 mm (six inches), supply barrier in lengths up to 15000 mm (50 feet) to eliminate field splicing.
   d. For joint widths of seven inches and wider, supply barrier 3000 mm (10-foot) modules with overlapping ends for field splicing.
   e. For joints within enclosed spaces such as chase walls, include 1 mm (0.032-inch) thick galvanized steel cover where conventional expansion joint cover is not used.
8. Seal Strip factory - formed and bonded to metal frames and anchor members.
9. Compression Seals: Prefabricate from thermoplastic rubber or dense neoprene to sizes and approximate profiles shown.

B. Interior Wall Joint Cover Assemblies:
   1. Surface Mounted Metal Cover Plates:
      a. Concealed frame for fastening to wall on one sides of joint.
      b. Extend cover to lap each side of joint and to permit free movement on one side.
      c. Provide concealed attachment of cover t frame cover in close contact with adjacent finish wall surfaces.
      d. Use angle cover plates at intersection of walls.
      e. Use smooth surface cover plates matching floor plates.
      f. Use expansion fire inserts in fire rated walls, rated same as hour rating of wall.

C. Ceiling Assemblies:
   1. Variable movement vinyl insert in metal frame on both sides of joint.
   2. Designed for flush mounting with no exposed fasteners.

3. Vinyl insert locked into metal frame.
4. Vinyl and metal finish as specified in section 09 06 00, SCHEDULE FOR FINISHES.

5. Vinyl insert semi rigid either flush face or accordion shape as showed to span joint width without sagging.

2.3 METAL FINISHES

A. General:
1. Apply finishes in factory after products are fabricated.
2. Protect finishes on exposed surfaces with protective covering before shipment.

B. Aluminum Finishes:
1. Finish letters and numbers for anodized aluminum are in accordance with the NAAMM AMP 501, Aluminum Association's Designation System).
   a. Clear anodized finish: AA-C22A41 Chemically etched medium matte, clear anodic coating, Class I Architectural, 0.7 - mil thick.
   b. Color anodized finish: AA-C22A42, Chemically etched medium matte, integrally colored anodic coating, Class I Architectural, 0.7-mil thick. Dyes not accepted.
2. Factory-Primed Concealed Surface: NAAMM AMP 505 Protect concealed aluminum surfaces that will be in contact with plaster, concrete or masonry surfaces when installed by applying a shop coat of zinc-molybdate primer to contact surfaces. Provide minimum dry film thickness of 2.0 mils.

C. Stainless Steel: NAAMM AMP 503, finish No. 2B.

D. Carbon Steel: NAAMM AMP 504, Galvanized 690.

PART 3 EXECUTION

3.1 EXAMINATION

A. Manufacturer’s representative shall make a thorough examination of surfaces receiving work of this section.

B. Before starting installation, notify prime contractor of defects which would affect satisfactory completion of work.

3.2 PREPARATION

A. Verify measurements and dimensions at job site and cooperate in coordination and scheduling of work with work of related trades.

B. Give particular attention to installation of items embedded in concrete and masonry so as not to delay job progress.

C. Provide templates to related trade for location of support and

anchorage items.

3.3 INSTALLATION

A. Install in accordance with manufacturers installation instructions unless specified otherwise.

B. Provide anchorage devices and fasteners for securing expansion joint assemblies to in-place construction including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide metal fasteners of type and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.

D. Install joint cover assemblies in true alignment and proper relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.

E. Allow for thermal expansion and contraction of metal to avoid buckling.

F. Set floor covers at elevations flush with adjacent finished floor materials unless shown otherwise.

G. Material and method of grouting floor frames set in prepared recesses in accordance with manufacturer’s instructions.

H. Locate wall, ceiling and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories.

I. Locate anchors at interval recommended by manufacturer, but not less than 75 mm (3-inches) from each ends, and, not more than 600 mm (24-inches) on centers.

J. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.

K. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames or plates.

L. Flush Metal Cover Plates:

1. Secure flexible filler between frames so that it will compress and expand.
2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

M. Waterstops:

1. Install in conjunction with floor joints and where shown, run continuously to prevent water damage to finish spaces.
2. Provide seal with frame to prevent water leakage.
3. Provide outlet tubes from waterstops to drain to prevent damage to finish spaces.

N. Fire Barriers:
1. Install in compliance with tested assembly.
2. Install in floors and in fire rated walls.
3. Use fire barrier sealant or caulk supplied with system.

O. Sealants:
Install to prevent water and air infiltration.

P. Vertical Exterior Extruded Thermoplastic Rubber.
1. Install side frames mounted on sealant or butyl caulk tape with appropriate anchors 600 mm (24 inches) on center complete with independent continuous PVC back seal.
2. Install primary seals retained in extruded aluminum side frames.

Q. Installation of Extruded Thermoplastic Rubber or Seals:
1. For straight sections, provide preformed seals in continuous lengths.
2. Vulcanize or heat-seal field splice joints to provide watertight joints using manufacturer's recommended procedures.

R. Installation of Preformed Elastomeric Sealant Joint:
1. Locate joint directly over joints in wall or floor substrates.
2. Full length shall be fastened to substrate using a construction adhesive.
3. Install flush or slightly below finish material.

3.4 PROTECTION

A. Take proper precautions to protect the expansion joint covers from damage after they are in place.

B. Cover floor joints with plywood where wheel traffic occurs.

END OF SECTION 07 95 13

Division 08

Openings

Division 08

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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. Door Hardware: Section 08 71 00, DOOR HARDWARE.

B. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.

C. Card readers and biometric devices: Section 28 13 00, ACCESS CONTROL.

1.3 TESTING

A. 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.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.
10. 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 (R2006).....Thermal Transmittance of Steel Door and Frame Assemblies

128-09.....Acoustical Performance for Steel Door and Frame Assemblies

E. American National Standard Institute:

A250.8-2003 (R2008).....Specifications for Standard Steel Doors and Frames

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

A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A568/568-M-11.....Steel, Sheet, Carbon, and High-Strength, Low-alloy, Hot-Rolled and Cold-Rolled

A1008-10.....Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability

B209/209M-10.....Aluminum and Aluminum-Alloy Sheet and Plate

B221/221M-12.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

D1621-10.....Compressive Properties of Rigid Cellular Plastics

D3656-07.....Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns

E90-09.....Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

G. The National Association Architectural Metal Manufactures (NAAMM):

Metal Finishes Manual (AMP 500-06)

H. National Fire Protection Association (NFPA):

80-13.....Fire Doors and Fire Windows

I. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory

J. Intertek Testing Services (ITS):
Certifications Listings…Latest Edition

K. Factory Mutual System (FM):
Approval Guide

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.

B. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.

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

2.2 FABRICATION GENERAL

A. GENERAL:

1. Follow ANSI 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 ANSI A250.8. Thickness, 44 mm (1-3/4 inches), unless otherwise shown.
2. Close top edge of exterior doors flush and seal to prevent water intrusion.
3. When vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.

B. Standard Duty Doors: ANSI A250.8, Level 1, Full flush seamless design of size and design shown. Use for interior locations only. Do not use for stairwell doors, security doors and detention doors.

C. Heavy Duty Doors: ANSI A250.8, Level 2, Full flush seamless design 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.

Core Construction Type	Door Core Description
a	Kraft honeycomb
b	Polyurethane
c	Polystyrene
d	Unitized steel grid
e	Mineral fiberboard
f	Vertical steel stiffeners

D. Smoke Doors:

E.

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. ANSI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
2. 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.
3. Knocked-down frames are not acceptable.

B. Reinforcement and Covers:

1. ANSI A250.8 for, minimum thickness of steel reinforcement welded to back of frames.

2. Provide mortar guards securely fastened to back of hardware reinforcements except on lead-lined frames.

C. Terminated Stops: ANSI 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 frames set in prepared openings:

1) Steel pipe spacers with 6 mm (1/4 inch) inside diameter welded to plate reinforcing at jamb stops or hat shaped formed strap spacers, 50 mm (2 inches) wide, welded to jamb near stop.

2) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass thru frame and spacers.

3) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.

f. Anchors for observation windows and other continuous frames set in stud partitions.

1) In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.

2) Anchors spaced 600 mm (24 inches) on centers maximum.

g. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

2.4 SHOP PAINTING

A. ANSI A250.8.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Plumb, align and brace frames securely until permanent anchors are set.

1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
2. Use wood spreaders at bottom of frame if the shipping spreader is removed.
3. Protect frame from accidental abuse.
4. Where construction will permit concealment, leave the shipping spreaders in place after installation, otherwise remove the spreaders after the frames are set and anchored.
5. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.

B. Floor Anchors:

1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts. Use 9 mm (3/8 inch) bolts on lead lined frames.
2. Power actuated drive pins may be used to secure frame anchors to concrete floors.

C. Jamb Anchors:

1. Anchors in masonry walls: Embed anchors in mortar. Fill space between frame and masonry wall with grout or mortar as walls are

built.

2. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls.
3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.
4. Frames set in prepared openings of masonry or concrete: Expansion bolt to wall with 6 mm (1/4 inch) expansion bolts through spacers. Where subframes or rough bucks are used, 6 mm (1/4 inch) expansion bolts on 600 mm (24 inch) centers or power activated drive pins 600 mm (24 inches) on centers. Secure two piece frames to subframe or rough buck with machine screws on both faces.

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

3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

A. Install doors and hardware as specified in Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, WOOD DOORS, and Section 08 71 00, DOOR HARDWARE.

END OF SECTION 08 11 13

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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: Section 28 13 00, ACCESS CONTROL

1.3 SUBMITTALS

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

B. 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.

C. Manufacturer's Literature and Data:

1. Labeled fire rated doors showing conformance with NFPA 80.

D. Laboratory Test Reports:

1. Screw holding capacity test report in accordance with WDMA T.M.10.
2. Split resistance test report in accordance with WDMA T.M.5.
3. Cycle/Slam test report in accordance with WDMA T.M.7.
4. Hinge-Loading test report in accordance with WDMA T.M.8.

1.4 WARRANTY

A. Doors are subject to terms of Article titled “Warranty of Construction”, FAR clause 52.246-21, except that warranty shall be as follows:

1. For interior doors, manufacturer’s warranty for lifetime of original installation.

1.5 DELIVERY AND STORAGE

A. Factory seal doors and accessories in minimum of 6 mill polyethylene bags or cardboard packages which shall remain unbroken during delivery and storage.

B. Store in accordance with WDMA I.S.1-A, J-1 Job Site Information.

C. Label package for door opening where used.

1.6 APPLICABLE PUBLICATIONS

A. 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.1A-11.....Architectural Wood Flush Doors

I.S.4-09.....Water-Repellent Preservative Non-Pressure Treatment for Millwork

I.S.6A-11.....Architectural Wood Stile and Rail Doors

T.M.5-90.....Split Resistance Test Method

T.M.6-08.....Adhesive (Glue Bond) Durability Test Method

T.M.7-08.....Cycle-Slam Test Method

T.M.8-08.....Hinge Loading Test Method

T.M.10-08.....Screwholding Test Method

C. National Fire Protection Association (NFPA):

80-10.....Protection of Buildings from Exterior Fire

252-08.....Fire Tests of Door Assemblies

D. ASTM International (ASTM):

E90-09.....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. Match existing cut - Rotary cut birch.
   a. A grade face veneer standard optional.

b. AA grade face veneer
c. Match face veneers for doors for uniform effect of color and grain at joints.
d. Door edges shall be same species as door face veneer except maple may be used for stile face veneer on birch doors.
e. In existing buildings, where doors are required to have transparent finish, use wood species and grade of face veneers to match adjacent existing doors.

4. Factory sand doors for finishing. C.1. 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.

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.

2.4 IDENTIFICATION MARK:

A. On top edge of door.
B. Either a stamp, brand or other indelible mark, giving manufacturer’s name, door’s trade name, construction of door, code date of manufacture and quality.

C. Accompanied by either of the following additional requirements:
   1. An identification mark or a separate certification including name of inspection organization.
   2. Identification of standards for door, including glue type.
   3. Identification of veneer and quality certification.

2.5 SEALING:

A. Give top and bottom edge of doors two coats of catalyzed polyurethane or water resistant sealer before sealing in shipping containers.

PART 3 - EXECUTION

3.1 DOOR PREPARATION

A. Field, shop or factory preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.
B. Clearances between Doors and Frames and Floors:
   1. Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
C. Provide cutouts for special details required and specified.
D. Rout doors for hardware using templates and location heights specified in Section, 08 71 00 DOOR HARDWARE.
E. Fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (two inches) of door thickness, 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 steel astragal to meeting style of active leaf or pair of doors or double egress smoke doors.

3.2 INSTALLATION OF DOORS APPLICATION OF HARDWARE

A. Install doors and hardware as specified in this Section.

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 Project Manager.

END OF SECTION 08 14 00

SECTION 08 35 13.13
ACCORDION FOLDING DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies top supported, accordion folding, vinyl covered doors.

1.2 RELATED WORK

A. Color and texture of vinyl fabric and color of enamel finish on steel track: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 MANUFACTURER'S QUALIFICATIONS

A. Accordion folding doors shall be the product of a manufacturer regularly engaged in the manufacture of accordion folding doors specified.

1.4 PERFORMANCE REQUIREMENTS

A. When doors are fully extended and latched, they shall provide a complete closure of the opening.

B. When compressed, doors shall stack in a space no greater than 12 mm per 300 mm (1/2 inch per foot) of opening width plus the thickness of the lead post.

1.5 SUBMITTALS

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

B. Shop Drawings:
Folding doors, showing each door (location and size) and method of installation.

C. Samples:
Vinyl covering; 150 mm (6 inch) square samples of each color and each texture to be used

D. Manufacturer's Literature and Data (Mark Literature to show items being furnished):
Folding door(s)

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):
A1008/A1008M-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low Alloy with Improved Formability
E84-10.....Surface Burning Characteristics of Building Materials

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Covering: Pigmented polyvinyl-chloride fused to mildew resistant cotton fabric topped with stabilized, clear virgin vinyl weighing not less than 1000 gpm^2 (27 ounces per square yard). Vinyl shall not peel, craze or crack after repeated operations or long idle standing and shall remain flexible when cold. Vinyl fabric material shall have a maximum flame spread of 25 and a maximum smoke developed rating of 50 when tested by ASTM E84.
B. Sheet Steel: ASTM 1008, cold rolled, commercial quality for door tracks, load and jamb posts. The cast or heat analysis report mentioned in the ASTM is not required.

2.2 FABRICATION

A. General: Doors shall be factory fabricated, and be designed to provide stability and uniform spacing of folds during operation.
B. Track, Jamb Post, Lead Post, Jamb Channel and Hinges: Rust resistant steel not less than 1.2 mm (0.0478 inch) thick. Hinges shall be zinc-coated. Track shall have tread surface contoured for minimum friction.
C. Trolley: Wheels shall be steel ball bearing type with nylon treads.
D. Hardware: Each side of door shall have latching device and pull handles and keeper on door frame. Exposed hardware shall have finish to harmonize with finish of hardware in room.

2.3 CONSTRUCTION

A. Doors shall be top supported on door frames without floor guides. Tracks shall be concealed with wood strips that match doors and with edges chamfered.
B. Construct doors with collapsible and extendable hinge plates across top and bottom, and weld them to interconnecting vertical steel rods to provide smooth, positive operation so that all sections extend and collapse equally and simultaneously.

C. Covering shall be fastened to hinges with concealed steel clips.

2.4 FINISH

A. Except for surfaces of hardware, clean exposed metal surfaces free of foreign matter, oil, and grease.

B. Give surfaces a prime coat of paint; then apply finish coat of baked-on enamel.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Verify field dimensions prior to fabrication.

3.2 INSTALLATION

A. Anchorage: Secure track to underside of head of door frame with fasteners of size and type as recommended or specified by the door manufacturer. Track shall be centered in door frame.

B. Adjustment: Provide shims or other means as required to make doors fit openings. Doors shall be installed so that strike edge member fits tight to jamb for full height of door. Make all necessary adjustments to assure that the hardware functions as designed.

END OF SECTION 08 35 13.13

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SECTION 08 36 13
SECTIONAL DOORS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies electrically operated thermal insulated sectional overhead steel doors.

1.2 RELATED WORK:

A. Overhead roll-up doors: Section 08 33 00, COILING DOORS.

B. Lock cylinders for cylindrical locks: Section 08 71 00, DOOR HARDWARE.

C. Field painting: Section 09 91 00, PAINTING.

D. Electrical Installation: Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS and Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS:

A. Manufacturer's regularly engaged in manufacturing items of type specified.

B. Installers under direct supervision of manufacturer's representative or trained personnel.

1.4 SUBMITTALS:

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

B. Shop Drawings:

1. 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 for motor with manually operated dead lock.

C. Manufacturer's Literature and Data:

1. Brochures or catalog cuts.
2. Manufacturer's installation procedures and instructions.
3. Maintenance instructions, parts list.

D. Certificates:

1. Attesting door, anchors and hardware will withstand the horizontal loads specified.
2. Attesting door complies with thermal performance, air infiltration, and water infiltration requirements.

1.5 APPLICABLE PUBLICATIONS:

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

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

A36/A36M-08.....Structural Steel

A227/A227M-06.....Steel Wire, Cold-Drawn for Mechanical Springs

A229/229M-99(R2005).....Steel Wire, Oil-Tempered for Mechanical Springs

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

C1036-06.....Flat Glass

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

E283-04.....Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen

E330-02(R2010).....Structural Performance of Exterior Windows, Curtain Walls, and Doors by the Uniform Static Air Pressure Difference.

E331-00(R2009).....Water Penetration of Exterior Windows, Curtain Walls, and Doors by the Uniform Static Air Pressure Difference.

C. American National Standards Institute and Door and Access Systems Manufacturers Association (ANSI/DASMA):

102-04.....Sectional Overhead Type Doors.

D. National Electrical Manufacturer's Association (NEMA):

ICS 2-00 (R2005).....Industrial Control and Systems: Controllers, Contactors, and Overload Relays

MG 1-10.....Motors and Generators

E. National Fire Protection Association (NFPA):

70-11.....National Electrical Code

F. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel: ASTM A653 for forming operations. ASTM A36 for structural sections.

B. Hard Drawn Spring wire: ASTM A227.

C. Oil Tempered Spring wire: ASTM A229.

D. Weather-strips, Gaskets, and Thermal Breaks:

1. Neoprene, EPDM, PVC, silicone rubber, or other low conductance material.
2. Standard with door manufacturer.

2.2 DESIGN REQUIREMENTS:

A. Wind Load: Design to withstand a horizontal or wind pressure of 960 Pa (20 pounds per square foot) of door area without damage when tested in accordance with ASTM E330.

B. Thermal Performance: Maximum U value of 0.14 for door when tested in accordance with ASTM C236.

C. Air Infiltration: Maximum of 0.10 cfm at 24 Km (15 miles per hour) wind speed per foot of crack between door sections and door perimeter opening when tested in accordance with ASTM E283.

D. Water Infiltration: No infiltration when tested in accordance with ASTM E331.

E. Comply with ANSI/NAGDM 102, for an Industrial door and specified design criteria, inside face mounted with tracks at jambs set back a sufficient distance to provide a clear opening when door is in open position.

F. Operation-Cycle Requirements: Door components and operators to operate for not less than 10,000 cycles.

2.3 FABRICATION:

A. Steel Door Sections:

1. Formed of hot-dipped galvanized steel.
2. Meeting rails: interlocking joints with thermal breaks separating face sheets formed to provide weathertight closure and alignment for full width of door.
3. Height of sections: Not to exceed 600 mm (24 inches) may be varied to suit door height.
4. Insulation shall have a flame spread rating of not more than 25 and a smoke development factor of not more than 50 when tested in accordance with ASTM E 84.

5. Reinforced for hardware anchorage with not less than 10 gage galvanized steel.

B. Tracks:

1. Manufacturer's standard formed of galvanized steel.
2. Minimum of 14 gage for 50 mm (2 inch) tracks and 12 gage for 75 mm (3 inch) tracks.
3. Vertical tracks fabricated with adjustable brackets for mounting at incline to continuous steel angle wall bracket.
4. Horizontal track: Reinforce with continuous steel angle anchored to vertical steel angle wall bracket and to ceiling angle supports. Use vertical and cross or diagonal braced to obtain rigid installation of horizontal track.
5. Use not less than 13 gage galvanized steel angles.

C. Hardware:

1. Manufacturers standard hinges, brackets, rollers, locking devices and other hardware required for a complete installation.
2. Hinges and roller brackets minimum of 13 gage galvanized steel.
3. Use rollers with ball bearings and case hardened races.
4. Positive locking device to receive cylinder lock, specified in Section 08 71 00, DOOR HARDWARE, with interlocking switch to motor operator.

2.4 ELECTRIC MOTOR OPERATORS:

A. Complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation, including emergency manual operator.

B. Design:

1. Design the operator for motor removal without disturbing the limit-switch timing and without affecting the emergency manual operators.
2. Make provision for emergency manual operation of door by chain-gear mechanism in case of electrical failure.
3. Arrange the emergency manual operating mechanism to immediately be put into and out of operation from the floor with a mechanical device to disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged and not affect the timing of the limit switches.

4. Provide interlock with motor to prevent motor from operating when manual locks are activated.

C. Motors:

1. Motor conform to NEMA MG 1, maximum operation 3600 rpm.
2. Suitable for operation on current specified in Division 26, ELECTRICAL.
3. Use high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from door position, and produce door travel speed range of 0.20 to 0.30 m per second (8 to 12 inches per second), without exceeding the rated capacity.
4. Single-phase motors shall not have commutation or more than one starting contact.
5. Motor Enclosures: Drip proof type or NEMA TENV type.

D. Controls:

1. Control equipment: NEMA 2.
2. Control enclosures: NEMA ICS 6, Type 12 or Type 4, except that contractor enclosures may be Type 1. Use weatherproof corrosion-resistant covers for exterior locations.
3. At door motors use an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations indicated.
4. Control switches:
   a. Three push button type on interior, unless noted to be key activated.
   b. Buttons marked, OPEN, CLOSE and STOP.
   c. The OPEN and STOP buttons: Momentary pressure or contact type.
   d. The CLOSE button: Constant pressure type.
   e. Use key activated switch on exterior requiring constant pressure to operate.
   f. Limit switches: Manufacturers standard, position of switches readily adjustable.
5. Operation:
   a. Open door upon activation of Open switch.
   b. Close door only when constant pressure applied.
   c. When the door is in motion, and the STOP button is pressed, door shall stop instantly and remain in the stop position; from stop

position, door may be operated in either direction by OPEN or CLOSE button.

d. Limit switches automatically stop doors at their fully open and closed positions.

6. Push buttons full-guarded to prevent accidental operation.
7. Transformer:
   a. Use a control transformer in power circuits to reduce the voltage on control circuits to 120 volts or less.
   b. Conform to NEMA ST 20.
8. Electrical Components: Conform to NFPA 70.
9. Safety Device:
   a. Bottom door edge weather-strip safety device to immediately stop and reverse the door closing to full open position upon contact with an obstruction. Door is to open upon failure of device, component of device or component of control system.
   b. The door closing circuit shall be electrically locked out and door to remain capable of manual operation until the failure or damage has been corrected.
   c. Do not use as a limit switch.
   d. Safety device connecting cable to motor to be flexible type SO cable with spring loaded automatic take up reel or equivalent device, as required for proper operation of the doors.

2.5 FINISHES:

A. Steel:
   1. Comply with NAAMM’s Metal Finishes Manual.
   2. Clean surfaces free of scale, rust, oil and grease.
   3. Galvanized steel: Apply phosphate treatment.
   4. Apply shop prime coat of corrosion inhibitive paint on exposed surfaces after fabrication.
   5. Apply finish paint on color scheduled when specified in Section 09 06 00, SCHEDULE FOR FINISHES.
   6. Do not paint track, rollers, hinges, or locks.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install in accordance with approved shop drawings and manufacturer's instructions. For electrical work, see Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS and Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

B. Locate anchors and inserts for tracks, brackets, motors, switches, hardware, and other accessories accurately.

C. Securely attach tracks to adjoining construction with not less than 9 mm (3/8 inch) diameter bolts, spaced near each end and not over 600 mm (24 inches) apart.

D. Locate control switches where shown at least five feet above the floor line so that the operator will have complete visibility of the door.

E. Lubricate, properly adjust and demonstrate door to operate freely.

F. Upon completion, door openings shall be weathertight and doors shall be free from warp, twists, or distortion.

3.2 REPAIR:

A. Repair zinc-coated surfaces both bare and painted, by the application of galvanizing repair compound.

B. Spot prime and apply finish paint to all repairs.

END OF SECTION 08 36 13

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SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies aluminum entrance work including storefront construction, hung doors and other components to make a complete assembly.

1.2 RELATED WORK:

A. Glass and Glazing: Section 08 80 00, GLAZING.

B. Hardware: Section 08 71 00, DOOR HARDWARE.

C. Automatic Door Operators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.

D. Texture and color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

E. Card Readers: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM (PACS).

1.3 SUBMITTALS:

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

B. Shop Drawings: (1/2 full scale) showing construction, anchorage, reinforcement, and installation details.

C. Manufacturer’s Literature and Data:

1. Doors, each type.
2. Entrance and Storefront construction.

D. Samples:

1. Two samples of anodized aluminum of each color showing finish and maximum shade range.

E. Manufacturer's Certificates:

1. Stating that aluminum has been given specified thickness of anodizing.
2. Indicating manufacturer's qualifications specified.

1.4 QUALITY ASSURANCE:

A. Approval by Contracting Officer is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.

B. Certify manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.

B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.

C. Protect from damage from handling, weather and construction operations before, during and after installation.

1.6 APPLICABLE PUBLICATIONS:

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

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

B209-06.....Aluminum and Aluminum-Alloy Sheet and Plate

B221-05.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

E283-04.....Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

E331-00.....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

F593-04.....Stainless Steel Bolts, Hex Cap Screws, and Studs

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series.....Metal Finishes Manual

D. American Architectural Manufacturer's Association (AAMA):

2604-05.....High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels

E. American Welding Society (AWS):

D1.2-03.....Structural Welding Code Aluminum

1.7 PERFORMANCE REQUIREMENTS:

A. Shapes and thickness of framing members shall be sufficient to withstand a design wind load as specified on structural drawings with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65 (applied to overall load failure of the unit). Provide glazing beads, moldings, and trim of not less than 1.25 mm (0.050 inch) nominal thickness.

B. Air Infiltration: When tested in accordance with ASTM E 283, air infiltration shall not exceed 2.63 x 10-50 cm per square meter (0.06 cubic feet per minute per square foot) of fixed area at a test pressure

of 0.30 kPa (6.24 pounds per square foot) 80 kilometers (50 mile) per hour wind.

C. Water Penetration: When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 0.38 kPa (8 pounds per square foot) of fixed area.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Aluminum, ASTM B209 and B221:

1. Alloy 6063 temper T5 for doors, door frames, and fixed glass sidelights.
2. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
3. For color anodized finish, use aluminum alloy as required to produce specified color.

B. Thermal Break: Manufacturer standard low conductive material retarding heat flow in the framework, where insulating glass is scheduled.

C. Fasteners:

1. Aluminum: ASTM F468, Alloy 2024.
2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

2.2 FABRICATION:

A. Fabricate doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.

B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.

C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.

D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, DOOR HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.

E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

2.3 PROTECTION OF ALUMINUM:

A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
   1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
   2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
   3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.4 FRAMES:

A. Fabricate doors, frames, mullions, transoms, frames for fixed glass and similar members from extruded aluminum not less than 3 mm (0.125 inch) thick.

B. Provide integral stops and glass rebates and applied snap-on type trim.

C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.

D. Fabricate framework with thermal breaks in frames where insulating glass is scheduled and specified under Section 08 80 00, GLAZING.

2.5 STILE AND RAIL DOORS:

A. Nominal 45 mm (1-3/4 inch) thick, with stile and head rail 90 mm (3-1/2 inches) wide, and bottom rail 250 mm (10 inches) wide.

B. Bevel single-acting doors 3 mm (1/8 inch) at lock, hinge and meeting stile edges. Provide clearances of 2 mm (1/16 inch) at hinge stiles, 3 mm (1/8 inch) at lock stiles and top rails, and 5 mm (3/16 inch) at floors and thresholds. Form glass rebates integrally with stiles and rails. Glazing beads may be formed integrally with stiles and rails or applied type secured with fasteners at 150 mm (six inches) on centers.

C. Construct doors with a system of welded joints or interlocking dovetail joints between stiles and rails. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel rod extending into the stiles, and having a self-locking nut and washer at each end. Reinforce stiles and rails to prevent door distortion when tie rods are tightened. Provide a compensating spring-type washer under each nut to take up any stresses that may develop. Construct joints between rails and stiles to remain rigid and tight when door is operated.

D. Weather-stripping: Provide removable, woven pile type (silicone-treated) weather-stripping attached to aluminum or vinyl holder. Make slots for applying weather-stripping integral with doors and door frame stops. Apply continuous weather-stripping to heads, jambs, bottom, and meeting stiles of doors and frames. Install weather-stripping so doors can swing freely and close positively.

2.6 REINFORCEMENT FOR BUILDERS HARDWARE:

A. Fabricate from stainless steel plates.

B. Hinge and pivot reinforcing: 4.55 mm (0.1793 inch) thick.

C. Reinforcing for lock face, flush bolts, concealed holders, concealed or surface mounted closers: 2.66 mm (0.1046 inch) thick.

D. Reinforcing for all other surface mounted hardware: 1.5 mm (0.0598 inch) thick.

2.7 COLUMN COVERS AND TRIM

A. Fabricate column covers and trim shown from 1.5 mm (0.0625 inch) thick sheet aluminum of longest available lengths.

B. Use concealed fasteners.

C. Provide aluminum stiffener and other supporting members shown or as required to maintain the integrity of the components.

2.8 FINISH

A. In accordance with NAAMM AMP 500 series.

B. Anodized Aluminum:

1. Color Finish: Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 7 mils thick. More than 50 percent variation of the maximum shade range approved will not be accepted in a single component or in adjacent components, stiles, and rails on a continuous series.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.

B. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.

C. Install hardware specified under Section 08 71 00, DOOR HARDWARE.

D. Install hung door operators specified under Section 08 71 13, AUTOMATIC DOOR OPERATORS.

E. Card Readers: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.

3.2 ADJUSTING:

A. After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

3.3 PROTECTION, CLEANING AND REPAIRING:

A. 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.

END OF SECTION 08 41 13

SECTION 08 44 13
GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies glazed aluminum curtain wall system.
   1. Thermally isolated, pressure equalized on interior.
   2. Type: Stick system to include following:
      a. Glass and Glass Spandrel Panels.
      b. Integral reinforcing.
      c. Closures, trim, subsills and flashings.
      d. Fasteners, anchors, and related reinforcement.

1.2 RELATED WORK

A. Miscellaneous metal members: Section 05 50 00, METAL FABRICATIONS.
B. Firestopping between curtain wall and structure: Section 07 84 00, FIRESTOPPING.
C. Sheet metal flashing and trim: Section 07 60 00, FLASHING AND SHEET METAL.
   a. Joint sealants: Section 07 92 00, JOINT SEALANTS.
D. Aluminum and glass hinged entry doors and storefront construction: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
E. Section 08 80 00, GLAZING.
F. Section 08 88 00, SPECIAL FUNCTION GLAZING.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Approval is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:
      a. Manufacturers Qualifications: Manufacturer with three (3) years continuous documented experience in design, fabrication, and installation of glazed aluminum curtain wall systems of type and size required for that project.
      b. Installer: Manufacturer approved in writing. Continuously installed glazed aluminum curtain walls systems for previous three (3) years.
      c. Manufacturer shall provide technical field representation at project site, as a minimum, at start of project, during middle, towards end of project, and during field testing of field mockup panel.
      d. Testing Laboratory: Contractor retained. Engage an AAMA accredited commercial testing laboratory to perform tests

specified. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to perform testing specified in this section.

e. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of glazed aluminum curtain wall system. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, one another, and adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

1) Do not modify intended aesthetic effects. If modifications are proposed, submit comprehensive explanatory data for review.

f. Qualification of Welders:

1) Welding shall be performed by certified welders qualified in accordance with AWS D1.2, using procedures, materials, and equipment of the type required for this work.

B. Mockup

1. Construct, at job site, full size typical wall unit which incorporates horizontal and vertical joints, framing, window units, panels, glazing, sealants, and other accessories as detailed and specified. Mock-up wall unit location, size and design shall be as indicated. Orient mockup to be facing full sun when constructed.

2. Performance Test

a. Conduct performance test after approval of visual aspects has been obtained. Finished work shall match approved mock-up.

b. Refer to Performance Requirements and Field Quality Control Articles, included hereinafter, for testing requirements.

3. Approved Mock-up

a. After completion and approval of test results of job site mockup, as directed, approved mock-up panel shall be used as minimum standard of comparison for entire curtain wall system.

C. Pre-Installation Conference

1. Prior to starting installation of glazed curtain wall system schedule conference with Contracting Officer to ensure following:

a. Clear understanding of drawings and specifications.

b. Onsite inspection and acceptance of structural and pertinent structural details relating to curtain wall system.

c. Coordination of work of various trades involved in providing system. Conference shall be attended by Contractor; personnel directly responsible for installation of curtain wall system, flashing and sheet metal work, firestopping system and curtain wall manufacturer and their Technical Field Representatives. Conflicts shall be resolved and confirmed in writing.

1.4 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Product Data:

1. Manufacturer’s standard details and fabrication methods.
2. Data on finishing, components, and accessories.
3. Instructions: Submit descriptive literature, detail specifications, available performance test data and instructions for installation, and adjustments.
4. Recommendations for maintenance and cleaning of exterior surfaces.

C. Shop Drawings:

1. Show elevations of glazed curtain wall system at 1:50 (1/4 inch) scale, metal gages, details of construction, methods of anchorage, glazing details, and details of installation.
2. Submit for curtain wall system, accessories, and mock-up. Tentative approval of drawings shall be received before fabrication of mock-up. Final approval of drawings shall be deferred pending approval of mock-up and accessories. Drawings shall indicate in detail all system parts including elevations, full size sections, framing, jointing, panels, types and thickness of metal anchorage details, flashing and coping details, field connections, weep and drainage system, finishes, sealing methods, glazing, glass sizes and details, firestopping insulation materials, and erection details.
3. Operation and Maintenance Manuals
   a. Submit cleaning and maintenance instructions.

D. Samples:

1. Submit pairs of samples of each specified color and finish on 300 mm (12-inch) long section by width of each tubular, or extruded shape section or 300 mm by 300 mm (12-inch by 12-inch) wide sections of sheet shapes.

2. Submit corner section of framing members showing fasteners, panels, glazing methods, glazing materials, and weather-stripping. Submit one sample minimum 300 mm by 300 mm (12 inches by 12 inches). In lieu of submitting separate samples for corner section, intermediate section, and panel, one composite sample incorporating all components and features listed may be submitted.
3. Where normal color variations are anticipated, include 2 or more units in set indicating extreme limits of color variations.

E. Glass:
1. Specified in Section 08 80 00, GLAZING, and Section 08 88 00, SPECIAL FUNCTION GLAZING.

F. Quality Control Submittals:
1. Design Data:
   a. Submit structural and thermal calculations for complete wall assembly. Structural calculations and design shop drawings shall be signed and sealed by a structural engineer registered in state in which project is to be located.
2. Factory Test Reports:
   a. Test Reports: Provide certified test reports, for each of following listed tests, from a qualified independent testing laboratory showing that glazed aluminum curtain wall system assembly has been tested in accordance with specified test procedures and complies with performance characteristics as indicated by manufacturer’s testing procedures. Manufacturer shall submit appropriate testing numbers for specific tests indicated below.
      1) Deflection and structural tests.
      2) Water penetration tests.
      3) Air infiltration tests.
      4) Delamination tests.
      5) Thermal conductance tests.
      6) Sound transmission loss test.
      7) Submit factory tests required except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested within last year, under conditions specified herein, resulting test reports may be submitted in lieu of listed testing.

G. Manufacturer's Certificates:

1. Submit Certificates of Compliance, with specification requirements, for the following:
   a. Metal extrusions.
   b. Metal accessories.
   c. Stating that aluminum has been given specified thickness of anodizing or organic coating finish.
   d. Indicating manufacturer’s and installer’s meet qualifications as specified.
   e. Submit list of equivalent size installations, for both manufacturer and installer, which have had satisfactory and efficient operation.

H. Manufacturer’s Field Reports:
   1. Submit field reports of manufacturer’s field representative observations of curtain wall installation indicating observations made during inspection at beginning of project, during middle of installation and at conclusion of project. Indicate results of field testing of mockup field panel, and any directions given Contractor for corrective action.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to AAMA CW 10 for care and handling of architectural aluminum from shop to site.

B. Prior to packaging for shipment from factory, mark wall components to correspond with shop and erection drawings and their placement location and erection.

C. Prior to shipment from factory, place knocked-down lineal members in cardboard containers and cover finished surfaces of members with protective covering of adhesive paper, waterproof tape, or strippable plastic. Do not cover metal surfaces that will be in contact with sealants after installation.

D. Inspect materials delivered to site for damage; unload and store with ventilation, free from heavy dust, not subject to combustion products or sources of water, and shall permit easy access for inspection and handling. Sealing and caulking compounds, including handling, shall be in accordance with requirements of Section 07 92 00 JOINT SEALANTS.

1.6 PROJECT CONDITIONS

Field Measurements: Where glazed aluminum curtain wall systems are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate

measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying Work.

1.7 APPLICABLE PUBLICATIONS

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

B. American Architectural Manufacturers Association (AAMA):

MCWM-1-89.....Metal Curtain Wall Manual

CW 10-04.....Care and Handling of Architectural Aluminum from Shop to Site

CW 11-85.....Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing

CW 13-85.....Structural Sealant Glazing Systems (A Design Guide)

CWG 1-89.....Installation of Aluminum Curtain Walls

TIR A1-04.....Sound Control for Fenestration Products

TIR A8-08.....Structural Performance of Composite Thermal Barrier Framing Systems

TIR A9-91.....Metal Curtain Wall Fasteners

TIR A11-04.....Maximum Allowable Deflection of Framing Systems for Building Cladding Components of Design Wind Loads

101/I.S.2/A440-08.....Windows, Doors and Unit Skylights

501-05.....Methods of Test for Exterior Walls

503-08.....Field Testing of Metal Storefronts, Curtain walls and Sloped Glazing Systems

2605-98.....High Performance Organic Coatings on Architectural Extrusions and Panels

1503-09.....Thermal Transmission and Condensation Resistance of Windows, Doors and Glazed Wall Sections

C. American National Standards Institute (ANSI):

Z97.1-09.....Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test

D. American Society of Civil Engineers (ASCE):

ASCE 7-10.....Minimum Design Loads for Buildings and Other Structures

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

A36/A36M-08.....Structural Steel

A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A193-10.....Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service

A307-10.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

B209-10.....Aluminum and Aluminum Alloy Sheet and Plate

B211-03.....Aluminum and Aluminum Alloy Bar, Rod, Wire

B221/B221M-08.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

B316/B316M-10.....Aluminum and Aluminum Alloy Rivet and Cold-Heading, Wire, and Rods

C578-10.....Rigid Cellular Polystyrene Thermal Insulation

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

C920-11.....Elastomeric Joint Sealants

C794-10.....Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.

C1363-05.....Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

D1037-06.....Evaluating the Properties of Wood-Base Fibers and Particle Panel Materials

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

E90-09.....Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

E283-04.....Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Difference Across this Specification

E330-02(R2010).....Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

E331-00(R2009).....Water Penetration of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference

E413-10.....Classification for Rating Sound Insulation

E783-02(R2010).....Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

E1105-00(R2008).....Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors By Uniform or Cyclic Static Air Pressure Differences

F. American Welding Society, Inc. (AWS):

D1.2-08.....Structural Welding Code-Aluminum

G. Consumer Product Safety Commission (CPSC):

16 CFR 1201.....Architectural Glazing Standards and Related Material

H. Federal Specifications (FS):

TT-P-645B-90.....Primer, Paint, Zinc-Molybdate, Alkyd Type

I. Glass Association of North America (GANA):

2010 Edition.....GANA Glazing Manual

2008 Edition.....GANA Sealant Manual

2009 Edition.....GANA Laminated Glazing Reference Manual

2008 Edition.....Tempered Glass Engineering Standard Manual

J. Military Specifications (MIL):

MIL-C-18480.....(Rev. B) Coating Compound, Bituminous Solvent, Coal Tar Base

K. National Association of Architectural Metal Manufacturers (NAAMM):

500 Series (2006).....Metal Finishes Manual.

L. Steel Structures Painting Council (SSPC)

Paint 25-97 (2004).....Red Iron Oxide Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments

1.8 WARRANTY

A. Submit manufacturer’s written warranty for materials, installation and weathertightness, and subject to terms of “Warranty of Construction”, except that warranty period shall be extended to five (5) years from date of final acceptance of project by Government.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Design Requirements:

1. Curtain Wall System: Tubular aluminum sections with thermal break condition supplementary support framing, factory prefinished, glass, and spandrel infill; related flashings, anchorage and attachment devices.
2. System Assembly: Site assembled.
3. No curtain wall framing member shall deflect, in a direction normal to plane of wall, more than 1/175 of its clear span or 20 mm (3/4 inch), whichever is less, when designed in accordance with requirements of TIR A11 and tested in accordance with ASTM E330, except that when a gypsum wallboard surface will be affected, deflection shall not exceed 1/360 of span. No framing member shall have a permanent deformation in excess of 0.2 percent of its clear span when tested in accordance with ASTM E330 for a minimum test period of 10 seconds at 1.5 times design wind pressures indicated as part of structural drawing wind load requirements. No glass breakage, damage to fasteners, hardware or accessories shall be permitted due to deformation stated above:
   a. Provide system complete with framing, mullions, trim, fasteners, anchors, accessories, concealed auxiliary members, and attachment devices for securing wall to structure as specified or indicated. Unless noted otherwise, comply with MCWM-1.
   b. Curtain wall system components and integral door units shall be furnished by one manufacturer or fabricator; however, all components need not be products of same manufacturer.
   c. Fully coordinate system accessories directly incorporated, and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified.
   d. Provide system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from -18 degrees C to 49 degrees C (0 degrees F to 120 degrees F).

e. Provide wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified.

B. Manufacturer's Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of curtain walls that are similar to those indicated for this Project in material, design, and extent.

C. Performance Requirements:

1. System shall meet or exceed all performance requirements specified.
2. Curtain wall components shall have been tested in accordance with requirements below and shall meet performance requirements specified:
3. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with ASCE 7-Minimum Design Loads for Buildings and Other Structures to a design pressure as measured in accordance with ASTM E330.
4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with IBC 2009 code.
5. Water Penetration:
   a. No water penetration shall occur when wall is tested in accordance with ASTM E331 at a differential static test pressure of 20 percent of inward acting design wind pressure as indicated on structural drawings, but not less than 479 Pa (10 psf).
   b. Make provision in wall construction for adequate drainage to outside of water leakage or condensation that occurs within outer face of wall. Leave drainage and weep openings in members and wall open during test.
6. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783
   a. Static-Air-Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
   b. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq ft) of surface maximum.
7. Deflections Test: ASTM E330, Procedure B:
   a. No member shall deflect in a direction parallel to plane of wall, when carrying its full design load, more than an amount which

will reduce edge cover or glass bite below 75 percent of design dimension. No member after deflection under full design load, shall have a clearance between itself and top of panel, glass, sash, or other part immediately below it less than 3 mm (1/8 inch); clearance between member and an operable window or door shall be minimum 1.5 mm (1/16 inch).

8. Sound Attenuation Through Wall System (Exterior to Interior):
   a. STC 50, measured in accordance with ASTM E413.

2.2 MATERIALS

A. Extruded Aluminum Framing Members: ASTM B221M; 6063-T5 extruded aluminum for non-structural components or 6063-T6 extruded aluminum for structural members; temper and alloy as recommended by manufacturer.

B. Sheet Aluminum: ASTM B209M; 6065-T5 temper and alloy as recommended by manufacturer.
   1. Formed flashing and closures: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
   2. Extruded sill members: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.

C. Steel Sections: ASTM A36M.

D. Primer: TS TT-P-645; red, for shop application and field touch-up.

E. Fasteners:
   1. For Exterior Cap Retainers: ASTM A193 B8 300 series, stainless steel screws.
   2. For Framework Connections: ASTM B211M 2024-T4 aluminum, ASTM A193 B8 300 series, stainless steel, and ASTM B316 aluminum rivets, as required by connection.
   3. For Anchoring Glazed Aluminum Curtain Wall to Support Structure: ASTM A307 zinc plated steel fasteners.

F. Shims: Metal or plastic.

G. Joint Sealants and Accessories:
   1. In accordance with requirements specified in Section 07 92 00, JOINT SEALANTS.
   2. Structural Flush Glazed Joints: High performance silicone sealant applied in accordance with manufacturer's recommendations.
   3. Non-structural Flush Glazed Joints and Weather Seal Joints: Silicone sealants applied in accordance with manufacturer's recommendations.

4. Provide only sealants that have been tested per ASTM C794 to exhibit adequate adhesion to samples of glass and metal equivalent to those required for project.
5. Exposed metal to metal joints: Silicone sealant selected from manufacturer’s standard colors.

H. Glazing Materials:
1. As specified under Section 08 80 00, GLAZING, and Section 08 88 00, SPECIAL FUNCTION GLAZING.
2. Glazing Gaskets:
   a. Exterior: Continuous EPDM gaskets at each glass and spandrel panel.
   b. Interior: Continuous, closed cell PVC foam sealant tape, sealed at corners.
3. Glass Sizes and Clearances:
   a. Accommodate up to 25 mm (1 inch) glazing.
   b. Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip glass to remove flares or to reduce oversized dimensions. All cutting shall occur in factory.
4. Glass Setting Materials:
   a. Provide head bead and drive wedge required for glass installation to suit curtain wall system in accordance with manufacture’s recommendations.

I. Firestopping: Refer to Section 07 84 00, FIRESTOPPING for requirements.

2.3 FABRICATION

A. Curtain wall components shall be of materials and thickness indicated or specified. Details indicated are representative of required design and profiles. Maintain sightlines indicated on drawings. Unless specifically indicated or specified otherwise, methods of fabrication and assembly shall be at discretion of curtain wall manufacturer. Perform fitting and assembling of components in shop to maximum extent practicable. Anchorage devices shall permit adjustment in three directions. There shall be no exposed fasteners.

B. Joints: Joints exceeding +1.5 mm (+1/16") shall be mechanically fastened.

C. Ventilation and Drainage: Direct water leakage to exterior by means of concealed drainage system and weeps. Flashings and other materials used internally shall be nonstaining, noncorrosive, and nonbleeding.

D. Protection and Treatment of Metals:

1. Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving shop.
2. Provide protection against galvanic action wherever dissimilar metals are in contact, except in case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint conforming to MIL-C-18480 or apply appropriate caulking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.

E. Metal sills and Closures: Fabricate accessories, spandrel panels, trim closures of sizes and shapes indicated from similar materials and finish as specified for wall system.

F. Concealed Interior Mullion Reinforcing: ASTM A36M steel shapes as required for strength and mullion size limitations, hot dip galvanized after fabrication in accordance with ASTM A123.

2.4 PROTECTION

A. Provide protection for aluminum against galvanic action, wherever dissimilar materials are in contact, by painting contact surfaces of dissimilar material with a heavy coat of bituminous paint (complete coverage), or by separating contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on one side.

2.5 METAL FINISHES

A. In accordance with NAAMM AMP500 series.

B. Anodized Aluminum:

1. AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class 1 Architectural, 0.7-mil thick finish. Dyes will not be accepted.
   a. Dark bronze.

C. Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide.

D. Touch-Up Primer for galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

E. Concealed Steel Items: Galvanized in accordance with ASTM A123 to 610. Primed with iron oxide paint.

F. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of glazed curtain wall system, arrange for representative(s) of manufacturer to examine structure and substrate to determine that they are properly prepared, and ready to receive glazed curtain wall work included herein.

B. Verifying Conditions and Adjacent Surfaces: After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions, including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in building frame.

3.2 PREPARATION

A. Take field dimensions and examine condition of substrates, supports, and other conditions under which work of this section is to be performed to verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Contact between aluminum and dissimilar metals shall receive a protective coating of asphaltic paint for prevention of electrolytic action and corrosion.

3.3 INSTALLATION

A. Installation and erection of glazed curtain wall system and all components shall be in accordance with written directions of curtain wall manufacturer. Match profiles, sizes, and spacing indicated on approved shop drawings.

B. Bench Marks and Reference Points: Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of marks, stop erection work in that area until discrepancies have been corrected.

C. Ensure that drainage system operates properly in accord with AAMA 501 procedures.

D. Do not proceed with structural silicone work when metal temperature is below 0 degrees C (32 degrees F).

E. Isolate between aluminum and dissimilar metals with protective coating or plastic strip to prevent electrolytic corrosion.

F. Install glazed aluminum curtain wall system so as to maintain a virtually flat face cap, with no visible bowing.

G. Install entire system so that fasteners are not visible.

H. Tolerances:

1. Maximum variation from plane or location shown on approved shop drawings: 3 mm per 3600 mm (1/8 inch per 12 feet) of length up to not more than 13 mm (1/2 inch) in any total length.
2. Maximum offset from true alignment between two identical members abutting end to end in line: 0.8 mm (1/32 inch).
3. Sealant Space Between Curtain Wall Mullion and Adjacent Construction: Maximum of 19 mm (3/4 inch) and minimum of 6 mm (1/4 inch).

I. Joint Sealants:

1. Joint Sealants: Shall be in accordance with requirements of Section 07 92 00, JOINT SEALANTS.
2. Surfaces to be primed and sealed shall be clean, dry to touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions shall conform to approved detail drawings with a tolerance of plus 3 mm (1/8 inch). Do not apply compound unless ambient temperature is between 5 and 35 degrees C (40 and 90 degrees F). Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings shall be of type that leave no residue on metals.
3. Match approved sample. Force compound into grooves with sufficient pressure to fill grooves solidly. Sealing compound shall be uniformly smooth and free of wrinkles and, unless indicated otherwise, shall be tooled and left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled. Mix only amount of multi-component sealant which can be installed within four hours, but at no time shall this amount exceed 19 liters (5 gallons).
4. Apply primer to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after caulking is completed.
5. Tightly pack backing in bottom of joints which are over 13 mm (1/2 inch) in depth with specified backing material to depth indicated or

specified. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.

6. Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.
7. Remove compound smears from surfaces of materials adjacent to sealed joints as work progresses. Use masking tape on each side of joint where texture of adjacent material will be difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with approved solvent. Upon completion of caulking and sealing, remove remaining smears, stains, and other soiling, and leave work in clean neat condition.

J. Glass:

1. Refer to Section 08 80 00, GLAZING, and Section 08 88 00, SPECIAL FUNCTION GLAZING, and drawing for glass types. Install in accordance with manufacturer's recommendations as modified herein.
2. Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.
3. Clean sealing surfaces at perimeter of glass and sealing surfaces of rebates and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer. All sashes shall be designed for outside glazing. Provide continuous snap in glazing beads to suit glass as specified.
4. Insulating and tempered glass, and glass of other types that exceed 100 united inches in size: Provide void space at head and jamb to allow glass to expand or move without exuding sealant. Perimeter frames and ventilator sections shall have glazing rebates providing an unobstructed glazing surface 19 mm (3/4 inch) in height. Glazing rebate surfaces must be sloped to shed water.
5. Provide adequate means to weep incidental water and condensation away from sealed edges of insulated glass units and out of wall system. Weeping of lock-strip gaskets should be in accordance with recommendation of glass manufacturer.

K. Metal Copings:

1. Refer to Section 07 60 00, FLASHING AND SHEET METAL for requirements of metal copings when they are not a part of glazed curtain wall system work.
2. Coordinate curtain wall installation with metal coping detail on contract drawings. Provide watertight seal to meet criteria set forth in this section regarding air and water penetration.

3.4 ADJUSTING

A. Adjust doors to provide a tight fit at contact points and operate easily.

B. Adjust weather-stripping to make even contact with surfaces.

C. Adjust operating hardware and moving parts.

3.5 CLEANING

A. Install curtain wall frame and associated metal to avoid soiling or smudging finish.

B. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings.

C. Remove excess glazing and sealant compounds, dirt, and other substances.

D. Follow recommendations of manufacturer in selection of cleaning agents. Do not use cleaning agents containing ammonia or other compounds that might damage finished metal surfaces.

E. Replace cracked, broken, and defective glass with new glass at no additional cost to Government. Just prior to final acceptance of curtain wall system clean glass surfaces on both sides, remove labels, paint spots, compounds, and other defacements, and clean metal fixed panels. Remove and replace components that cannot be cleaned successfully.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage an AAMA accredited commercial qualified independent testing and inspecting agency to perform field quality-control tests specified, and to prepare test reports: Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Contracting Officer for approval.

B. Conduct field check test for water leakage on designated wall areas after erection to comply with MCWM-1. Conduct test on two wall areas,

two bays wide by two stories high where directed. Conduct test and take necessary remedial action as directed by Contracting Officer.

C. Test Specimen:
   1. Test specimen shall include curtain wall assembly and construction. Test chamber shall be affixed to exterior side of test specimen and test shall be conducted using positive static air pressure.
   2. Test specimens shall be selected by Contracting Officer after curtain wall system has been installed in accordance with contract drawings and specification.

D. Sealant Adhesion Tests: Test installed sealant, in presence of sealant manufacturer’s field representative, in a minimum of two areas and as follows:
   1. Test weatherseal sealant as recommended in writing by sealant manufacturer.

E. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783.
   1. Field air leakage testing is not required for continuous curtain wall systems.
   2. Static-Air-Pressure Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
   3. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq. ft.) of surface maximum.

F. Water Penetration: Test glazed aluminum curtain wall system for compliance with requirements according to AAMA 503, which requires testing according to ASTM E1105.
   1. Uniform Static-Air-Pressure Difference: 20 percent of positive design wind load, but not less than 479 Pa (10 psf). No uncontrolled water shall be present.

G. Retesting:
   1. Should system fail field test, system may be modified or repaired, and retested.
   2. Should system fail second field test, system may be additionally modified or repaired, and retested.
   3. All modifications and repairs made to tested areas shall be recorded, and same modifications and repairs made to all system and adjacent construction on project.
   4. Should second test fail, Contracting Officer may require testing of additional areas of the curtain wall.

H. Rejection:

1. Failure of any of specimens to meet test requirements of third test shall be cause for rejection of wall system and adjacent construction on project.

3.7 PROTECTION

A. After installation, protect windows, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or damage their appearance or finish. Protection methods shall be in accordance with recommendations of product manufacturers or of respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or respective trade association.

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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, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, Section 08 35 13.13, ACCORDION FOLDING DOORS, Section 08 36 13, SECTIONAL DOORS, Section 08 71 13, AUTOMATIC DOOR OPERATORS, 08 44 13, GLAZED ALUMINUM CURTAIN WALLS

C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES. D.

Painting: Section 09 91 00, PAINTING.

E. Card Readers: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM (PACS).

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, 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: 2 years.

B. Locks, latchsets, and panic hardware: 5 years. C. Door closers and continuous hinges: 10 years. D. Hinges: lifetime of the building.

1.5 MAINTENANCE MANUALS

A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

1.6 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies (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 Project Manager for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Project Manager's office until all other similar items have been installed in project, at which time the Project Manager 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. Keying: All cylinders shall be keyed into existing Best (SFIC) 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 Project Manager.—

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):

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

A156.13-05.....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

A156.21-09.....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

A156.31-07 .....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 ACCEPTABLE MANUFACTURERS

Item	Manufacturers Acceptable Substitutes
A.	Hinges: Stanley, Hager, Ives, McKinney
B.	Locks, Latche:s Yale. No substitute
C.	Exit Devices: Von Duprin. No substitute
D.	Closers: LCN. No substitute
E.	Flush Bolt:s Ives, Trimco, Quality
F.	Stops Ives: Trimco, Quality
G.	Overhead Stops: Glynn-Johnson
H.	Seals & Bottoms: Reese National Guard, Pemko
I.	Magnetic Locks: Dyna Lock. No substitute
J.	Cylinder, core: Best by the Contractor and key. No substitutes
I.	UL Armor Plates: TRIMCO, approved equal
J.	Auto operators: Horton. No substitute

2.2 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.

2.3 CONTINUOUS HINGES

A. ANSI/BHMA A156.26, Grade 1-600.

1. Listed under Category N in BHMA's "Certified Product Directory." B. General:

Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete,

C. Continuous geard hinges:

1. Construct geared hinges of heavy-duty series, extruded 6063-T6 aluminum alloy; Hinge shall be non-handed with symmetrical template hole pattern and factory drilled. Hinge shall accept a minimum of 20 fasteners on the door and 20 fasteners on the frame.

2.4 OVERHEAD CLOSERS

A. Door closers shall be the building standard - LCN 4040XP series with metal covers.

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.
4. Material of closer body shall be cast iron.
5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
6. Closers shall have full size metal cover; plastic covers will not be accepted.
7. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
8. 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.
9. 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.
10. Provide parallel arm closers with heavy duty rigid arm.
11. 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.
12. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
13. All closers shall have a 1 ½" (38mm) minimum piston diameter.

2.5 **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 drywall partitions occur, use floor stops, Type L02141 or L02161 in office areas, Type L02121 elsewhere.

D. Provide stop Type L02011, as applicable for exterior doors. At outswing doors where stop can be installed in concrete, provide stop mated to concrete anchor set in 76mm (3-inch) core-drilled hole and filled with quick-setting cement.

E. Omit stops where floor mounted door holders are required and where automatic operated doors occur.

F. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.

G. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.

H. 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.

I. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).

2.6 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.

2.7 LOCKS AND LATCHES

A. Keying: All cylinder cores and keys shall be best lock and will be provided by Owner. Locks to be provided with cylinder shell to accept 7-pin Best Cormax system with X9W keyway. Cores shall be combined per the VA requirements.

B. 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.

C. 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 the building standard - Yale AUR. 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. 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. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.5.
3. Privacy locks in non-mental-health patient rooms shall have an inside thumbturn for privacy and an outside thumbturn for emergency entrance.

2.8 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).
3. Residual Magnetism: Not more than 0 lbf (0 N) to separate door from magnet.

2.9 ELECTRIC STRIKES

A. ANSI/ BHMA A156.31 Grade 1.

B. General: Use fail-secure electric strikes at fire-rated doors.

2.10 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

B. Key system shall match the existing Best key system. Field verify with the Owner’s Representative.

2.11 KEY CABINET

A. ANSI Standard A156.5. Provide key cabinet made of cold rolled, 1.2 mm (0.0478 inch) thick furniture steel electro-welded. Doors shall have "no sag" continuous brass-pin piano type hinge and be equipped with chrome plated locking door handles, hook cam and mechanical pushbutton door lock. Key Cabinet and Key Control System shall accommodate all keys for this project plus 25 percent. Provide minimum number of multiple cabinets where a single cabinet of largest size will not accommodate the required number of keys.

B. Key tags shall consist of two sets: Permanent self-locking and loan key snaphook type with tag colors as follows: Red fiber marker of the permanent self-locking type approximately 32 mm (1-1/4 inch) in diameter engraved with the legend "FILE KEY MUST NOT BE LOANED." Also furnish for each hook a white cloverleaf key marker with snap-hooks engraved with the legend "LOAN KEY."

C. The manufacturer of the lock cylinders and locks shall attach a key tag to keys of each lock cylinder and shall mark thereon the respective item number and key change number. Provide each group of keys in a key gathering envelope (supplied by Key Cabinet Manufacturer) in which the lock manufacturer shall include the following information: Item number, key change number and door number. The contractor shall furnish the Key Cabinet Manufacturer the hardware and keying schedules and change keys.

D. The Key Cabinet Manufacturer shall set up a three-way cross index system, including master keys, listing the keys alphabetically, the hooks numerically and the key changes numerically on different colored index cards. Index cards shall be typewritten and inserted in a durable binder. Attach the keys to the two sets of numbered tags supplied with the cabinet. (The permanent tag and the loan key tag). Instruct the owner in proper use of the system. Install cabinet as directed by the Project Manager.

2.12 ARMOR PLATES, KICK PLATES, AND DOOR EDGING

A. Conform to ANSI Standard A156.6.

B. Provide protective plates and door edging as specified below:

1. Kick 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 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 shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
3. Kick 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. 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.

2.13 EXIT DEVICES

A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.

B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.

C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire

pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.

D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.

E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.

F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

G. Building Standard: Von Duprin 99 Series exit devices with anti-microbial coating.

2.14 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.

2.15 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.

2.16 DOOR PULLS WITH PLATES

A. Conform to ANSI A156.6. Pull Type J401, 152 mm (6 inches) high by 19 mm (3/4 inches) diameter with plate Type J302, 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Provide pull with

projection of 70 mm (2 3/4 inches) and a clearance of 51 mm (2 inches). Cut plates of door pull plate for cylinders, or turn pieces where required.

2.17 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 J302 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.

2.18 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.

2.19 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.

2.20 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.

2.21 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).

2.22 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:

1. Folding doors and partitions.
2. Fire-rated access doors-Engineer's key set.

C. Mutes (Silencers): Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door. Provide 2 mutes for each edge of sliding door which would contact door frame.

2.23 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS

A. Where lock is shown, equip each cabinet door (metal) with lock Type E06213, conforming to ANSI A156.5. Key locks in Key Sets approved by Contracting Officer. See mechanical drawings and specifications for location of cabinets.

B. Cabinet manufacturer shall supply the hinges, bolts and pulls. Ship locks to cabinet manufacturer for installation.

2.24 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.

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.

2.25 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 Project Manager for approval.

B. Hardware Heights from Finished Floor:
   1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
   2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
   3. Deadlocks centerline of strike 1219 mm (48 inches).
   4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
   5. Centerline of door pulls to be 1016 mm (40 inches).
   6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
   7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
   8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors. At exterior doors, closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.

B. Hinge Size Requirements:

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 feet)	125 mm (5 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 Project Manager. 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

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 Project Manager 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 Project Manager 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.

B. Hardware Consultant working on a project will be responsible for providing additional information regarding these hardware sets.

C. Provide cylinders for all locksets as specified.

D. The following list indicates what the suffix for each hardware group designates:
A – Auto Operator
C – Classroom function D – Access Control
E – Entry/Office function
I – Institutional lock (keyed both sides)
K – Push-pull
P – Passage function
S – Storeroom function
T – Toilet (privacy) function
X – Exit/panic device
Z – door hardware by others

SECURITY HARDWARE ABBREVIATIONS LEGEND:

AC = Access Control Device (Card reader, biometric reader, keypad, etc.)
ADO = Automatic Door Operator
DEML = Delayed Egress Magnetic Lock
DEPH = Delayed Egress Panic Exit Device
DPS = Door Position Switch (Door or Alarm Contact)
EL = Electric Lock or Electric Lever Exit Device PB = Push-button Combination Lock (stand-alone) RR = Remote Release Button
ELR = Electric Latch Retraction Exit Device
REX = Request-to-Exit Switch in Latching Device Inside Trim

Hardware Group No. A03-E LOCKSET KEYED BOTH SIDES.

For use on mark/door #(s):
2C01 2ST02.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
	EA	MORTISE LOCK	AUR8830-2FL-instituional	626	YAL
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	SET	SEALS	700EU	AL	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	425	AL	NGP

Operational Description
Self-Closing.

Hardware Group No. C02

For use on mark/door #(s):
204 204B

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	MORTISE LOCK	AUR8808FL-CLASSROOM	626	YAL
1	EA	SURFACE CLOSER	4040XP MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	EA	WALL STOP	L12201	626	IVE

Operational Description
Self-Closing.

Hardware Group No. C03

For use on mark/door #(s):
203

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE

Operational Description
Self-Closing.
Self-Closing.

Hardware Group No. C04-M

For use on mark/door #(s):
2C02

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	L14011	626	IVE
1	EA	MORTISE LOCK	AUR8801FL - PASSAGE	626	YAL
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
2	EA	KICK PLATE	J102	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1	SET	SEALS	2525	BRN	NGP

Operational Description
Self-Closing.
Magnetic Hold Open is continuously energized allowing the doors to be held open under normal building conditions. When the Fire Alarm is activated, power to the Magnetic Hold Open is disconnected causing the doors to close automatically.

Hardware Group No. D02

For use on mark/door #(s):
108 111 113A BS13 1C04B

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	MORTISE LOCK	AUR8891FL-EAS-STOREROOM	626	YAL
1	EA	SURFACE CLOSER	4040XP MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	EA	WALL STOP	L12201	626	IVE

Provide electrical wiring elevation drawings and point to point wiring diagrams
Electrical conduit welded in frame provided by hollow metal frame supplier.
Request to exit by access control.
Proximity reader by access control.
Power supply by access control.
Door position switch by access control.

Operational Description
Self-Closing.

Hardware Group No. D03

For use on mark/door #(s):
1ST02.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	MORTISE LOCK	AUR8891FL-EAS-STOREROOM	626	YAL
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	EA	WALL STOP	L12201	626	IVE

Provide electrical wiring elevation drawings and point to point wiring diagrams
Electrical conduit welded in frame provided by hollow metal frame supplier.
Door position switch by access control.
Power supply by access control.
Proximity reader by access control.

Operational Description
Self-Closing.

Hardware Group No. D03-A

For use on mark/door #(s):
113.1 114.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	MORTISE LOCK	AUR8809FL-EAS-CLASSROOM	626	YAL
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	EA	WALL STOP	L12201	626	IVE

Provide electrical wiring elevation drawings and point to point wiring diagrams
Electrical conduit welded in frame provided by hollow metal frame supplier.
Door position switch by access control.
Power supply by access control.
Proximity reader by access control.

Operational Description
Self-Closing.

Hardware Group No. D03-E

For use on mark/door #(s):
1C04.2 1ST02.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
	EA	MORTISE LOCK	AUR8891FL-EAS-STOREROOM	626	YAL
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN

1	EA	ARMOR PLATE	8400 36" X 2" LDW	630	IVE
1	EA	DRIP CAP	16A	CL	NGP
1	SET	SEALS	700EU	AL	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	425	AL	NGP

Request to exit by access control.
Proximity reader by access control.
Power supply by access control.
Door position switch by access control.
Electrical conduit welded in frame provided by hollow metal frame supplier.
Provide electrical wiring elevation drawings and point to point wiring diagrams

Operational Description
Self-Closing.

Hardware Group No. D04

For use on mark/door #(s):
103.1 103.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	L14011	626	IVE
1	EA	MORTISE LOCK	AUR8805FL-STOREROOM	626	YAL
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	AUTO OPERATOR	4100 - SGL LEAF	313	HOR
2	EA	ACTUATOR	C1260-4		HOR
2	EA	ARMOR PLATE	8400 36" X 2" LDW	630	IVE
2	EA	WALL STOP	L12201	626	IVE
1	SET	SEALS	2525	BRN	NGP

Provide electrical wiring elevation drawings and point to point wiring diagrams
Electrical conduit welded in frame provided by hollow metal frame supplier.
Door position switch by access control.
Power supply by access control.
Proximity reader by access control.
Request to exit by access control.
120 VAC required for auto operator.

Operational Description
Electric strike is released when power is applied (Fail Secure).

Hardware Group No. D04-A

For use on mark/door #(s):
1C01

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr

6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
2	EA	EXIT DEVICE			
2	EA	OH STOP	90S	630	GLY
1	EA	AUTO OPERATOR	4100 - DBL LEAF	313	HOR
2	EA	ACTUATOR	C1260-4		HOR
1	SET	SEALS	2525	BRN	NGP
2	EA	DRIP CAP	16A	CL	NGP
2	EA	ACTUATOR	C1260-4		HOR
1	EA	THRESHOLD	425	AL	NGP

Request to exit by access control.
Proximity reader by access control.
Power supply by access control.
Door position switch by access control.
Electrical conduit welded in frame provided by hollow metal frame supplier.
Provide electrical wiring elevation drawings and point to point wiring diagrams

Hardware Group No. D04-EO

For use on mark/door #(s):
1C04.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	DUST PROOF STRIKE	L14011	626	IVE
1	EA	FIRE EXIT HARDWARE	9947-EO-F	626	VON
1	EA	MAGNETIC LOCK	M490P	628	SCE
2	EA	OH STOP	90S	630	GLY
1	EA	AUTO OPERATOR	4100 - dbl leaf	689	HOR
1	EA	ACTUATOR	C1260-4		HOR
2	EA	KICK PLATE	J102	630	IVE

Clear plastic traffic door slats
over entire opening.
Request to exit by access control.
Proximity reader by access control.
Power supply by access control.
Door position switch by access control.
Electrical conduit welded in frame provided by hollow metal frame supplier.
Provide electrical wiring elevation drawings and point to point wiring diagrams

Operational Description
Free Egress from dock area at all times. Pressing Push Bar retracts latch bolts. No exterior trim.

Magnetic lock secured when powered (Fail Safe). Door Status Monitor/Magnetic Board Sensor monitors whether the door is open or closed. Magnetic Bond Sensor monitors door is secure at optimal holding force. Relock Time Delay provides adjustable relock delay.

Door into dock area controlled by prox reader and magnetic lock.
upon loss of electrical power door unlocks to allow egress and ingress.

Hardware Group No. E01

For use on mark/door #(s):

114A 114B 114C 114D 203C
203D 203F 114E 114F

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	MORTISE LOCK	AUR8807FL-OFFICE		YAL
1	EA	WALL STOP	L12201	626	IVE

Hardware Group No. HW-1J

For use on mark/door #(s):

BS12 BS14 113.2 114.1 114G 114H
201 202

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	MORTISE LOCK	AUR8801FL - PASSAGE	626	YAL
1	EA	SURFACE CLOSER	4040XP MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	EA	WALL STOP	L12201	626	IVE

Operational Description
Self-Closing.

Hardware Group No. K04-A

For use on mark/door #(s):

1C02

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
2	EA	PULL PLATE	J401 X 302	630	IVE
2	EA	PUSH BAR	9100-STD	630	IVE
2	EA	WALL STOP	L12201	626	IVE
1	EA	AUTO OPERATOR	4100 - DBL LEAF	313	HOR
2	EA	ACTUATOR	C1260-4		HOR

Hardware Group No. P01

For use on mark/door #(s):

203A 203B 204A 204C
204D 204E 204F 204G 204H 204I

204J 204K 204L 204M 204N 204O
204P

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	MORTISE LOCK	AUR8801FL - PASSAGE	626	YAL
1	EA	WALL STOP	L12201	626	IVE

Hardware Group No. S03

For use on mark/door #(s):
109 110 112 1C04A 130A.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	MORTISE LOCK	AUR8805FL-STOREROOM	626	YAL
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	EA	WALL STOP	L12201	626	IVE

Operational Description
Self-Closing.

Hardware Group No. S04

For use on mark/door #(s):
BS11 107 130.1 130A.1 2C01.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	L04261	626	IVE
1	EA	DUST PROOF STRIKE	L14011	626	IVE
1	EA	MORTISE LOCK	AUR8805FL-STOREROOM	626	YAL
2	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
2	EA	ARMOR PLATE	8400 36" X 2" LDW	630	IVE

Operational Description
Self-Closing.

Hardware Group No. S04-E

For use on mark/door #(s):

130.2
Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON

2	SET	MANUAL FLUSH BOLT	L04261	630	IVE
1	EA	DUST PROOF STRIKE	L14011	626	IVE
1	EA	MORTISE LOCK	AUR8805FL-STOREROOM	626	YAL
2	EA	ARMOR PLATE	8400 36" X 2" LDW	630	IVE
1	SET	SEALS	2525	BRN	NGP
2	EA	DRIP CAP	16A	CL	NGP
2	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
2	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	425	AL	NGP
2	EA	OH STOP	90S	630	GLY

Provide electrical wiring elevation drawings and point to point wiring diagrams
Electrical conduit welded in frame provided by hollow metal frame supplier.

Hardware Group No. X01

For use on mark/door #(s):
2ST02.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	A31031G	628	IVE
1	EA	FIRE EXIT HARDWARE	99-EO-F-SNB	626	VON
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	J102	630	IVE
1	SET	SEALS	2525	BRN	NGP

Operational Description
Free Egress at all times. Pressing Push Bar retracts latchbolts. No exterior trim.
Self-Closing.

Hardware Group No. X04-A

For use on mark/door #(s):
1C03

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	9947-EO-F-LBRAFL	626	VON
1	EA	FIRE EXIT HARDWARE	9947-L-F-LBRAFL-996-06	626	VON
1	EA	SURFACE CLOSER	4040XP EDA MC	US10B	LCN
2	EA	AUTO OPERATOR	4100 - SGL LEAF	313	HOR
2	EA	ACTUATOR	C1260-4		HOR
2	EA	ARMOR PLATE	8400 36" X 2" LDW	630	IVE
1	SET	SEALS	2525	BRN	NGP

Operational Description
Free Egress at all times. Pressing Push Bar retracts latchbolts. Latchbolt retracted by lever unless locked by key. Key locks and unlocks lever.
Free Egress at all times. Pressing Push Bar retracts latchbolts. No exterior trim.

Self-Closing.

Hardware Group No. X04-M

For use on mark/door #(s):
BCS05

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	A2112 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	9947-EO-F-LBRAFL	626	VON
1	EA	FIRE EXIT HARDWARE	9947-L-F-LBRAFL-996-06	626	VON
2	EA	SURFACE CLOSER	4040XP EDA MC	US10B	LCN
2	EA	KICK PLATE	J102	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1	SET	SEALS	2525	BRN	NGP

Operational Description
Free Egress at all times. Pressing Push Bar retracts latchbolts. No exterior trim.
Free Egress at all times. Pressing Push Bar retracts latchbolts. Latchbolt retracted by lever unless locked by key. Key locks and unlocks lever.
Self-Closing.
Magnetic Hold Open is continuously energized allowing the doors to be held open under normal building conditions. When the Fire Alarm is activated, power to the Magnetic Hold Open is disconnected causing the doors to close automatically.

Hardware Group No. Z01

For use on mark/door #(s):
1C04.3 1C04.4 1C04.5

Provide each RU door(s) with the following:

Qty	Description	Catalog Number	Finish	Mfr

Hardware by door supplier

END OF SECTION 08 71 00

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

A. Aluminum frames entrance work; Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.

B. Door hardware; Section 08 71 00, DOOR HARDWARE.

C. Section 28 13 16, ACCESS CONTROL SYSTEM AND DATABASE MANAGEMENT.

D. Glass and glazing of doors and frames; Section 08 80 00, GLAZING.

E. Electric general wiring, connections and equipment requirements; Division 26, ELECTRICAL.

1.3 QUALITY ASSURANCE

A. Automatic door operators, controls and other equipment shall be products of a manufacturer regularly engaged in manufacturing such equipment for a minimum of three years.

B. One type of automatic door equipment shall be used throughout the building.

C. Equipment installer shall have specialized experience and shall be approved by the manufacturer.

1.4 WARRANTY

A. Automatic door operators shall be subject to the terms of the "Warranty of Construction" Article of Section, GENERAL CONDITIONS, except that the Warranty period shall be two years in lieu of one year.

1.5 MAINTENANCE MANUALS

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

1.6 SUBMITTALS

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

B. Manufacturer's literature and data describing operators, power units, controls, door hardware and safety devices.

C. Shop Drawings:

1. Showing location of controls and safety devices in relationship to each automatically operated door.
2. Showing layout, profiles, product components, including anchorage, accessories, as applicable.

3. Submit templates, wiring diagrams, fabrication details and other information to coordinate the proper installation of the automatic door operators.

D. Submit in writing to Project Manager that items listed in Article 1.3 are in compliance.

1.7 DESIGN CRITERIA

A. As a minimum automatic door equipment shall comply with the requirements of BHMA 156.10. Except as otherwise noted on drawings, provide operators which will move the doors from the fully closed to fully opened position in five seconds maximum time interval, when speed adjustment is at maximum setting.

B. Equipment: Conforming to UL 325. Provide key operated power disconnect wall switch for each door installation.

C. Electrical Wiring, Connections and Equipment: Provide all motor, starter, controls, associated devices, and interconnecting wiring required for the installation. Equipment and wiring shall be as specified in Division 26, ELECTRICAL.

1.8 APPLICABLE PUBLICATIONS

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

B. Builders Hardware Manufacturers Association, Inc. (BHMA):
A156.10-05.....Power Operated Pedestrian Doors (BHMA 1601)

C. National Fire Protection Association (NFPA):
101-09.....Life Safety Code

D. Underwriters Laboratory (UL):
325-10.....Door, Drapery, Gate, Louver, and Window Operators and Systems

1.9 DELIVERY AND STORAGE

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

PART 2 - PRODUCTS

2.1 SWING DOOR OPERATORS

A. Manufacturer: Stanley

B. General: Swing door operators shall be of institutional type, door panel size 600 mm to 1250 mm (2'-0" to 5'-0") width, weight not to exceed 300 kg (600 pounds), electric operated for overhead mounting. Furnish metal mounting supports, brackets and other accessories

necessary for the installation of operators at the head of the door frames. The motor on automatic door operator shall be provided with an interlock so that the motor will not operate when doors are electrically locked from opening.

C. Operators shall have checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle. Operators shall be capable of recycling doors instantaneously to full open position from any point in the closing cycle when control switch is activated. Operators shall, when automatic power is interrupted or shut-off, permit doors to easily open manually without damage to automatic operator system.

D. Operator, enclosed in housing, shall open door by energizing motor and shall stop by electrically reducing voltage and stalling motor against mechanical stop. Door shall close by means of spring energy, and close force shall be controlled by gear system and motor being used as dynamic break without power, or controlled by hydraulic closer in electro-hydraulic operators. System shall operate as manual door control in event of power failure. Opening and closing speeds shall be adjustable:

1. Operator Housing: Housing shall be a minimum of 112 mm (4-1/2 inches) wide by 140 mm (5.5 inches) high aluminum extrusions with enclosed end caps for application to 100 mm (4 inches) and larger frame systems. All structural sections shall have a minimum thickness of 3.2 mm (0.125 inch) and be fabricated of a minimum of 6063-T5 aluminum alloy.
2. Power Operator: Completely assembled and sealed unit which shall include gear drive transmission, mechanical spring and bearings, all located in aluminum case and filled with special lubricant for extreme temperature conditions. Complete unit shall be rubber mounted with provisions for easy maintenance and replacement, without removing door from pivots or frame.
3. Connecting hardware shall have drive arm attached to door with a pin linkage rotating in a self-lubricating bearing. Door shall not pivot on shaft of operator.
4. Electrical Control: Operator shall have a self contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching

of power operator. All connecting harnesses shall have interlocking plugs.

2.2 MICROPRCESSOR CONTROLS

A. The system shall include a multi-function microprocessor control providing adjustable hold open time (1–30 seconds), LED indications for sensor input signals and operator status and power assist close options. Control shall be capable of receiving activation signals from any device with normally open dry contact output. All activation modes shall provide fully adjustable opening speed:

B. The door shall be held open by low voltage applied to the continuous duty motor. The control shall include an adjustable safety circuit that monitors door operation and stops the opening direction of the door if an obstruction is sensed. The motor shall include a recycle feature that reopens the door if an obstruction is sensed at any point during the closing cycle. The control shall include a standard three position key switch with functions for ON, OFF, and HOLD OPEN, mounted on operator enclosure, door frame, or wall, as indicated in the architectural drawings.

2.3 POWER UNITS

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

2.4 DOOR CONTROLS

A. Opening and closing actions of doors shall be actuated by controls and safety devices specified, and conform to ANSI 156.10. Controls shall cause doors to open instantly when control device is actuated; hold doors in open positions; then, cause doors to close, unless safety device or reactivated control interrupts operation.

B. Manual Controls:

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

C. Motion Detector: The motion detector may be surface mounted or concealed, and monitor the immediate zone, to detect intrusion by persons, carts or similar objects. The zone which the detector monitors shall be 1500 mm (five feet) deep and 1500 mm (five feet) across, plus

or minus 150 mm (six inches) on all dimensions. The maximum response time shall be no less than 25 milliseconds. Unit shall be designed to operate on 24 volts AC. The control shall not be affected by cleaning material, solvents, dust, dirt and outdoor weather conditions.

2.5 SAFETY DEVICES

A. General: Area over which doors swing or slide shall be a safety section and anyone standing in path of door's movement shall be protected by a safety device.

B. Each swing door shall have installed on the pull side a presence sensor to detect any person standing in the door swing path and prevent the door from opening.

C. Time delay switches shall be adjustable between 3 to 60 seconds and shall control closing cycle of doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate installation of equipment with other related work. Manual controls and power disconnect switches shall be recessed or semi-flush mounted in partitions. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment, in finish work.

B. Install power units in locations shown. Where units are to be mounted on walls, provide metal supports or shelves for the units. All equipment, including time delay switches, shall be accessible for maintenance and adjustment.

C. Operators shall be adjusted and must function properly for the type o£ traffic (pedestrians, carts, stretchers and wheelchairs) expected to pass through doors. Each door leaf of pairs of doors shall open and close in synchronization. On pairs of doors, operators shall allow either door to be opened manually without the other door opening.

D. Install controls at positions shown and make them convenient for particular traffic expected to pass through openings. Maximum height of push plate wall switches from finished floors shall be 40 inches unless otherwise approved by the Project Manager.

3.2 INSTRUCTIONS

A. Following the installation and final adjustments of the door operators, the installer shall fully instruct VA personnel for 2 hours on the operating, servicing and safety requirements for the swing and sliding automatic door operators.

B. Coordinate instruction to VA personnel with VA Project Manager.

END OF SECTION 08 71 13

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies glass, 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. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: Section 09 06 00, SCHEDULE FOR FINISHES.
   2. Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM (PACS).
   3. Section 08 81 30, INSULATING GLASS SYSTEMS.

1.3 LABELS

A. Temporary labels:
   1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
   2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
   3. Temporary labels shall remain intact until glass and plastic material is approved by Project Manager.

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. Organic coated glass.

1.4 PERFORMANCE REQUIREMENTS

A. Building Enclosure Vapor Retarder and Air Barrier:
   1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
   2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass Thickness:
   1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with 2009 IBC.

2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
3. Test in accordance with ASTM E 1300.
4. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

1.5 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Warranty: Submit written guaranty, conforming to General Condition requirements, and to “Warranty of Construction” Article in this Section.

C. Manufacturer's Literature and Data:
   1. Glass, each kind required.
   2. Insulating glass units.
   3. Elastic compound for metal sash glazing.
   4. Glazing cushion.
   5. Sealing compound.

D. Samples:
   1. Size: 150 mm by 150 mm (6 inches by 6 inches).
   2. Tinted glass.
   3. Clear glass.

E. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer’s test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.

B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

1.7 PROJECT CONDITIONS

A. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

1.8 WARRANTY

A. Warranty: Conform to terms of "Warranty of Construction", FAR clause 52.246-21, except extend warranty period for the following:

1. Insulating glass units to remain sealed for 10 years.

1.9 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute (ANSI):

Z97.1-09.....Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test.

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

C1363-05.....Thermal Performance of Building Assemblies, by Means of A Hot Box Apparatus

C542-05.....Lock-Strip Gaskets.

C716-06.....Installing Lock-Strip Gaskets and Infill Glazing Materials.

C794-10.....Adhesion-in-Peel of Elastomeric Joint Sealants

C864-05.....Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

C920-11.....Elastomeric Joint Sealants

C964-07.....Standard Guide for Lock-Strip Gasket Glazing

. C1036-06.....Flat Glass.

C1048-12.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

C1376-10 Pyrolytic and Vacuum Deposition Coatings on

C1172-03.....Laminated Architectural Flat Glass.

C1349-04.....Architectural Flat Glass Clad Polycarbonate.

D635-10.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastic in a Horizontal Position.

D4802-10.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

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

E119-10.....Standard Test Methods for Fire Test of Building Construction and Material

E2190-10.....Insulating Glass Unit

E330-02.....Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

E774-97.....Sealed Insulating Glass Units

D. Commercial Item Description (CID):

A-A-59502.....Plastic Sheet, Polycarbonate

E. Code of Federal Regulations (CFR):

16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 1977, with 1984 Revision.

E. National Fire Protection Association (NFPA):

80-13.....Fire Doors and Windows.

252-12.....Standard Method of Fire Test of Door Assemblies

257-12.....Standard on Fire Test for Window and Glass Block Assemblies

G. F. National Fenestration Rating Council (NFRC):

Certified Products Directory (Latest Edition).

G. Safety Glazing Certification Council (SGCC):

Certified Products Directory (Issued Semi-Annually).

H. Underwriters Laboratories, Inc. (UL):

752-11.....Bullet-Resisting Equipment.

I. Unified Facilities Criteria (UFC):

4-010-01-2012.....DOD Minimum Antiterrorism Standards for Buildings

K. Glass Association of North America (GANA):

Glazing Manual (Latest Edition)

Sealant Manual (2009)

L. American Society of Civil Engineers (ASCE):

ASCE 7-10.....Wind Load Provisions

PART 2 - PRODUCT

2.1 GLASS

A. Use thickness stated unless specified otherwise in assemblies.

B. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

3. Coordinate color/tint/coating to accommodate required security monitoring.

C. Heat reflective and low emissivity coated glass:

1. ASTM C1036, Type I, Class 2, Quality q3.
2. Color: Clear.
3. Thickness, 6 mm (1/4 inch).

D. Patterned and Wired Flat Glass:

1. ASTM C1036, Type II, Class 1,Form 1, Pattern Pl, Finish F1, Quality m1.
2. Thickness, 6 mm (1/4 inch).

2.2 HEAT-TREATED GLASS

A. Clear Heat Strengthened Glass – **(GL-1)**:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4inch) .

B. Clear Tempered Glass – **(GL-2)**:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

2.3 COATED GLASS

A. Spandrel Glass:

1. ASTM C1048, Kind HS, Condition B, Type I.
2. Thickness, 6 mm (1/4 inch).

B. Low-E Tempered Glass:

1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with low emissivity pyrolytic coating having an E of 0.15.
2. Apply coating to second surface of insulating glass units.
3. Thickness, 6 mm (1/4 inch).

D. Organic Coated Glass:

1. Optional for tempered, heat strengthened, or laminated glass.
2. Polyester coated to obtain safety glazing ANSI Z97.1 and SGCC label.
3. Applied to glass.

2.4 INSULATING GLASS UNITS

A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space.

B. Assemble units using glass types specified:

C. Sealed Edge Units (SEU):

1. Conform to ASTM E774, Class C performance requirements.
2. Air Space not less than 1/2 inch wide.
3. R value not less than 1.65.

D. SEU Clear Glass: **(IG-1)**

1. Exterior pane CLEAR, heat strengthened glass 6 mm (1/4 inch).
2. Interior pane Clear Glass 6 mm (1/4 inch).

3. Low E coating on second surface.

E. SEU Clear Tempered Glass: **(IG-2)**

1. Exterior pane ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, 1/4 inch thick. Low E on second surface.
2. Interior pane clear ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3 1/4 inch thick.

F. SEU Spandrel Glass **(IG-SG)**

1. Exterior Pane tinted, ASTM C1048, Kind FT, Condition A, Type I, Class 2, Quality q3, 6 mm (1/4 inch).
2. Interior pane ASTM C1048, Kind HS, Condition B, Type I, Quality q3, 6 mm (1/4 inch).

G. Sealed Edge Units with Integral Blind **(IG-IB)**:

1. See Section 08 81 30 INSULATING GLASS BLIND SYSTEMS.

2.5 GLAZING ACCESSORIES

A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.

B. Setting Blocks: ASTM C864:

1. Channel shape; having 6 mm (1/4 inch) internal depth.
2. Shore a hardness of 80 to 90 Durometer.
3. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
4. Block width: Approximately 1.6 mm (/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 (1 to 3 inches).
4. Shore a hardness of 40 to 50 Durometer.

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
2. Shape, size and degree of softness and strength suitable for use in

glazing application to prevent water infiltration.

E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

F. Glazing Gaskets: ASTM C864:

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.

G. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

H. 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.

I. 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.

J. Color:

1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be nonstaining.
2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer’s approved shop drawings.

B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation: Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to

erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

3.2 PREPARATION

A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION - GENERAL

A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.

C. Set glazing without bending, twisting, or forcing of units.

D. Do not allow glass to rest on or contact any framing member.

E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.

G. 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.

3.4 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 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 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, 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 a sealant compatible with glazing tape to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.6 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

B. Locate and secure glazing pane using glazers' spring wire clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.7 REPLACEMENT AND CLEANING

A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Project Manager.

B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.

C. Leave glass, putty, and other setting material in clean, whole, and

acceptable condition.

3.8 PROTECTION

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

3.9 GLAZING SCHEDULE

A. Fire Resistant Glass:
   1. Install clear wire glass in interior fire rated or labeled doors and windows.

B. Tempered Glass:
   1. Install in full and half glazed doors unless indicated otherwise.
   2. Use clear tempered glass on interior side lights and doors.

C. Clear Glass:
   1. Interior observation windows not specified otherwise.

D. Insulating Glass:
   1. Install SEU clear tempered glass in storefronts, curtain walls, and doors and sidelights adjacent to entrances or walks.
   2. Install SEU clear glass in storefront windows, and curtain walls not adjacent to entrances or walks.

E. Spandrel Glass: Install specified spandrel glazing where indicated.

END OF SECTION 08 80 00

SECTION 08 81 30
INSULATING GLASS BLIND SYSTEMS

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. Section Includes:
   1. Insulated glass blind system
      a. SL20A Tilt Only

B. Related Sections:
   1. Section 08 80 00 GLAZING for standard glass products.
   2. Section

1.3 DEFINITIONS

A. Glazing Manufacturers: Firms that produce primary glass, as defined in referenced glazing publications.

B. Interspace: Space between lites of insulating glass blind systems.

1.4 PERFORMANCE REQUIREMENTS

A. Provide insulating glass blind systems that comply with the following:
   1. ASTM E 774 testing in insulating glass units for durability classification by Insulating Glass Certification Council.
   2. Life cycle testing demonstrating over 10,000 tilting operations.
   3. Demonstrate proper blind operation inside insulating glass unit with inside glass exposed to temperature of 20 deg C and external glass exposed to temperature of minus 30 deg C.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include elevations, edge details, hardware, and attachments to other work.

C. Samples: For the following products, in the form of 15 x 18 -inch square Samples for glass.

D. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Product who are certified under the National Glass Association’s Certified Glass Installer Program.

B. Source Limitations for Insulating Glass Blind Systems: Obtain insulating glass blind systems

from single source from single manufacturer.

C. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for commercial and Residential Use."

D. Safety Glazing Products: For Tempered insulating glass blind systems, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass,thickness, and safety glazing standard with which glass complies.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 COORDINATION

A. Coordinate dimensions, including thickness, of insulating glass blind systems with dimensions of construction that receives insulating glass blind systems.

1.10 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of

hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moistures, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Blinds: Manufacturer's standard form in which insulating glass blind systems manufacturer agrees to repair or replace blinds that fail or deteriorate within specified warranty period. Failure does not include blinds that have been exposed to temperatures greater than 220 deg F or external magnetic operator.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 INSULATING GLASS BLIND SYSTEMS

A. Insulating Glass Blind Systems: Magnetically-coupled gear-driven tilt mini-blind installed in sealed insulating glass, with externally-mounted magnet assembly that is coupled to an internal magnet that controls the tilting of blind slats. Force to tilt blind is less than 10 Newtons.

1. Air Space: ¾ inch.
2. Tilt Operator Type:
   a. Magnet knob operator.
3. Tilt Operator Location: manufacturer's standard.

B. Horizontal Louver Blinds, Aluminum Slats:

1. Slats: 6010-T8 aluminum alloy, 0.50-inch wide by 0.008-inch thick, with crowned profile.
2. Spacing: Manufacturer's standard.
3. Finish: One color, baked polyester paint ultra-violet-resistant finish.
4. Head and Bottom Rails: 6063-T5 aluminum alloy, painted in coordinated color with slats. Side rails support head rail and provide spacing between blind and inside surface of glass.
5. Ladder Tapes and Plisse Cords: Thermally-fixed polyester, UV resistant, and evenly spaced to prevent long-term slat sag.
6. Operating Mechanism: Sintered neodymium, iron-boron magnets, producing energy of Bh maximum 33 to 35 Mega Oersteds and maximum working temperature of 248 deg F. Internal mechanism has steel gears

hardened on surface and bearings to reduce friction and support magnets.

7. Colors, Textures, Patterns, and Gloss:
   a. White

C. Insulating Glass Units: Clear insulating glass, factory assembled units consisting of sealed lites separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other equirements specified.

1. Heat-Treated Float Glass: ASTM C 1048; Type 1; Quality-Q3; Class 1 (clear) unless otherwise indicated; of kind and condition indicated.
   a. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   b. All glass to be fully tempered float glass.
   c. All Low-e glass (if specified) to be pyrolitic (hard coat) on surface #3.
2. Glass Thickness: 1/8 inch, minimum. Provide glazing in thicknesses as needed to comply with requirements indicated.
3. Overall Thickness of Insulated Glass Blind System Unit: 1 inch minimum.
4. Sealing System: Seal with manufacturer’s standard sealant.
5. Spacer: Manufacturer’s standard spacer material and construction.
6. Desiccant: Molecular sieve or silica gel, or blend of both.

D. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide:

Kyler Industries
192 East 48th Street
Holland, MI 49423
(616) 392-1042 (voice)
(616) 392-3778 (fax)
www.Kyler-Industries.com

E. Miscellaneous Glazing Materials: Refer to Division 8 Section “Glazing”.

2.2 FABRICATION

A. Factory fabricate insulating glass blind system with necessary space around internal magnet so
it interfaces with external magnet operator.

B. Tolerances:

1. Space of approximately 1/8 inch on each side between slats and spacer, for free movement of system and allowing thermal transmission of aluminum slats.
2. Blind Width Tolerance: Plus zero; minus 1/16 inch.
3. Blind Height Tolerance: Plus 3/8 inch; minus zero. Bottom rail engages pins in sidetrack with some slack and is slightly above lower spacer bar.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine framing for insulating glass blind system units, with Installer present, for compliance with requirements for installation tolerances, minimum required face or edge clearances, effective sealing between joints of framing members, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving insulating glass blind system units immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 INSTALLATION

A. Install insulating glass blind system according to manufacturer’s written instructions.

B. Refer to Division 8 Section “Glazing” for installation of insulating glass blind system units

3.4 ADJUSTING, CLEANING, AND PROTECTIONS

A. Remove protective film, clean glass, and position external magnet on glass aligned with internal magnet to produce optimum tilt operation for smooth slat rotation of blinds (per manufacturer’s instructions).
   1. Remove nonpermanent labels, and clean surfaces.

B. Protect insulating glass blind system units from damage immediately after installation by attaching crossed streamers to framing held away from glazing unit. Do not apply markers to security glazing surfaces.

C. Protect insulating glass blind system units from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating

substances do come into contact with insulating glass blind system units, remove substances immediately as recommended in writing by insulating glass blind system manufacturer.

D. Remove and replace insulating glass blind system units that are broken, chipped, cracked, or abraded or that are damaged from natural causes, accidents, or vandalism during construction period.

E. Wash insulating glass blind system units on exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash insulating glass blind system units as recommended in writing by insulating glass blind system manufacturer.

END OF SECTION 08 81 30

SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK

A. Louvers in steel doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.

B. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHESS.

1.3 SUBMITTALS

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

B. Shop Drawings:
Each type, showing material, finish, size of members, method of assembly, and installation and anchorage details.

C. Manufacturer's Literature and Data:
Each type of louver and vent.

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 – November 2007

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

A167-99(R2004).....Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet, and Strip

A1008/A1008M REV A-07...Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability

B209/B209M-07.....Aluminum and Aluminum Alloy, Sheet and Plate

B221-06.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-07.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire Shapes, and Tubes

D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-505 (1988).....Metal Finishes Manual

E. National Fire Protection Association (NFPA):

90A-02.....Installation of Air Conditioning and Ventilating Systems

G. American Architectural Manufacturers Association (AAMA):
605-98.....High Performance Organic Coatings on Architectural Extrusions and Panels

H. Air Movement and Control Association, Inc. (AMCA):
500-L-99.....Testing Louvers

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum, Extruded: ASTM B221/B221M.

B. Stainless Steel: ASTM A167, Type 302B.

C. Carbon Steel: ASTM A1008/A1008M.

D. Aluminum, Plate and Sheet: ASTM B209/B209M.

E. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or shown, shall be toggle or expansion bolts, of size and type as required for each specific type of installation and service condition.

1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
2. Fasteners for louvers, louver frames, and wire guards shall be of stainless steel or aluminum.

F. Inorganic Zinc Primer: MPI No. 19.

2.2 EXTERIOR WALL LOUVERS

A. General:

1. Provide fixed type louvers of size and design shown.
2. Heads, sills and jamb sections shall have formed caulking slots or be designed to retain caulking. Head sections shall have exterior drip lip, and sill sections an integral water stop.
3. Furnish louvers with sill extension or separate sill as shown.
4. Frame shall be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Performance Characteristics See plans for air flow performance required per AMCA Standard 500-L.

1. Louvers shall bear AMCA certified rating seals for air performance and water penetration ratings.

C. Aluminum Louvers:

1. General: Frames, blades, sills and mullions (sliding interlocking type); 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 outside 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 stainless steel designed to retain wire mesh.
C. Wire mesh shall be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire 1.3 mm (0.05-inch) diameter 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 BRICK VENTS

A. Vents to fit in vertical mortar joint, formed of approximately 3 mm (0.125 inch) thick cast aluminum, or 3 mm (0.125) inch extruded aluminum.
B. Provide vents complete with aluminum screen frame with corrosion resistant insect screening mounted on back of vent.
C. Provide vents with required anchors.

2.6 FINISH

A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505

B. Aluminum Louvers:

1. Anodized finish, color to be dark bronze to match storefront.

a. AA-C22A42 Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick.

NOTE: AA-C22A44 Chemically etched medium matte, with electronically deposited metallic compound, Class I Architectural, 0.7 mils thick may be provided as an option for AA-C22A42 color anodic coating. Dyes will not be accepted.

2. Organic Finish: AAMA 605 (Fluorocarbon coating).

2.11 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.

C. Provide anchoring devices and fasteners as necessary for securing louvers 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. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING

A. After installation, all exposed prefinished and plated items and all items fabricated from 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.

END OF SECTION 08 90 00

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Division 09

Finishes

Division 09

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SECTION 09 06 00
SCHEDULE FOR FINISHES

VAMC:

Location: Iowa City, Iowa

Project Name: VA Renovate and Expand Space for Patient Support Areas

Project No.: DVA #636-311

Contract No.:

Submission: 100%

Date: December 5, 2014

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

1.2 MANUFACTURERS

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

1.3 SUBMITALS

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

1.4 APPLICABLE PUBLICATIONS

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

B. MASTER PAINTING INSTITUTE: (MPI)

2001.....Architectural Painting Specification Manual

PART 2 - PRODUCTS

2.1 DIVISION 31 - EARTHWORK–

A. SECTION 32 31 13, CHAIN LINK FENCES AND GATES

Finish Chain Link Fabric	Finish Posts and Rails	Manufacturer	Mfg. Color Name/No.
Galvanized	Galvanized		

B. SECTION 32 17 23, PAVEMENT MARKINGS.

Color	Manufacturer	MFG. Color Name/No.
White		

2.2 DIVISION 03 – CONCRETE

A. SECTION 03 30 00, CAST IN PLACE CONCRETE

Surface	Finish Description
Vertical Dock Wall	Gray

B. SECTION 03 45 00, PRECAST ARCHITECTURAL CONCRETE

Finish Color	Texture	Finish	Manufacturer	Mfg. Color Name/No.
Light Gray	Acid Etch/Abrasive Blast			

2.3 DIVISON 04 – MASONRY

A. Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING

Finish Code	Manufacturer	Mfg. Color Name
		Match existing

B. Section 04 20 00, UNIT MASONRY

1. FACE BRICK (FB)				
Finish Code	Size	Pattern	Manufacturer	Mfg. Color Name/No.

FB-1	Modular		Sioux City Bank	50% Red Granite Smooth 50% Red Colonnial

2.CONCRETE MASONRY UNIT (CMU)				
Type	Size	Pattern	Finish	Mfg. Color Name/No.
CMU Standard	Standard	Running	Standard	Gray

2.4 DIVISION 05 – METALS

A. SECTION 05 50 00, METAL FABRICATION

Item	Finish
Modular Channel Units	Paint to match wall or ceiling
Guard Angles for Overhead Doors	Paint to match wall or ceiling
Edge Guards Angles for Opening in Slabs	Paint to match wall or ceiling
Steel Frames for pits	Safety Yellow
Loose Lintels	Paint to match wall
Exterior Railings	Dark Bronze (PNT-7)

B. SECTION 05 51 00, METAL STAIRS

Component	Finish	Color
Guard Rails	Paint	PNT 4
Handrails	Paint	PNT 4
Stringers	Paint	PNT 4
Risers	Paint	PNT 4
Underside	Paint	PNT 4

C. SECTION 07 95 13, EXPANSION JOINT COVER ASSEMBLIES

	Material	Finish	Manufacturer	Mfg. Color Name/No.
Wall Component Cover Plate Frame Casket or Sealant (interior only)	Aluminum	Anodized		

2.5 DIVISION 06 WOOD, PLASTICS, AND COMPOSITES

A. SECTION 06 20 00, FINISH CARPENTRY

1.				
Room No. and Name	Component	Finish Code	Manufacturer	Mfg Color Name/No.
	Solid Surface	SS-1	Silestone	Lyra
	Solid Surface	SS-2	Dupont	Corian, Dove
	Solid Surface	SS-3	Dupont	Corian, Flint
	Solid Surface	SS-4	Samsung	Pebble Grey PG810
	Solid Surface	SS-5	Dupont	Burled Beach
	Plastic Laminate	PL-1	Wilsonart	Storm
	Plastic Laminate	PL-2	Wilsonart	Pearl Soapstone 4886-38

2.6 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

A. SECTION 07 24 00, EXTERIOR INSULATION AND FINISH SYSTEMS

Finish Code	Finish	Manufacturer	Mfg. Color Name/No.
PNT	Sand	Sherwin Williams	Collonade Gray SW7641

B. SECTION 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

Color	Manufacturer	Mfg. Color Name/No.
White		

C. SECTION 07 60 00, FLASHING AND SHEET METAL

Item	Material	Finish
Copings	Aluminum	Dark Bronze
Fascia	Aluminum	Dark Bronze
Scuppers	Aluminum	Dark Bronze

D. 07 72 00, ROOF ACCESSORIES

Item	Material	Finish	Manufacturer	Manufacturer/Color Name/Number.
Roof Hatch	Aluminum	Mill		
Copings	Extruded Aluminum	Dark Bronze		
Fascia Systems	Extruded Aluminum	Dark Bronze		

E. SECTION 07 92 00, JOINT SEALANTS

Location	Color	Manufacturer	Manufacturer Color
Masonry Expansion Joints	Match mortar		
CMU Control Joints	White/Gray (paintable)		
Precast Concrete Panels	Match Panels		
New to Existing Walls	Match Mortar		
Door Frames	Match Frame		
Flooring	Match Flooring		

2.7 DIVISION 08 - OPENINGS

A. SECTION 08 11 13, HOLLOW METAL DOORS AND FRAMES

Paint both sides of door and frames same color including ferrous metal louvers, and hardware attached to door	
Component	Color of Paint Type and Gloss
Frames – Interior - Bldg 2	PNT 4/PNT 9
Frames – Interior - Basement	PNT 9
Frames – Exterior - Bldg 2	PNT 4
Doors – Exterior – Bldg 2	PNT 4

B. SECTION 08 14 00, WOOD DOORS

Component	Finish/Color
Doors	Match existing

C. SECTION Doors 08 35 13.13, Accordion Folding

Location	Component	Finish	Manufacturer	Manufacturer Color Name/No.
114H Meeting Room	Door	Vinyl		Driftwood Embossed Weave

D. SECTION 08 38 16, FLEXIBLE TRAFFIC DOORS

Location	Frame	Finish
	Steel	Black

E. SECTION 08 36 13, SECTIONAL DOORS

Finish	Manufacturer	Manufacturer Color Name/No.
		White

F. SECTION 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

Material	Finish	Manufacturer	Manufacturer Color Name/No.
Aluminum	Anodized		Dark Bronze to match existing

G. WINDOW SILLS

Room No. and Name	Material	Finish
	SECTION 03 45 00,PRE-CAST ARCHITECTURAL CONCRETE	Honed – Light Gray

H. WINDOW STOOLS

Room No. and Name	Material	Finish
	Solid Surface Silestone	Lyra

I. SECTION 08 71 00, DOOR HARDWARE

Item	Material	Finish
		See Section 08 71 00 Door Hardware

J. SECTION 08 80 00, GLAZING

Glazing Type	Manufacturer	Mfg. Color Name/No.
IG-SG		Tinted
IG-1		Clear
IG-2		Clear
GL-1		Clear
GL-2		Clear

K. SECTION 08 44 13, GLAZED ALUMINUM CURTAIN WALLS

Component	Material	Finish	Manufacturer	Mfg. Color Name/No.
Frame	Aluminum	Dark Bronze		

2.8 DIVISION 09 - FINISHES

A. SECTION 09 30 13, CERAMIC TILING

1. SECTION 09 30 13, CERAMIC TILING

Finish Code	Manufacturer	Mfg. Color Name/No
CT-1	American Olean	Porcelain Infusion: Gray Wall IF75 8"x20"
CT-2	American Olean	Porcelain Infusion: White Wall IF70 8"x20"
CT-4	American Olean	Unglazed Mosaic Tile: Light Smoke Speckled A04 2"x2"
CT-3	American Olean	Gloss Light Smoked: 0042 4"x4"
CTB-1	American Olean	Porcelain Infusion: Gray Wall IF75 6"x12"

2. SECTION 09 30 13, PORCELAIN TILE (PT)

Finish Code	Size	Shape	Pattern	Manufacturer	Mfg. Color Name/No.
PT-1	12"x24"		Porcelain Infusion	American Olean	Gray Wenge IF65

B. SECTION 09 51 00, ACOUSTICAL CEILINGS

Finish Code	Component	Color Pattern	Manufacturer	Mfg Name/No.
ACT-1	Exposed Suspension System	White (WA)	Armstrong	Prelude XL
ACT-1	Type III	White (WH)	Armstrong	Cirrus 584

C. SECTION 09 65 19, RESILIENT TILE FLOORING (LVT)

Finish Code	Pattern name	Manufacturer	Mfg. Color Name/No.
LVT-1	NS RR73-E RK 12X18	Centiva	Mesa Verde
LVT-2	WP3305-E 6X36	Centiva	American Cherry
LVT-3	NS 712-F FR 12X18	Centiva	Okara Gray

D. SECTION 09 65 13, RESILIENT BASE STAIR TREADS AND ACCESSORIES

Finish Code	Item	Height	Manufacturer	Mfg Name/No.
VB-2	Vinyl Base (VB)	4"	Roppe	Pinnacle – Charcoal 123

VB-1	Vinyl Base (VB)	4"	Roppe	Pinnacle – Black Brown 193
VB-4	Vinyl Base (VB)	4"	Roppe	Long Toe – Black Brown 193
RSR-1	Rubber Stair Raiser 1		Roppe	Smooth- Black 100
RST-1	Rubber Stair Tread 1		Roppe	#93 Textured-Black 100

E.SECTION 09 68 00, CARPET MODULES (CPT)

Finish Code	Size	Pattern Direction	Manufacturer	Mfg. Color Name/No.
CPT-1	24" x 24"	¼ Turn	J&J Invision	Texas Tea, 1417

F.SECTION 09 91 00, PAINT AND COATINGS

1. MPI Gloss and Sheen Standards

		Gloss @60	Sheen @85
Gloss Level 1	a traditional matte finish-flat	max 5 units, and	max 10 units
Gloss Level 2	a high side sheen flat-“a velvet-like” finish	max 10 units, and	10-35 units
Gloss Level 3	traditional “egg-shell like” finish	10-25 units, and	10-35 units
Gloss Level 4	a “satin-like” finish	20-35 units, and	min. 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	

Gloss Level 7	a high gloss	more than 85 units	

2. Paint Codes

Paint Code	Gloss	Manufacturer	Mfg. Color Name/No.
PNT-1	Level 3	Sherwin Williams	Accessible Beige SW7036
PNT-2	Level 3	Sherwin Williams	Dorian Gray SW7017
PNT-3	Level 3	Sherwin Williams	Homburg Gray SW7622
PNT-4	Level 5	Pro Industrial	Match SW7017 Dorian Gray
PNT-5	Level 3	Sherwin Williams	Repose Gray SW7015
PNT-6	Level 2	Sherwin Williams ProMar 200	Match SW7036 Accessible Beige
PNT-7	Level 3	Sherwin Williams	Herbal Wash SW7739
PNT-8	Level 1	Sherwin Williams	Divine White SW6105
PNT-9	Level 5	Pro Industrial	Match SW7048 Urban Bronze
PNT-10	Level 3	Sherwin Williams	Labradorite SW7619
PNT-11	Level 2	Sherwin Williams ProMar 200	Match SW7015 Repose Gray
PNT-12	Level 3	Sherwin Williams	Nuance SW7049
PNT-13	Level 2	Sherwin Williams ProMar 200	Match SW7622 Homburg Gray
EP-1	Level 6	Epoxy Paint	Repose Gray SW7015
EP-2	Level 6	Epoxy Paint	Accessible Beige SW7036

G. SECTION 09 72 00, WALL COVERINGS

Finish Code Manufacturer Mfg. Color Name/No.

AWC-1 MDC Wall coverings Canyon Silver

H. SECTION 09 77 14, WOOD VENEER WALL PANEL (AWP)

Finish Code	Manufacturer	Mfg. Color Name/No.
AWP-1	Armstrong- Wood Works Wall	Dark Cherry- perforated W2

2.9 DIVISION 10 - SPECIALTIES

A. SECTION 10 11 23, CHALKBOARDS / TACKBOARDS

Room No. and Name	Component	Material	Manufacturer	Finish
				See Section
				10 11 23 Tackboards

B. SECTION 08 90 00, LOUVERS AND WALL VENTS

Item	Material	Finish	Manufacturer	Mfg. Color Name/No.
Exterior Wall Louvers	Aluminum	Dark Bronze		
Brick Vents	Aluminium	Dark Bronze		

C. SECTION 10 26 00, WALL GUARDS AND CORNER GUARDS

Item	Material	Manufacturer	Mfg. Color Name/No.
Corner Guards	CG-1	C/S Acrovyn	SSM-10N Floor to Ceiling, Ozark 314
Corner Guards	CG-2	Inpro Corp.	IPC/#150 Floor to Ceiling, Chino 0258
Crash Rail	CR-1	Inpro Corp.	IPC/Nutree, 9 ½" High, Black
Crash Rail	CR-2	Inpro Corp.	IPC/#1600, 6" High, Castle 0256
Chair Rail	CHR-2	Inpro Corp.	IPC/#2500, Chino 0258
Chair Rail	CHR-3	Inpro Corp.	IPC/#2500, Castle 0256
Corner Guard	CG-3	Nutree	Custom- see interior details, Color: Black
Corner Guard	CG-4	Inpro Corp.	IPC/#181128 Floor to Ceiling, Stainless Steel
Wall Protection	WP-1	Acrovyn	Ozark 314, Suede Texture

Wall Protection	WP-2	Acrovyn	Fawn 196, Suede texture
End Cap	EC-1	C/S Acrovyn	FSC-25/ Ozark 314
End Cap	EC-2	Inpro Corp.	IPC/160D End wall protector, floor to ceiling/ Chino 0258
Hand Rail	HR-1	Inpro Corp.	IPC/800, Castle 0256

D. SECTION 10 44 13, FIRE EXTNGUISHER CABINETS

Component	Material	Finish
Recessed and Semi-Recessed Cabinets	Steel	White

E. SECTION 10 21 13, TOILET COMPARTMENTS

Item	Material	Manufacturer	Finish
Toilet Partition	Stainless Steel		3
Urinal Screen	Stainless Steel		3

F. SECTION 10 28 00, TOILET, BATH AND LAUNDRY ACCESSORIES

Item	Material	Manufacturer	Finish
			See Section 10 28 00
			Toilet, Bath and Laundry Accessories

2.10 DIVISION 12 - FURNISHINGS

A. SECTION 12 32 00, WOOD CASEWORK

Item Type	Location	Finish/Color

B. SECTION 12 36 00, COUNTERTOPS AND ACCESSORIES

Type	Finish/Color
Stainless Steel	Type 304

C. SECTION 12 24 13, ROLLER WINDOW SHADES

Component	Material	Manufacturer	Mfg. Color Name/No.
Manual Roller Shade – 5% Open		Hunter Douglas Contract	SheerWeave 4000, Granite- 5% Open

D. SECTION 12 32 00, WOOD CASEWORK

Component	Material	Manufacturer

E. SECTION 14 24 00, HYDRAULIC ELEVATORS

1. Passenger Elevator No. P	Component	Material	Color
	Hoistway Entrances	Powder Coat	Antique White

	Hoistway Doors	Powder Coat	Antique White
	Car Walls	Plastic Laminate	Select Cherry 7759
	Car Floor	Carpet	Sand Pebble
	Car Doors	Powder Coat	Antique White
	Car Door Frame	Powder Coat	Antique White

PART 3 - EXECUTION

3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS

FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS	
Term	Abbreviation
Vinyl Composition Tile	VCT
Acoustical Ceiling	ACT
Carpet Module Tile	CPT
Resinous Flooring	RF
Glazing	G
Solid Surface	SS
Paint	PNT
Rubber Base	VB
Plastic Laminate	PL
Luxury Vinyl Tile	LVT
Corner Guard	CG
Crash Rail	CG
Wall End Cap	EC

Hand Rail	HR
Chair Rail	CHR
Acoustical Wall Panel	AWP
Clear Coating	CC

3.2 ROOM FINISH SCHEDULE ON DRAWINGS

END OF SECTION 09 06 00

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SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

A. Section 09 51 00, ACOUSTICAL CEILINGS.

B. 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 metal stud and furring construction system including details around openings and corner details.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

A. 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)

A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire

A653/653M-11.....Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

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

C636-08.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

C645-09.....Non-Structural Steel Framing Members

C754-11.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

C841-03(R2008).....Installation of Interior Lathing and Furring

C954-10.....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

E580-11.....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

A. 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 A653/A653M steel, 0.8 mm (0.0329-inch) thick bare metal (33 mil).

2. Runners same thickness as studs.

B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.

C. Doubled studs for openings and studs for supporting concrete backer-board.

D. Studs 3600 mm (12 feet) or less in length shall be in one piece.

E. Shaft Wall Framing:

1. Conform to rated wall construction.
2. C-H Studs.
3. E Studs.
4. J Runners.
5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.

B. 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.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be

same as that used in fire rating test.

B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than 610 mm (24 inches) on center.

C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.

D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.

E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions.

F. Openings:

1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.

G. Fastening Studs:

1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.

H. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

I. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING **SUPPORTS REQUIRED BY OTHER TRADES**

A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.4 INSTALLING SHAFT WALL SYSTEM

A. Elevator Shafts:

1. Frame elevator door frames with 0.87 mm (0.0341-inch) thick J strut or J stud jambs having 75 mm (three-inch) long legs on the shaft side.
2. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
3. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.**5 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.)

END OF SECTION 09 22 16

SECTION 09 26 00
VENEER PLASTERING

PART 1 GENERAL

1.1 DESCRIPTION

A. This section specifies veneer plaster.

1.2 RELATED WORK

A. Metal framing: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

B. Gypsum backing board on multi-layer system, Section 09 29 00, GYPSUM BOARD

B. Application of sealants: Section 07 92 00, JOINT SEALANTS.

1.3 TERMINOLOGY

A. Definitions and description of terms in accordance with ASTM C11, C843, C844, and as specified.

B. Underside of Structure Overhead: Where steel trusses or bar joists are shown, the underside of structure overhead is the underside of the floor or roof construction supported by the trusses or bar joists.

C. "Yoked" Gypsum Board cut out for opening with no joint at the opening corners.

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. Gypsum veneer plaster.
2. Bonding agent.
3. Accessories.
4. Joint reinforcing materials.
5. Laminating adhesive.

C. Shop Drawings:

1. Typical veneer plaster installation, showing corner details, casing details, control joint details, and other similar details.

1.5 APPLICABLE PUBLICATIONS

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

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

C11-07.....Terminology Relating to Gypsum and Related Building Materials and Systems

C472-99 (R2004).....Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete

C475-02 (R2007).....Joint Compound and Joint Tape for Finish Gypsum Board Construction

C587-04.....Gypsum Veneer Plaster

C588-03.....Gypsum Base for Veneer Plasters

C631-95 (R2004).....Bonding Compounds for Interior Plastering

C843-99 (R2006).....Application of Gypsum Veneer Plaster

C844-07.....Application of Gypsum Base to Receive Gypsum Veneer Plaster

C954-07.....Steel Drill Screws for the Application of Gypsum Panel Products Board or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness

C1002-07.....Steel Drill Screws for the Applications of Gypsum Panel Products Board or Metal Plaster Bases

C1047-05.....Accessories for Gypsum Wallboard and Gypsum Veneer Base

D3678-97 (R2001).....Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions

PART 2 - PRODUCTS

2.1 GYPSUM VENEER PLASTER

A. ASTM C587. Minimum compressive strength of finish coat plaster shall be 17.2 MPa (2500 psi) in accordance with ASTM C472.

2.2 ACCESSORIES

A. Corner Bead, Edge Trim and Control Joints: ASTM C1047 or D3678, except as specified.

B. Corner bead and edge trim (casings): Minimum 0.38 mm (0.015-inch) thick zinc-coated steel sheet or rigid PVC plaster (Fry Reglet No. DMCT-375 and DMCT-1250).

C. Flanges not less than 22 mm (7/8-inch) wide with punch-outs or deformations as required to provide plaster bond.

2.3 JOINT REINFORCING TAPE

A. ASTM C475, Paper tape.

2.4 FASTENERS

A. Screws: ASTM C1002 or C954.

B. Staples: Flattened zinc-coated steel wire, minimum 15 mm (9/16-inch) leg for securing corner beads or casing and minimum 9 mm (3/8-inch) leg for securing joint reinforcement.

2.5 BONDING COMPOUND

A. ASTM C631 where noted, skim coat glazed block and brick surfaces to receive scheduled finish.

B. Prior to skimming with veneer plaster, provide bonding compound equal to plaster weld by Larsen Products Corporation or Adhesion Primer B51W805 by Sherwin Williams.

PART 3 EXECUTION

3.1 INSTALLATION CRITERIA

A. Where fire rated construction is required for walls and partitions, construct the same as that used in fire rating test.

3.2 SEALANT APPLICATION

A. Apply sealants to veneer plaster base to cut outs, penetrations, and intersections with adjoining materials prior to application of veneer plaster for acoustical partitions.

B. Coordinate with Section 07 92 00, JOINT SEALANTS, for application of sealants.

3.3 VENEER PLASTER APPLICATION

A. Mix and apply veneer plaster in accordance with ASTM C843 for one-component plasters, except as specified otherwise.

B. Joint Reinforcement: ASTM C843.

C. Apply smooth-trowel finish.

D. The veneer plaster finish may terminate 100 mm (four inches) above the suspended ceiling.

E. Seal and reinforce all joints and fastener heads above ceilings.

3.4 CLEANUP AND PATCHING

A. Remove any plaster splashes from adjacent surfaces. Repair defects in veneer plaster. Plaster surfaces shall be smooth, clean, and in condition to receive the finishing materials that will be applied.

END OF SECTION 09 26 00

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SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

B. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

C. Gypsum base for veneer plaster: Section 09 26 00, VENEER 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: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.

C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Cornerbead and edge trim.
2. Finishing materials.
3. Laminating adhesive.
4. Gypsum board, each type.

C. Shop Drawings:

1. Typical gypsum board installation, showing corner details, edge trim details and the like.
2. Typical shaft wall assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

A. In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

A. In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

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

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

C11-08.....Terminology Relating to Gypsum and Related Building Materials and Systems

C475-02.....Joint Compound and Joint Tape for Finishing Gypsum Board

C840-08.....Application and Finishing of Gypsum Board

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

C954-07.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness

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

C1047-05.....Accessories for Gypsum Wallboard and Gypsum Veneer Base

C1396-06.....Gypsum Board

E84-08.....Surface Burning Characteristics of Building Materials

C. Underwriters Laboratories Inc. (UL):

Latest Edition.....Fire Resistance Directory

D. Inchcape Testing Services (ITS):

Latest Editions Cert ification Listings

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. 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.

2.2 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 punch-outs or deformations as required to provide compound bond.

2.3 FASTENERS

A. ASTM C1002 and ASTM C840, except as otherwise specified.

B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).

C. Select screws of size and type recommended by the manufacturer of the material being fastened.

D. For fire rated construction, type and size same as used in fire rating test.

E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.4 FINISHING MATERIALS AND LAMINATING ADHESIVE

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

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:

1. Two sides of partitions:
   a. Fire rated partitions.
   b. Smoke partitions.
   c. Sound rated partitions.
   d. Full height partitions shown (FHP).
2. One side of partitions or furring:
   a. Inside of exterior wall furring or stud construction.
   b. Room side of room without suspended ceilings.
   c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
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. Use gypsum boards in maximum practical lengths to minimize number of end joints.

D. Bring gypsum board into contact, but do not force into place.

E. Ceilings:

1. For single-ply construction, use perpendicular application.
2. For two-ply assembles:
   a. Use perpendicular application.
   b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.

F. Walls (Except Shaft Walls):

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
3. Stagger screws on abutting edges or ends.
4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
6. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
7. Control Joints ASTM C840 and as follows:
   a. Locate at both side jambs of openings if gypsum board is not

"yoked". Use one system throughout.

b. 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.

G. Accessories:

1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
2. Install in one piece, without the limits of the longest commercially available lengths.
3. Corner Beads:
   a. Install at all vertical and horizontal external corners and where shown.
   b. Use screws only. Do not use crimping tool.
4. Edge Trim (casings Beads):
   a. At both sides of expansion and control joints unless shown otherwise.
   b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
   c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
   d. Where shown.

3.3 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:
   2. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.
E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.
F. Elevator Shafts:
   1. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
   2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.4 FINISHING OF GYPSUM BOARD

A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 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 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 construction; Sanding is not required of non decorated surfaces.

3.5 REPAIRS

A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.

D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non-decorated surface to provide smoke tight construction and fire protection equivalent to the fire rated construction .

END OF SECTION 09 29 00

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SECTION 09 30 13
CERAMIC-PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

A. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.

B. Color, texture and pattern of field tile and trim shapes, size of field tile, trim shapes, and color of grout specified: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Metal and resilient edge strips at joints with new resilient flooring, and carpeting: Section 09 65 19, RESILIENT TILE FLOORING Section 09 68 00, CARPETING, and Section 09 67 23.10, RESINOUS FLOORING 09 67 23.10.

1.3 SUBMITTALS

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

B. Samples:

1. Base tile, each type, each color, each size.
2. Porcelain tile, each type, color, patterns and size.
3. Wall (or wainscot) tile, each color, size and pattern.
4. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.
5. Porcelain tile stair tread with ¼″ horizontal grooves running entire length of tile.
6. Metal edge strips in 6 inch lengths.

C. Product Data:

1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
2. Chemical resistant mortar and grout (Epoxy and Furan).
3. Cementitious backer unit.
4. Dry-set Portland cement mortar and grout.
5. Divider strip.
6. Elastomeric membrane and bond coat.

7. Reinforcing tape.
8. Leveling compound.
9. Latex-Portland cement mortar and grout.
10. Commercial Portland cement grout.
11. Organic adhesive.
12. Slip resistant tile.
13. Waterproofing isolation membrane.
14. Fasteners.

D. Certification:
1. Master grade, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
   a. Chemical resistant mortar and grout (epoxy and furan).
   b. Modified epoxy emulsion.
   c. Commercial Portland cement grout.
   d. Cementitious backer unit.
   e. Dry-set Portland cement mortar and grout.
   f. Elastomeric membrane and bond coat.
   g. Reinforcing tape.
   h. Latex-Portland cement mortar and grout.
   i. Leveling compound.
   j. Organic adhesive.
   k. Waterproof isolation membrane.
   l. Factory mounted tile suitability for application in wet area specified under 2.1, A, 3 with list of successful in-service performance locations.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material under cover and in a dry location to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute (ANSI):

A108.1A-11.....Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar

A108.1B-11 Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with dry-Set or latex-Portland Cement Mortar

A108.1C-11 Contractors Option; Installation of Ceramic Tile in the Wet-Set method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar

A108.6-05.....Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy

A108.10-05.....Installation of Grout in Tilework

A108.11-05.....Interior Installation of Cementitious Backer Units

A118.3-05.....Chemical Resistant, Water Cleanable Tile-Setting Epoxy and Water Cleanable Tile-Setting and Grouting Epoxy Adhesive

A118.4-05.....Latex-Portland Cement Mortar

A118.9-05.....Cementitious Backer Units

A137.1-12.....Ceramic Tile

C. American Society For Testing And Materials (ASTM):

A185-07.....Steel Welded Wire Fabric, Plain, for Concrete Reinforcing

C109/C109M-11.....Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or [50-mm] Cube Specimens)

C241-09.....Abrasion Resistance of Stone Subjected to Foot Traffic

C348-08.....Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

C627-10.....Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

C954-11.....Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from

0.033 in (0.84 mm) to 0.112 in (2.84 mm) in thickness

C979-10.....Pigments for Integrally Colored Concrete

C1002-07.....Steel Self-Piercing Tapping Screws for the Application of Panel Products

C1027-09.....Determining “Visible Abrasion Resistance on Glazed Ceramic Tile”

C1127-09.....Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface

C1178/C1178M-11.....Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel

C1325-08.....Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units

D4397-10.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

D5109-99(R2004).....Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards

D. Marble Institute of America (MIA): Design Manual III-2007

E. Tile Council of America, Inc. (TCA):

2007.....Handbook for Ceramic Tile Installation

PART 2 - PRODUCTS

2.1 TILE

A. Comply with ANSI A137.1, Standard Grade, except as modified:

1. Inspection procedures listed under the Appendix of ANSI A137.1.
2. Abrasion Resistance Classification:
   a. Tested in accordance with values listed in Table 1, ASTM C 1027.
   b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms
   c. Class IV, 6000 revolutions for remaining areas.
3. Slip Resistant Tile for Floors:
   a. Coefficient of friction, when tested in accordance with ASTM C1028, required for level of performance:
      1) Not less than 0.7 (wet condition) for bathing areas.
      2) Not less than 0.8 on ramps for wet and dry conditions.
      3) Not less than 0.6, except 0.8 on ramps as stated above, for

wet and dry conditions for other areas.

b. Tile Having Abrasive Grains:

1. Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.

4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.

5. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

B. Unglazed Ceramic Mosaic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.

C. Unglazed Quarry Tile: Nominal 13 mm (1/2 inch) thick, square edges.

D. Glazed Wall Tile: Cushion edges, glazing, as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

E. Trim Shapes:

1. Conform to applicable requirements of adjoining floor and wall tile.

2. Use trim shapes sizes conforming to size of adjoining field wall tile unless detailed or specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

3. Internal and External Corners:

a. Square internal and external corner joints are not acceptable.

b. External corners including edges: Use bullnose shapes.

c. Internal corners: Use cove shapes.

d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.

e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.

f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.

g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.

h. For unglazed ceramic mosaic and glazed wall tile installed in Portland cement mortar setting bed, use cove and bullnose shapes as applicable. When ceramic mosaic wall and base tile is

required, use C Series cove and bullnose shapes.

i. For unglazed ceramic mosaic and glazed wall tile installed in dry-set Portland cement mortar, latex-Portland cement mortar, and organic adhesive (thin set methods), use cove and surface bullnose shapes as applicable.

2.2 CEMENTITIOUS BACKER UNITS

A. Use in showers or wet areas. B.ASTM C1325.

C. Use Cementitious backer units in maximum available lengths.

D. Backer unit meet or exceed the following additional physical properties:

Property	Test Method	Value
Water absorption	ASTM C948	Less than 20 percent by weight

2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS

A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) wide. Tape with pressure sensitive adhesive backing will not be permitted.

B. Tape Embedding Material: Latex-Portland cement mortar complying with ANSI A08.1.

C. Joint material, including reinforcing tape, and tape embedding material, shall be as specifically recommended by the backer unit manufacturer.

2.4 FASTENERS

A. Screws for Cementitious Backer Units.

1. Standard screws for gypsum board are not acceptable.
2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
3. ASTM C954 for steel 1 mm (0.033 inch) thick.
4. ASTM C1002 for steel framing less than 0.0329 inch thick.

B. Washers: Galvanized steel, 13 mm (1/2 inch) minimum diameter.

2.5 GLASS MAT WATER RESISTANT GYPSUM BACKER BOARD

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

2.6 SETTING MATERIALS OR BOND COATS

A. Conform to TCA Handbook for Ceramic Tile Installation.

B. Latex-Portland Cement Mortar: ANSI A108..
   1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A108.1.
C. Dry-Set Portland Cement Mortar: ANSI A108.1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A108.
D. Chemical-Resistant Bond Coat:
   1. Epoxy Resin Type: ANSI A108.1.
E. Elastomeric Waterproofing Membrane and Bond Coat:
   1. TCA F122-02.
   2. ANSI A108.1.
   3. One component polyurethane, liquid applied material having the following additional physical properties:
      a. Hardness: Shore "A" between 40-60.
      b. Elongation: Between 300-600 percent.
      c. Tensile strength: Between 40-60 psig. d. No volatile compounds.
   4. Coal tar modified urethanes are not acceptable.
F. Waterproofing Isolation Membrane:
   1. Sheet System TCA F122-02.
   2. Optional System to elastomeric waterproof membrane.
   3. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene (CM) sheet reinforced on both sides with a non-woven polyester fiber.
   4. Designed for use in wet areas as an isolation and positive waterproofing membranes for thin-set bonding of sheet to substrate and thin-set bonding of ceramic and porcelain tile or marble to sheet. Suited for both horizontal and vertical applications.
   5. Conform to the following additional physical properties:

Property	Units	Results	Test Method
Hardness Shore A	Points	70-80	ASTM D2240 (10 Second Reading)
Shrinkage	Percent	5 maximum	ASTM D1204

Brittleness		No crack remains flexible at temperature-37 degrees C (-25 degrees F)	ASTM D2497 13 mm (1/2- inch) Mandrel Bend
Retention of Properties after Heat Aging	Percent of original	80 Tensile 80 Breaking 80 Elongation	ASTM D3045, 90 degrees C (194 degrees F) for 168 hours

6. Manufacturer's standard sheet size with prefabricated or preformed inside and outside corners.
7. Sheet manufacturer's solvent welding liquid or xylene and edge sealant.

2.7 GROUTING MATERIALS

A. Coloring Pigments:
1. Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
2. Add coloring pigments to grout by the manufacturer.
3. Job colored grout is not acceptable.
4. Use is required in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.

B. Latex-Portland Cement Grout: ANSI A108.1- color as specified. C. Commercial Portland Cement Grout: ANSI A108.1 color as specified.
1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.
2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.

C. Chemical-Resistant Grout:
1. Epoxy grout, ANSI A108.1.
2. Furan grout, ANSI A108.1.

2.8 PATCHING AND LEVELING COMPOUND

A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

B. Shall have minimum following physical properties:
1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.
2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).
3. Tensile strength - 600 psi per ANSI 118.7.
4. Density – 1.9.

C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 100 mm (four inches) thick with fillers, being brought to a feather edge, and being trowelled to a smooth finish.

D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.

E. Ready for use in 48 hours after application.

2.9 METAL DIVIDER STRIPS

A. Terrazzo type divider strips.

B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1-1/2 inch) long leg.

C. Embedded leg perforated and deformed for keying to mortar.

D. Aluminum or brass as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.10 WATER

Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.11 CLEANING COMPOUNDS

A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including

patching and leveling compounds and elastomeric waterproofing membrane and coat.

B. Materials containing acid or caustic material not acceptable.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three days after installation.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.

C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).

D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).

E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after fourth day of completion of tile work.

3.2 ALLOWABLE TOLERANCE

A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:
   1. Not more than 1 in 500 (1/4 inch in 10 feet) from required elevation where Portland cement mortar setting bed is used.
   2. Not more than 1 in 1000 (1/8 inch in 10 feet) where dry-set Portland cement, and latex-Portland cement mortar setting beds and chemical-resistant bond coats are used.

B. Variation in Plane of Wall Surfaces:
   1. Not more than 1 in 400 (1/4 inch in eight feet) from required plane where Portland cement mortar setting bed is used.
   2. Not more than 1 in 800 (1/8 inch in eight feet) where dry-set or latex-Portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

A. Cleaning New Concrete or Masonry:
   1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.

   2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete surface with thin-set materials.
   3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.

B. Patching and Leveling:
   1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
   2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
      a. Thickness of compound as required to bring finish tile system to elevation shown.
      b. Float finish.
      c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

C. Additional preparation of concrete floors for tile set with epoxy, or furan-resin shall be in accordance with the manufacturer's printed instructions.

D. Walls:

1. In showers or other wet areas cover studs with polyethylene sheet.
2. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
3. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

E. Existing Floors and Walls:

1. Remove existing composition floor finishes and adhesive. Prepare surface by grinding, chipping, self-contained power blast cleaning or other suitable mechanical methods to completely expose uncontaminated concrete or masonry surfaces. Follow safety requirements of ANSI A10.20.

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

3.4 CEMENTITIOUS BACKER UNITS

A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.

B. Install in accordance with ANSI A108.1 except as specified otherwise.

C. Install units horizontally or vertically to minimize joints with end joints over framing members. Units with rounded edges; face rounded

edge away from studs to form a V joint for joint treatment.

D. Secure cementitious backer units to each framing member with screws spaced not more than 200 mm (eight inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.

E. Where backer unit joins shower pans or waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top one-inch of turned up waterproof systems.

F. Do not install joint treatment for seven days after installation of cementitious backer unit.

G. Joint Treatment:

1. Fill horizontal and vertical joints and corners with latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.
2. Leave 6 mm (1/4 inch) space for sealant at lips of tubs, sinks, or other plumbing receptors.

3.5 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD

A. Install in accordance with manufacturer’s instructions. TCA Systems W245-01.

B. Treat joints with tape and latex-Portland cement mortar or adhesive.

3.6 METAL DIVIDER STRIPS

A. Install metal divider strips in floor joints between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise.

B. Set divider strip in mortar bed to line and level centered under doors or in openings.

3.7 CERAMIC TILE - GENERAL

A. Comply with ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" applicable to methods of installation.

B. Installing Mortar Beds for Floors:

1. Install mortar bed to not damage cleavage or waterproof membrane; 32 mm (1-1/2 inch) minimum thickness.
2. Install floor mortar bed reinforcing centered in mortar fill.
3. Screed finish to level plane or slope to drains where shown, float finish.
4. For thin set systems cure mortar bed not less than seven days. Do not use curing compounds or coatings.
5. For tile set with Portland cement paste over plastic mortar bed coordinate to set tile before mortar bed sets.

C. Setting Beds or Bond Coats:

1. Set wall tile installed over concrete backer board in latex-Portland cement mortar, ANSI A108.1B.
2. Set wall tile installed over Portland cement mortar bed on metal lath base in Portland cement paste over plastic mortar bed, or dry-set Portland cement mortar or latex-Portland cement mortar over a cured mortar bed, ANSI A108.1C, TCA System W231-02, W241-02.
3. Set trim shapes in same material specified for setting adjoining tile.

D. Workmanship:

1. Lay out tile work so that no tile less than one-half full size is used unless otherwise shown. Make all cuts on the outer edge of the field.
2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
3. Form intersections and returns accurately.
4. Cut and drill tile neatly without marring surface.

5. Cut edges of tile abutting penetrations, finish, or built-in items:
   a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
   b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.
6. Completed work shall be free from hollow sounding areas and loose, cracked or defective tile.
7. Remove and reset tiles that are out of plane or misaligned.
8. Floors:
   a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.
   b. Align finish surface of new tile work flush with other and existing adjoining floor finish where shown.
   c. Shove and vibrate tiles over 200 mm (8 inches) square to achieve full support of bond coat.
9. Walls:
   a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights shown with tile.
   b. Finish reveals of openings with tile, except where other finish materials are shown or specified.
   c. At window openings, provide tile stools and reveals, except where other finish materials are shown or specified.
   d. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
10. Joints:
   a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise.
   b. Make joints 2 mm (1/16 inch) wide for glazed wall tile and mosaic tile work.
   c. Make joints in Paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.
11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

a. Tile wall installations in wet areas, including showers, tub enclosures, laundries and swimming pools.
b. Tile installed with chemical-resistant mortars and grouts.
c. Tile wall installations composed of tiles 200 by 200 mm (8 by 8 inches or larger.
d. Exterior tile wall installations.

3.8 CERAMIC TILE INSTALLED WITH PORTLAND CEMENT MORTAR

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

3.9 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDONG MORTAR

A. Due to the denseness of porcelain tile use latex Portland cement bonding mortar that meets the requirements of ANSI A108.1.Bonding mortars shall be mixed in accordance with manufacturer’s instructions. Improper liquid ratios and dwell time before placement of bonding mortar and tile shall affect bond.

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

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

3.11 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE

Installation of Tile: ANSI A108.4.

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

A. Epoxy Resin Type: Install tile in accordance with Installation of Tile with Epoxy Mortar; ANSI A108.1.
B. Furan Resin Type: Proportion, mix and place in accordance with the manufacturer's printed instructions. Set tile in accordance with ANSI A108.1.

3.13 GROUTING

A. Grout Type and Location:
   1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile.
B. Workmanship:
   1. Install and cure grout in accordance with the applicable standard.

2. Epoxy Grout: ANSI A108.6.

3.14 CLEANING

A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.

B. Methods and materials used shall not damage or impair appearance of tile surfaces.

C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.

D. Clean tile grouted with epoxy, furan and commercial Portland cement grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

3.15 PROTECTION

A. Keep traffic off tile floor, until grout and setting material is firmly set and cured.

B. Where traffic occurs over tile floor, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive and stains.

3.16 TESTING FINISH FLOOR

A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

END OF SECTION 09 30 13

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1- GENERAL

1.1 DESCRIPTION

A. Metal ceiling suspension system for acoustical ceilings.

B. Acoustical units.

1.2 RELATED WORK

A. Color, pattern, and location of each type of acoustical unit: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTAL

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

B. Samples:

1. Acoustical units, each type, with label indicating conformance to specification requirementsincluding units specified to match existing.
2. Colored markers for units providing access.

C. Manufacturer's Literature and Data:

1. Ceiling suspension system, each type, showing complete details of installation.
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-09.....Zinc-coated (Galvanized) Carbon Steel Wire

A653/A653M-11.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process

C423-09.....Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

C634-11.....Standard Terminology Relating to Environmental Acoustics

C635-13.....Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

C636-13.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

E84-13.....Surface Burning Characteristics of Building Materials

E119-12.....Fire Tests of Building Construction and Materials

E413-10.....Classification for Rating Sound Insulation.

E580-11.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint

E1264-08e1.....Classification for Acoustical Ceiling Products

C. International Organization for Standardization (ISO)

ISO 14644-1.....Classification of Air Cleanliness

PART 2- PRODUCTS

2.1 METAL SUSPENSION SYSTEM

A. ASTM C635, heavy-duty system, except as otherwise specified.

1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.
   a. Galvanized cold-rolled steel, bonderized.
   b. Extruded aluminum.
2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.

B. Exposed grid suspension system for support of lay-in panels:

1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

2.2 PERIMETER SEAL

A. Vinyl, polyethylene or polyurethane open cell sponge material having density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.

B. Thickness as required to fill voids between back of wall molding and

finish wall.

C. Not less than 9 mm (3/8 inch) wide strip.

2.3 WIRE

A. ASTM A641.

B. For wire hangers: Minimum diameter 2.68 mm (0.1055 inch).

C. For bracing wires: Minimum diameter 3.43 mm (0.1350 inch).

2.4 ANCHORS AND INSERTS

A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.

B. Hanger Inserts:

1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).
2. Flush ceiling insert type:
   a. Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
   b. Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
   c. Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.

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 KgPound	Hot-rolledKgPound
38	1 1/2	215.4	508
50	2	267.6	571.5

2.7 ACOUSTICAL UNITS

A. General:

1. ASTM E1264, weighing 3.6 kg/m^2 (3/4 psf) minimum for mineral fiber panels or tile.
2. Class A Flame Spread: ASTM 84
3. Minimum NRC (Noise Reduction Coefficient): 0.55 unless specified otherwise: ASTM C423.

4. Minimum CAC (Ceiling Attenuation Class): 40-44 range unless specified otherwise: ASTM E413.
5. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.75 on the exposed surfaces, except as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
6. Lay-in panels: Sizes as shown, with regular edge.

2.8 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.

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. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger bracingwire. Install in sides of concrete beams or joists at mid height.

3.3 ACOUSTICAL UNIT INSTALLATION

A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.

B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.

1. Install tile to lay level and in full contact with exposed grid.
2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

E. Markers:

1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.
2. Attach colored markers to exposed grid on opposite sides of the units providing access.
3. Attach marker on exposed ceiling surface of upward access acoustical unit.

3.5 CLEAN-UP AND COMPLETION

A. Replace damaged, discolored, dirty, cracked and broken acoustical units.

B. Leave finished work free from defects.

END OF SECTION 09 51 00

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the installation of vinyl or rubber base and resilient stair treads.

1.2 RELATED WORK

A. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHESS.

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.
3. Application and installation instructions.

C. Samples:

1. Base: 150 mm (6 inches) long, each type and color.
2. Resilient Stair Tread and Riser: 150 mm (6") long.
3. Adhesive: Literature indicating each type.

1.4 DELIVERY

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.

B. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.5 STORAGE

A. Store materials in weather tight and dry storage facility.

B. Protect material from damage by handling and construction operations before, during, and after installation.

1.6 APPLICABLE PUBLICATIONS

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

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

F1861-02.....Resilient Wall Base

PART 2 - PRODUCTS

2.1 GENERAL

A. 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 with molded top. Style B-cove.

B. Provide long toe cove base or standard cove base where indicated and where existing conditions require.

C. Provide pre-formed outside corners for both long toe and standard cove base.

2.3 RESILIENT TREADS

A. Fed. Spec, RR-T-650, Composition A, Type 2, 5 mm (3/16 ")thick on wear surface tapering to 3 mm (1/8") thick at riser end.

B. Nosing shape to conform to sub-tread nosing shape

2.4 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 conditions are proper and correct according to manufacturer's recommendations.

3.2 INSTALLATION REQUIREMENTS

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

B. Submit proposed installation deviation from this specification to the Project Manager indicating the differences in the method of installation.

C. The Project Manager 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 all surfaces on which material is to be installed.

B. Fill cracks, pits, and dents with leveling compound as recommended by manufacturer.

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.

I. In areas where all base is installed on a wall with vinyl wall covering, trim wall covering leaving 1/4" margin below where the top of the base will be installed, exposing wall surface, per manufacturer's instructions.

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, and where other equipment occurs.
2. Extend base scheduled for room into adjacent closet, alcoves, and around columns.

B. Application:

1. Apply manufacturer's recommended 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. (VB-1,2,3) Outside corners for standard base and long toe. Be sure wall base lies seam to seam with full wall coverage, typical.

2. (VB-4) Mitre outside and inside corners with long toe base. Be sure wall base lies seam to seam with full coverage, typical.

D. Do not roll base for at least 72 hours after installation to ensure adhesive cures.

3.5 STAIR TREAD INSTALLATION

A. Prepare surfaces to receive the treads in accordance with applicable portions of paragraph, preparation.

B. Layout of Treads

1. No joints will be accepted in treads.

2. Set full treads on intermediate and floor landings.

C. Applications:

1. Apply adhesive uniformly with no bare spots.
2. Roll and pound treads to assure adhesion

3.6 CLEANING AND PROTECTION

A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets. Refer to manufacturer's recommendations for cleaning agents.

B. Keep traffic off resilient material for at least 72 hours after installation.

C. Clean and polish materials in the following order:

1. After two weeks, scrub resilient base, sheet rubber and treads materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
2. Do not allow water, cleaner or solutions to work its way between the wall and base joints or top of wall base.

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 Project Manager.

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.

3.7 EXTRA MATERIAL

A. Furnish two extra cases of long toe base, Type (VB-4).

1. Deliver extra materials to Owner upon completion of the project.
2. Furnish extra wall base in manufacturer's labeled protective packaging.

END OF SECTION 09 65 13

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PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

A. Color and pattern and location in room finish schedule: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Resilient material manufacturers recommendations for adhesives, underlayment, primers and polish.
3. Application and installation instructions.

C. Samples:

1. Tile: 300 mm by 300 mm (12 inches by 12 inches) for each type, pattern and color.

D. Shop Drawings:

1. Layout of patterns shown on the drawings and in Section 09 06 00, SCHEDULE FOR FINISHES.
2. Edge strip locations showing types and detail cross sections.

E. Test Reports:

1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory.
2. Tested per ASTM D 3884.

1.4 DELIVERY

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.

B. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

1.5 STORAGE

A. Store materials in weathertight and dry storage facility.

B. Protect from damage from handling, water, and temperature.

1.6 APPLICABLE PUBLICATIONS

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

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

D4078-02 (2008).....Water Emulsion Floor Finish

E648-10.....Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

E662-09.....Specific Optical Density of Smoke Generated by Solid Materials

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

F510-93 (R 2008).....Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method

F710-08.....Preparing Concrete Floors to Receive Resilient Flooring

F1700-04 (R2010).....Solid Vinyl Floor Tile

C. Resilient Floor Covering Institute (RFCI):

IP #2.....Installation Practice for Vinyl Composition Tile (VCT)

D. Federal Specifications (Fed. Spec.):

SS-T-312.....Tile Floor: Asphalt, Rubber, Vinyl and Vinyl Composition

1.7 WARRANTY

A. Submit manufacturer’s written warranty for Commercial Limited Wear Warranty for 20 years.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish product type, materials of the same production run and meeting following criteria.

B. Use adhesives, underlayment, primers and polish recommended by the floor material manufacturer.

C. Flexibility: ASTM F 127

D. Smoke density: Less than 450 per ASTM E662.

E. Dimensional Stability: ASTM 2199.

F. Residual Indentation: ASTM F 970 and ASTM F 1914.

G. Flammability: ASTM E 648, Class 1 CRF > 0.45.

H. Slip Resistance: ADA Compliant.

I. Castor Chair Suitability: ITTS 205.

J. Color Fastness: ASTM F 1515.

K. Chemical Resistnace: STAM F 925.

2.2 LUXURY VINYL TILE

A. ASTM F 1700 Class III Type B. Heterogeneous – Layered product consisting of wear layer, decorative film, and backing with pre- and post-consumer content. Thickness: .120” (3.0mm), Wear Layer Thickness minimum 32 mil (.032”).

B. Color and pattern uniformly distributed throughout thickness.

2.3 ADHESIVES

A. Comply with applicable regulations regarding toxic and hazardous materials Green Seal (GS-36) for commercial adhesive.

B. Use low-VOC adhesive during installation. Water based is preferred over solvent based adhesives.

C. Recommended by manufacturer.

2.6 PRIMER (FOR CONCRETE SUBFLOORS)

As recommended by the adhesive and tile manufacturer.

2.7 LEVELING COMPOUND (FOR CONCRETE FLOORS)

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

B. Determine the type of underlayment selected for use by the condition to be corrected.

2.8 POLISH AND CLEANERS

A. As recommended by manufacturer.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Maintain temperature of materials a minimum of 20 °C (68 °F,) for 48 hours before installation.

B. Maintain temperature of rooms where work occurs between 20 °C and 22 °C (68 °F and 72 °F), for at least 48 hours, before, during and after installation.

C. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.2 SUBFLOOR PREPARATION

A. Verify that concrete slabs comply with ASTM F710. At existing slabs, determine levelness by F-number method in accordance with ASTM E1155. Overall value shall not exceed as follows:

FF30/FL20

B. Correct conditions which will impair proper installation.

C. Fill cracks, joints and other irregularities in concrete with leveling compound:

1. Do not use adhesive for filling or leveling purposes.
2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joints.

D. Clean floor of oil, paint, dust, and deleterious substances: Leave floor dry and cured free of residue from existing curing or cleaning agents.

E. Concrete Subfloor Testing:
Determine Adhesion and dryness of the floor by bond and moisture tests as recommended by RFCI manual MRP.

F. Perform additional subfloor preparation to obtain satisfactory adherence of flooring if subfloor test patches allows easy removal of tile.

G. Prime the concrete subfloor if the primer will seal slab conditions that would inhibit bonding, or if priming is recommended by the tile or adhesive manufacturers.

H. Preparation of existing installation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.

B. Mix tile from at least two containers. An apparent line either of shades or pattern variance will not be accepted.

C. Tile Layout:

1. If layout is not shown on drawings, lay tile symmetrically about center of room or space with joints aligned.
2. No tile shall be less than 150 mm (6 inches) and of equal width at walls.
3. Place tile pattern in the same direction; do not alternate tiles.

D. Trim tiles to touch for the length of intersections at pipes and vertical projections, seal joints at pipes with waterproof cement.

E. Application:

1. Apply adhesive uniformly with no bare spots.
   a. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection.
   b. More than 5 percent of the joints not touching will not be accepted.

2. Roll tile floor with a minimum 45 kg (100 pound) roller. No exceptions.
3. The Resident Engineer may have test tiles removed to check for non-uniform adhesion, spotty adhesive coverage, and ease of removal. Install new tile for broken removed tile.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer’s written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation.

1. Remove wet adhesive and other blemishes from exposed surfaces with a damp cloth.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove makrs and soul after 48 hours.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by Resident Engineer. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by Resident Engineer.

E. Remove soil, adhesive, and blemishes from floor tiles surfaces.

1. Not less than 48 hours after installation, clean floor with manufacturer’s liquid cleaner.
2. Not less than 48 hours after installation, clean floor with a neutral liquid cleaner.
3. Restrict heavy traffic for 48 hours after installation, light foot traffic is permissible after 24 hours.

F. When protective materials are removed and immediately prior to acceptance, replace any damage tile, re-clean resilient materials, lightly re-apply polish and buff floors.

3.6 LOCATION

A. Unless otherwise specified or shown, install tile flooring, on floor under areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.

B. Extend tile flooring for room into adjacent closets and alcoves.

END OF SECTION 09 65 19

SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies carpet, edge strips, adhesives, and other items required for complete installation.

1.2 RELATED WORK

A. Color and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Resilient wall base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 QUALITY ASSURANCE

A. Carpet installed by mechanics certified by the Floor Covering Installation Board.

B. Certify and label the carpet that it has been tested and meets criteria of CRI IAQ Carpet Testing Program for indoor air quality.

1.4 SUBMITTALS

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

B. Product Data:

1. Manufacturer’s catalog data and printed documentation stating physical characteristics, durability, resistance to fading and flame resistance characteristics for each type of carpet material and installation accessory.
2. Manufacturer’s printed installation instructions for the carpet, including preparation of installation substrate, seaming techniques and recommended adhesives and tapes.
3. Manufacturer’s certificate verifying carpet containing recycled materials include percentage of recycled materials as specified.

C. Samples:

1. Carpet: "Production Quality" samples 24 x 24 inches of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.
2. Floor Edge Strip (Molding): 150 mm (6 inches) long of each color and type specified.
3. Base Edge Strip (Molding): 150 mm (6 inches) long of each color specified.

D. Shop Drawings: Installers layout plan showing seams and cuts for carpet module.

E. Maintenance Data: Carpet manufacturer’s maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

1.5 DELIVERY AND STORAGE

A. Deliver carpet in manufacturer’s original wrappings and packages clearly labeled with manufacturer’s name, brand, name, size, dye lot number and related information.

B. Deliver adhesives in containers clearly labeled with manufacturer’s name, brand name, number, installation instructions, safety instructions and flash points.

C. Store in a clean, dry, well ventilated area, protected from damage and soiling. Maintain storage space at a temperature above 16 degrees C (60 degrees F) for 2 days prior to installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Areas in which carpeting is to be installed shall be maintained at a temperature above 16 degrees C (60 degrees F) for 2 days before installation, during installation and for 2 days after installation. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter for the duration of the contract. Traffic or movement of furniture or equipment in carpeted area shall not be permitted for 24 hours after installation. Other work which would damage the carpet shall be completed prior to installation of carpet.

1.7 WARRANTY

A. Carpet and installation subject to terms of "Warranty of Construction", except that warranty period is extended to two years.

1.8 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute (ANSI):
ANSI/NSF 140-07.....Sustainable Carpet Assessment Standard

C. American Association of Textile Chemists and Colorists (AATCC):
AATCC 16-04.....Colorfastness to Light
AATCC 129-05.....Colorfastness to Ozone in the Atmosphere under High Humidities
AATCC 134-06.....Electric Static Propensity of Carpets
AATCC 165-99.....Colorfastness to Crocking: Textile Floor Conerings-AATCC Crockmeter Method

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

ASTM D1335-05.....Tuft Bind of Pile Yarn Floor Coverings

ASTM D3278-96 (R2004)...Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D5116-06.....Determinations of Organic Emissions from Indoor Materials/Products

ASTM D5252-05.....Operation of the Hexapod Tumble Drum Tester

ASTM D5417-05.....Operation of the Vettermann Drum Tester

ASTM E648-06.....Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

E. The Carpet and Rug Institute (CRI):

CRI 104-02.....Installation of Commercial Carpet

PART 2 - PRODUCTS

2.1 CARPET

A. Physical Characteristics:

1. Carpet free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
2. Manufacturers standard construction commercial carpet:
   a. Modular Tile: 660 mm (24 inches) square tile.
3. Provide static control to permanently control static build up to less than 2.0 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
4. Pile Height: Maximum 3.25 mm (0.10 inch).
5. Pile Fiber: Nylon with recycled content 25 percent minimum branded (federally registered trademark).
6. Pile Type: Level Loop.
7. Backing materials: Manufacturer’s unitary backing designed for glue-down installation using recovered materials.
8. Appearance Retention Rating (ARR): Carpet shall be tested and have the minimum 3.5-4.0 Severe ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.
9. Tuft Bind: Minimum force of 40 N (10 lb) required to pull a tuft or loop free from carpet backing. Test per ASTM D1335.

10. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, minimum class 4 rating.
11. Colorfastness to Ozone: Comply with AATCC 129, minimum rating of 4 on the AATCC color transfer chart.
12. Delamination Strength: Minimum of 440 N/m (2.5 lb/inch) between secondary backing.

13. Flammability and Critical Radiant Flux Requirements:
    a. Test Carpet in accordance with ASTM E 648.
    b. Class I: Not less than 0.45 watts per square centimeter.
    c. Class II: Not less than 0.22 watts per square centimeter.
    d. Carpet in corridors, exits and Medical Facilities: Class I.
14. Density: Average Pile Yarn Density (APYD):
    a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
    b. Other areas: Minimum APYD 4000.
15. VOC Limits: Use carpet and carpet adhesive that comply with the following limits for VOC content when tested according to ASTM D 5116:
    a. Carpet, Total VOCs: 0.5 mg/sq.m x hr.
    b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
    c. Carpet, Formaldehyde: 0.05 mg/sq.m x hr.
    d. Carpet, Styrene: 0.4 mg/sq.m x hr.
    e. Adhesive, Total VOCs: 10.00 mg/sq.m x hr.
    f. Adhesive, Formaldehyde: 0.05 mg/sq.m x hr.
    g. Adhesive, 2-Ethyl-1-Hexanol: 3.00 mg/sq.m x hr.

B. Shall meet platinum level of ANSI/NSF 140.

C. Color, Texture, and Pattern: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

D. Extra Material: Provide two (2) un-openeded boxes of carpet tile for Owner's use.

2.2 ADHESIVE AND CONCRETE PRIMER

A. Waterproof, resistant to cleaning solutions, steam and water, nonflammable, complies with air-quality standards as specified. Adhesives flashpoint minimum 60 degrees C (140 degrees F), complies with ASTM D 3278.

B. Seam Adhesives: Waterproof, non-flammable and non-staining.

2.3 EDGE STRIPS (MOLDING)

A. Vinyl Edge Strip:
   1. Beveled floor flange minimum 50 mm (2 inches) wide.
   2. Beveled surface to finish flush with carpet for tight joint and other side to floor finish.
   3. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 LEVELING COMPOUND (FOR CONCRETE FLOORS)

A. Provide Portland cement bases polymer modifier with latex or polyvinyl acetate resin manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

B. Determine the type of underlayment selected for use by condition to be corrected.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Examine surfaces on which carpeting is to be installed.

B. Clean floor of oil, waxy films, paint, dust and deleterious substances that prevent adhesion, leave floor dry and cured, free of residue from curing or cleaning agents and existing carpet materials.

C. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.

D. Fill cracks, joints depressions, and other irregularities in concrete with leveling compound.
   1. Do not use adhesive for filling or leveling purposes.
   2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
   3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.

3.2 CARPET INSTALLATION

A. Do not install carpet until work of other trades including painting is complete and dry.

B. Install in accordance with CRI 104 direct glue down installation.
   1. Comply with indoor air quality recommendations noted in Section 6.5.
   2. Maintain temperature in accordance with Section 15.3.

C. Secure carpet to subfloor of spaces with adhesive applied as recommended by carpet manufacturer.

D. Follow carpet manufacturer's recommendations for matching pattern and texture directions.

E. Cut openings in carpet where required for installing equipment, pipes, outlets, and penetrations.
   1. Bind or seal cut edge of sheet carpet and replace flanges or plates.
   2. Use additional adhesive to secure carpets around pipes and other vertical projections.
F. Carpet Modules:
   1. Install per CRI 104, Section 13, Adhesive Application.
   2. Lay carpet modules with pile in same direction unless specified other wise in Section 09 06 00, SCHEDULE FOR FINISHES.
   3. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.
   4. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic.

3.3 EDGE STRIPS INSTALLATION

A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.
B. Anchor vinyl edge strip to floor with adhesive apply adhesive to edge strip and insert carpet into lip and press lip down over carpet.

3.4 PROTECTION AND CLEANING

A. Remove waste, fasteners and other cuttings from carpet floors.
B. Vacuum carpet and provide suitable protection. Do not use polyethylene film.
C. Do not permit traffic on carpeted surfaces for at least 24 hours after installation. Protect the carpet in accordance with CRI 104.
D. Do not move furniture or equipment on unprotected carpeted surfaces.
E. Just before final acceptance of work, remove protection and vacuum carpet clean.

3.5 EXTRA MATERIAL

A. Carpet tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

END OF SECTION 09 68 00

SECTION 09 72 00
WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Acoustical wall covering.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Samples for Verification: Full width by 36-inch- (914-mm-) long section of wall covering.

Sample from same print run or dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

Sample from same flitch to be used for the Work, with specified finish applied.

C. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

D. Qualification Data: For qualified testing agency.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

F. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Surface-Burning Characteristics: As follows, per ASTM E 84:

a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 450 or less.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.5 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 WALL COVERINGS

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

2.2 ACOUSTICAL WALL COVERING

A. Width: 54 inches (1372 mm).

B. Backing:Latex.

C. Repeat: Random.

D. Colors, Textures, and Patterns: As indicated in the Products Specification Section in the drawings.

2.3 ACCESSORIES

A. Adhesive: Clear-drying, premixed, heavy-duty vinyl adhesive, suitable for weight of fabric. Apply adhesive in compliance with the written recommendation of the adhesive manufacturer.

B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "Interior Painting" and recommended in writing by wall-covering manufacturer for intended substrate.

C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

Moisture Content: Maximum of 5 percent on new plaster, concrete and concrete masonry units when tested with an electronic moisture meter.

Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.

Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install reversing every other strip.

E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

F. Match pattern 72 inches (1830 mm) above the finish floor.

G. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 3 inches (75 mm) from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

I. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

SECTION 09 77 14
WOOD VENEER WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical wall panels and installation components.

1.2 REFERENCES

A. Test Methods:

1. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2. ASTM E 84/CAN/ULC S102 Standard Test Method for Surface Burning Characteristics of Building Materials.
3. CAN/ULC S102 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data for each type of acoustical wall panel required.

B. Samples: Minimum 3 inch x 3 inch samples of specified acoustical wall substrate; minimum 4 inch long samples of attachment method including trim and decorative accents.

C. Shop Drawings: Submit shop drawings showing how panels are to be laid out on the walls, details of trim members and width of panels. Width of panels and location of vertical seams are critical.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and installation components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical wall components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84,
   a. Flame Spread: 25 or less
   b. Smoke Developed: 200 or less

C. Coordination of Work: Coordinate acoustical wall work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical wall panels to project site in original, unopened packages and store them in a fully enclosed space where they will be

protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical wall panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical wall panels carefully to avoid chipping edges or damaged units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure:

1. Wood veneer wall panel materials should be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation.
2. The wood veneer panels should not be stored or installed in spaces where the temperature or humidity conditions vary greatly from the temperatures and conditions that will be normal in the occupied space.
3. As interior finish products, the wood veneer panels are designed for installation in temperature conditions between 50 degrees F and 86 degrees F, in spaces where the building is enclosed and HVAC systems are functioning and will be in continuous operation. Relative humidity should not fall below 25 percent or exceed 55 percent.

1.7 WARRANTY

A. Wall Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

1. Wall Panels: Manufacturer’s defects

B. Warranty Period:

1. Wall panels: One (1) year from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.8 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Wall Panels: Furnish quantity of full-size units equal to 5.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acoustical Wall Panels Basis of Design:

1. Armstrong World Industries, Inc.

2.2 ACOUSTICAL WALL PANELS

A. Wall Panels: Type AWP-1:

1. Surface Texture: Smooth
2. Composition: Particle Board
3. Finish: Natural Variations(Dark Cherry)
4. Size: (24 inches X 48 inches X 3/4 inch)
5. Edge Profile: K2C2 both vertical edges for interface
6. Noise Reduction Coefficient (NRC): ASTM C 423;
   a. W2 Perforation: 0.50 (D Mounting with Acoustical Fleece), 0.65 (DMounting with 1 inch Fiberglass Backer)
7. Flame Spread: ASTM E84 (HPVA), Class A
8. Dimensional Stability: Standard – space must be enclosed with HVAC systems operating at all times.
9. Acceptable Product: Woodworks Walls, item #5814, as manufactured by Armstrong World Industries.

B. Wall Panel Accessories:

1. Decorative Accent Trims and Splines
   a. Wall Installation Spline (concealed): Item #5858__BLY, 8 foot, Black Aluminum
2. Moldings:
   a. 1.15 inch Finish Molding: Item #5849NDC, 8 foot, Solid Wood
   b. Inside Corner Molding: Item #5867NDC, 8 foot, Solid Wood
   c. 4 inch Base Molding: Item #5855NDC, 8 feet 4 inches, Solid Wood
3. Decorative Corners and Splines:
   a. Bullnose Corner, Item #5852NDC, 8 foot, Solid Wood

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer’s printed recommendations.

3.2 PREPARATION

A. Measure each wall area and establish layout of acoustical units to balance border widths at opposite edges of each wall. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

A. Install wall panels by attaching the panels to an existing wall per the manufacturer's instructions, drawing details, and in accordance with the authorities having jurisdiction.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Routine maintenance of Soundsoak wall panels should consist of frequent vacuuming to minimize dirt accumulation. A dry or wet shampoo can be used on Soundsoak fabric. Work in with a damp sponge and vacuum to remove residue.

END OF SECTION 09 77 14

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, striping, 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 12 - FURNISHINGS, Division 14 – CONVEYING EQUIPMENT, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY sections.

B. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Asphalt and concrete pavement marking: Section 32 17 23, PAVEMENT MARKINGS.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data:
Before work is started, or sample panels are prepared, submit manufacturer's literature, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

C. Sample Panels:

1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.

2. Panels to show color: Composition board, 100 by 250 by 3 mm (4 inch by 10 inch by 1/8 inch).
3. Panel to show transparent finishes: Wood of same species and grain pattern as wood approved for use, 100 by 250 by 3 mm (4 inch by 10 inch face by 1/4 inch) thick minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 by 50 mm (2 by 2 inch) minimum or actual wood member to show complete finish.
4. Attach labels to panel stating the following:
   a. Federal Specification Number or manufacturers name and product number of paints used.
   b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
   c. Product type and color. d. Name of project.
5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

D. Manufacturers' Certificates indicating compliance with specified requirements:
1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
2. 0 VOC's.
3. Epoxy 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 and color.
3. Batch number and date.
4. Instructions for use.
5. Safety precautions.
6. VOC content.

B. In addition to manufacturer's label, provide a label legibly printed as following:
1. Federal Specification Number, where applicable, and name of material.
2. Surface upon which material is to be applied.
3. If paint or other coating, state coat types; prime, body or finish.

C. Maintain space for storage, and handling of painting materials and equipment in a neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.

D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

1.5 MOCK-UP PANEL

A. Before starting application of water paint mixtures, apply paint as specified to an area, not to exceed 9 m^2 (100 ft^2), selected by Project Manager.

B. Finish and texture approved by Project Manager will be used as a standard of quality for remainder of work.

1.6 APPLICABLE PUBLICATIONS

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

B. American Conference of Governmental Industrial Hygienists (ACGIH):

ACGIH TLV-BKLT-2012.....Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)

ACGIH TLV-DOC-2012.....Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)

C. American National Standards Institute (ANSI):

A13.1-07.....Scheme for the Identification of Piping Systems

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

D260-86.....Boiled Linseed Oil

E. Commercial Item Description (CID):

A-A-1555.....Water Paint, Powder (Cementitious, White and Colors) (WPC) (cancelled)

A-A-3120.....Paint, For Swimming Pools (RF) (cancelled)

F. Federal Specifications (Fed Spec):

TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)

G. Master Painters Institute (MPI):

No. 1-12.....Aluminum Paint (AP)

No. 4-12.....Interior/ Exterior Latex Block Filler

No. 5-12.....Exterior Alkyd Wood Primer

No. 7-12.....Exterior Oil Wood Primer

No. 8-12.....Exterior Alkyd, Flat MPI Gloss Level 1 (EO)

No. 9-12.....Exterior Alkyd Enamel MPI Gloss Level 6 (EO)

No. 10-12.....Exterior Latex, Flat (AE)

No. 11-12.....Exterior Latex, Semi-Gloss (AE)

No. 18-12.....Organic Zinc Rich Primer

No. 22-12.....Aluminum Paint, High Heat (up to 590% - 1100F) (HR)

No. 26-12.....Cementitious Galvanized Metal Primer

No. 27-12.....Exterior / Interior Alkyd Floor Enamel, Gloss (FE)

No. 31-12.....Polyurethane, Moisture Cured, Clear Gloss (PV)

No. 36-12.....Knot Sealer

No. 43-12.....Interior Satin Latex, MPI Gloss Level 4

No. 44-12.....Interior Low Sheen Latex, MPI Gloss Level 2

No. 45-12.....Interior Primer Sealer

No. 46-12.....Interior Enamel Undercoat

No. 47-12.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5 (AK)

No. 48-12.....Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)

No. 49-12.....Interior Alkyd, Flat, MPI Gloss Level 1 (AK)

No. 50-12.....Interior Latex Primer Sealer

No. 51-12.....Interior Alkyd, Eggshell, MPI Gloss Level 3

No. 52-12.....Interior Latex, MPI Gloss Level 3 (LE)

No. 53-12.....Interior Latex, Flat, MPI Gloss Level 1 (LE)

No. 54-12.....Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)

No. 59-12.....Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE)

No. 60-12.....Interior/Exterior Latex Porch & Floor Paint, Low Gloss

No. 66-12.....Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC)

No. 67-12.....Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR)

No. 68-12.....Interior/ Exterior Latex Porch & Floor Paint, Gloss

No. 71-12.....Polyurethane, Moisture Cured, Clear, Flat (PV)

No. 74-12.....Interior Alkyd Varnish, Semi-Gloss

No. 77-12.....Epoxy Cold Cured, Gloss (EC)

No. 79-12.....Marine Alkyd Metal Primer

No. 90-12.....Interior Wood Stain, Semi-Transparent (WS)

No. 91-12.....Wood Filler Paste

No. 94-12.....Exterior Alkyd, Semi-Gloss (EO)

No. 95-12.....Fast Drying Metal Primer

No. 98-12.....High Build Epoxy Coating

No. 101-12.....Epoxy Anti-Corrosive Metal Primer

No. 108-12.....High Build Epoxy Coating, Low Gloss (EC)

No. 114-12.....Interior Latex, Gloss (LE) and (LG)

No. 119-12.....Exterior Latex, High Gloss (acrylic) (AE)

No. 135-12.....Non-Cementitious Galvanized Primer

No. 138-12.....Interior High Performance Latex, MPI Gloss Level 2 (LF)

No. 139-12.....Interior High Performance Latex, MPI Gloss Level 3 (LL)

No. 140-12.....Interior High Performance Latex, MPI Gloss Level 4

No. 141-12.....Interior High Performance Latex (SG) MPI Gloss Level 5

H. Steel Structures Painting Council (SSPC):

SSPC SP 1-04 (R2004)....Solvent Cleaning

SSPC SP 2-04 (R2004)....Hand Tool Cleaning

SSPC SP 3-04 (R2004)....Power Tool Cleaning

Cleaning

PART 2 - PRODUCTS

2.1 MATERIALS

A. Identity markers options:

1. Pressure sensitive vinyl markers.

2. Snap-on coil plastic markers.

B. Aluminum Paint (AP): MPI 1.

C. Interior/Exterior Latex Block Filler: MPI 4.

D. Interior Alkyd, Semi-Gloss (AK): MPI 47.

E. Exterior Alkyd, Semi-Gloss (EO): MPI 94.

F. Fast Drying Metal Primer: MPI 95.

G. Interior High Performance Latex, MPI Gloss Level 3: MPI 144.

H. Interior High Performance Latex, MPI Gloss Level 4: MPI 147.

I. Interior Latex Primer: MPI 149.

J. Interior High Performance Latex (SG),

K. Water Based Epoxy MPI Gloss Level 5: MPI 141.

L. MDC Microtex Ceramic Micro-Textured finish coating System

2.2 PAINT PROPERTIES

A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.

B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

2.3 REGULATORY REQUIREMENTS/QUALITY ASSURANCE

A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.

1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
2. Lead-Base Paint:
   a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
   b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
3. Asbestos: Materials shall not contain asbestos.
4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
6. Use high performance acrylic paints in place of alkyd paints, where possible.
7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting

materials.

1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. 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. 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.

D. Zinc-Coated (Galvanized) Metal, Aluminum, Copper and Copper Alloys 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 Board, Cement Plaster and Stucco:
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 and

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 Project Manager.

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 Projec Manager, 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.

3.6 EXTERIOR FINISHES

A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Steel and Ferrous Metal:

1. MPI 9 (Exterior Alkyd Enamel (EO)).

3.7 INTERIOR FINISHES

A. Metal Work:

1. Apply to exposed surfaces.
2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
   a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) unless specified otherwise.

B. Gypsum Board:

1. One coat of MPI 45 (Interior Primer Sealer) plus two coats of MPI 139 (Interior High Performance Latex, Gloss level 3; or MPI 147, Gloss Level 5; or PNT-4 MDC Microtex Finish Coating System.
2. Two coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF)).
3. Surface scheduled to receive Wallcovering, one coat of MPI 149 (interior primer sealer). Check manufacturer's recommendations.

C. Masonry and Concrete Walls:

1. Over MPI 4 (Interior/Exterior Latex Block Filler)on CMU surfaces.
2. Two coats of MPI 141 Interior High Performance Latex, MPI Gloss Level 5.

3.8 REFINISHING EXISTING PAINTED SURFACES

A. Clean, patch and repair existing surfaces as specified under surface preparation.

B. Remove and reinstall items as specified under surface preparation. C. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.

D. Patched or Replaced Areas in Surfaces and Components: Apply spot prime and body coats as specified for new work to repaired areas or replaced components.

E. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.

F. Sand or dull glossy surfaces prior to painting.

G. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.

H. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.9 PAINT COLOR

A. Color and gloss of finish coats is specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. For additional requirements regarding color see Articles, REFINISHING EXISTING PAINTED SURFACE and MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE.

C. Coat Colors:

1. Color of priming coat: Lighter than body coat.
2. Color of body coat: Lighter than finish coat.
3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.

D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:

1. Paint to match color of casework where casework has a paint finish.
2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.10 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE

A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.

B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified under paragraph H, colors.

C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.

D. Paint after tests have been completed.

E. Omit prime coat from factory prime-coated items.

F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED. H.

Color:

1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:

a. White .....Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on 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. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.

d. Federal Safety Orange: .Entire lengths of electrical conduits containing feeders 600 volts or more.

e. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

I. Apply paint systems on properly prepared and primed surface as follows:

1. Interior Locations:

a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:

1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.

2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.

3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished. b. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 9 (Exterior Alkyd Enamel (EO)) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

3. Other exposed locations:

a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two coats of MPI 1 (Aluminum Paint (AP)).

b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating

systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 10 (Exterior Latex, Flat (AE))

3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING

A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.

1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
3. Painting of ferrous metal and galvanized metal.
4. Identity painting and safety painting. B.

Building and Structural Work not Painted:

1. Prefinished items:
   a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
   b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
2. Finished surfaces:
   a. Hardware except ferrous metal.
   b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
   c. Signs, fixtures, and other similar items integrally finished.
3. Concealed surfaces:
   a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, 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.

3.12 IDENTITY PAINTING SCHEDULE

A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.
   1. Legend may be identified using 2.1 G options or by stencil applications.
   2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000 mm (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
   3. Locate Legends clearly visible from operating position.
   4. Use arrow to indicate direction of flow.
   5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings where asterisk appears for High, Medium, and Low Pressure designations as follows:
      a. High Pressure - 414 kPa (60 psig) and above.

b. Medium Pressure - 104 to 413 kPa (15 to 59 psig). c. Low Pressure - 103 kPa (14 psig) and below.

d. Add Fuel oil grade numbers.

6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
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

Hot Water Supply Domestic/Solar WaterH.W. Sup Dom/SW
Hot Water Return Domestic/Solar WaterH.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, 15000.
8. See Sections for methods of identification, legends, and abbreviations of the following:
   a. 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.
   b. 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.
   c. 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.

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 PARTITION" or, "FIRE BARRIER or PARTITION" 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.

END OF SECTION 09 91 00

Division 10

Specialties

Division 10

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SECTION 10 21 13
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies stainless steel toilet partitions, and urinal screens.

1.2 RELATED WORK

A. Overhead structural steel supports for ceiling hung pilasters: Section 05 50 00, METAL FABRICATIONS.

B. Color of baked enamel finish: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Grab bars and toilet tissue holders: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.

1.3 SUBMITTALS

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

B. Samples: 150 mm (six-inch) square of stainless steel panel.

C. Manufacturer's Literature and Data: Specified items indicating all hardware and fittings, material, finish, and latching.

D. Shop Drawings: Construction details at 1/2 scale, showing installation details, anchoring and leveling devices.

E. Manufacturer's certificate, attesting that zinc-coatings conform to specified requirements.

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. Federal Specifications (Fed. Spec.):

FF-B-575C.....Bolt, Hexagon and Square

C. Code of Federal Regulations (CFR):

40 CFR 247.....Comprehensive Procurement Guidelines for Products Containing Recovered Materials

D. Commercial Item Descriptions (CID):

A-A-1925.....Shield, Expansion (Nail Anchors)

A-A-60003.....Partitions, Toilet, Complete

PART 2 - PRODUCTS

2.1 FABRICATION

A. Stainless Steel: Facing sheets and closures fabricated from ASTM A 666, Type 302 or 304, stainless steel sheet, leveled to stretcher-leveled flatness.

B. Conform to Fed. CID A-A-60003, except as modified herein.

C. Fabricate to dimensions shown or specified.

D. Toilet Enclosures:

1. Type 1, Style B (Ceiling hung).
2. Reinforce panels shown to receive toilet tissue holders or grab bars.
3. Upper pivots and lower hinges adjustable to hold doors open 30 degrees.
4. Latching devices and hinges for handicap compartments shall comply with ADA requirements.
5. Keeper:
   a. U-slot to engage bar of throw latch.
   b. Combined with rubber bumper stop.
6. Wheelchair Toilets:
   a. Upper pivots and lower hinges to hold out swinging doors in closed position.
   b. Provide U-type doors pulls, approximately 100 mm (four inches) long on pull side.
7. Finish:
   a. Finish 3 on steel doors, pilasters, and enclosure panels.

D. Urinal Screens:

1. Type III, Style D (wall hung), finish 3, and (stainless steel).
   a. With integral flanges and continuous, full height wall anchor plate.
   b. Option: Full height U-Type bracket.
   c. Wall anchor plate drilled for 4 anchors on both sides of screen.
2. Screen 600 mm (24 inches) wide and 1060 mm (42 inches high).

2.2 FASTENERS

A. Partition Fasteners: CID A-A-60003.

B. Use expansion bolts, CID A-A-60003, for anchoring to solid masonry or concrete.

C. Use toggle bolts, CID A-A-60003, for anchoring to hollow masonry or stud framed walls.

D. Use steel bolts FS-B-575, for anchoring pilasters to overhead steel supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install in rigid manner, straight, plumb and with all horizontal lines level.
2. Conceal evidence of drilling, cutting and fitting in finish work.
3. Use hex-bolts for through-bolting.
4. Adjust hardware and leave in freely working order.
5. Clean finished surfaces and leave free of imperfections.

B. Panels and Pilasters:

1. Support panels, except urinal screens, and pilaster abutting building walls near top and bottom by stirrup supports secured to partitions with through-bolts.
2. Secure stirrups to walls with two suitable anchoring devices for each stirrup.
3. Secure panels to faces of pilaster near top and bottom with stirrup supports, through-bolted to panels and machine screwed to each pilaster.
4. Secure edges of panels to edges of pilasters near top and bottom with "U" shaped brackets.

C. Urinal Screens:

1. Anchor urinal screen flange to walls with minimum of four bolts both side of panel.
2. Space anchors at top and bottom and equally in between.

END OF SECTION 10 21 13

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SECTION 10 22 13
WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers steel mesh partitions complete with doors, and hardware.

1.2 RELATED WORK

Lock cylinders keyed to system: Section 08 71 00, DOOR HARDWARE.

1.3 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation also.

B. American Society for Testing and Materials (ASTM):
A36/36M-08.....Carbon Structural Steel

1.4 SUBMITTALS

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

B. Shop Drawings: Mesh partitions, showing design, construction and materials.

C. Provide layout drawings with detailed erection drawings and specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Woven Wire: 38 mm (1-1/2 inch) diamond mesh No. 10 gage 3.4 mm (0.1345 inch diameter) uncoated steel crimped and woven.

B. Steel Shapes, Plates and Bars: ASTM A36/36M.

1. Vertical Channel: 32 x 16 x 3 mm (1-1/4 x 5/8 x 1/8 inch).
2. Horizontal Channel: 25 x 13 x 3 mm (1 x 1/2 x 1/8 inch).
3. Center Reinforcement: Two, 25 x 13 mm (1 x 1/2 inch) turned in toe channels bolted.
4. Corner Post: 45 x 45 3 mm (1-3/4 x 1-3/4 x 1/8 inch) angle.
5. Top Reinforcement: 57 x 25 x 5 mm (2-1/4 x 1 x 3/16) channel.
6. Cast or forged adjustable floor shoes.

C. Doors:

1. Hinged Door (See drawings for configuration):
   a. Frame: 32 x 13 mm (1-1/4 x 1/2 x 1/8 inch) channel, with a midpoint channel.
   b. Hardware: 1-1/2 pair butts A 212 NRP 100 mm (4 inch). Pick proof mortise type lock, key operated outside, recessed knob inside (see Hardware Section for lock cylinder).

c. Miscellaneous: Provide sheet metal baffle at lock, continuous angle stop and flat bar closures.2.

2.2 FABRICATION

A. Woven wire clinched to frame, mortise and tendon joints. Frame units shall be maximum 1520 mm (5 feet) wide.

B. Rivet hardware to doors and frames.

C. Finish: Steel shall be phosphate coated and shall have one coat of baked enamel. Color shall be manufacturers standard gray. Do not paint shelves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erect the partition in accordance with the manufacturers detailed erection drawings.

B. Secure top reinforcing channels with 6 mm (1/4-inch) "U" bolts, 710 mm (2 feet 4 inches) on center.

C. Secure vertical posts with 6 mm (1/4 inch) bolts 300 to 380 mm (12 to 15 inches) on center, and anchor verticals at walls to wall 380 mm (15 inches) on center, shim as required.

D. Provide floor shoes at each post and each corner, adjust to level, anchor to floor with two anchors for each shoe.

3.2 ACCEPTANCE

A. Repair or replace damaged parts, touch-up abraded paint with matching paint.

B. Partitions shall be level and firm. Adjust hardware to operate smoothly and latch securely.

END OF SECTION 10 22 13