U.S. Department of Veterans Affairs

VA SIOUX FALLS

PHARMACY ADDITION FOR USP COMPLIANCE

Sioux Falls, South Dakota

VA Project #438-500

SGA # 181906

Project Specifications:

100% Bid Set Resubmittal Volume 1
March 7, 2019

STONE GROUP
ARCHITECTS

DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS

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LIST OF DRAWING SHEETS

The drawings listed below accompanying this specification form a part of the contract.

Drawing No.	Title
	GENERAL
5.GI001	COVER SHEET
5.GI002	GENERAL NOTES, LEGENDS AND ABBREVIATIONS
5.GI101	LIFE SAFETY PLAN AND CODE SUMMARY
5.GI102	OVERALL GROUND LEVEL LIFE SAFETY PLAN
	CIVIL
5.CJ101	CIVIL GENERAL NOTES
5.CD101	EXISTING CONDITIONS & REMOVAL PLAN
5.CS101	DIMENSION PLAN
5.CG101	GRADING PLAN
5.CG102	ERSC PLAN
5.CU101	UTILITY PLAN
5.CK101	CIVIL DETAILS
5.CK102	CIVIL DETAILS
	STRUCTURAL
5.SG001	STRUCTURAL GENERAL NOTES
5.SG002	IBC INSPECTION TABLES & COMMON ABBRVIATIONS
5.SG003	SNOW DRIFT & WIND UPLIFT PLANS
5.SB101	FOUNDATION & FLOOR SLAB PLAN
5.SB501	DETAILS
5.SB601	SCHEDULES & TYPICAL DETAILS
5.SF101	INTERSTITIAL FLOOR FRAMING PLAN
5.SF102	ROOF FRAMING PLAN
5.SF401	LATERAL BRACE FRAMING ELEVATIONS AND DETAILS
5.SF501	DETAILS
5.SF502	DETAILS
5.SF601	SCHEDULES & TYPICAL DETAILS
	ARCHITECTURAL
5.AD101	FIRST FLOOR DEMOLITION/ RCP DEMOLITION PLANS
5.AD102	ROOF DEMOLITION PLAN
5.AE101	FIRST LEVEL FLOOR PLAN
5.AE102	FIRST LEVEL FINISH, WALL PROTECTION, SIGNAGE PLAN

5.AE103	INTERSTITIAL LEVEL FLOOR PLAN
5.AE104	FIRST LEVEL REFLECTED CEILING PLAN
5.AE109	ROOF PLAN
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5.FA102	FIRE PROTECTION PLAN – BASEMENT FLOOR
	HEATING, VENTILATING, AIR
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5.HV101	FIRST LEVEL HVAC VENTILATION PLAN
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	MECHANICAL
5.M001	MECAHNICAL SYMBOLS SHEET
5.M002	MECHANICAL ABBREVIATIONS AND GENERAL NOTES
5.M401	MECHANICAL DETAILS
5.M402	MECHANICAL DETAILS
5.M403	MECHANICAL DETAILS
5.M404	MECHANICAL SCHEDULES
5.MD101	MECHANICAL DEMOLITION PLAN
	PLUMBING
5.P001	MECAHNICAL PLUMBING SYMBOLS AND ABBREVIATIONS
5.P101	UNDERFLOOR PLUMBING PLAN
5.P102	FIRST LEVEL PLUMBING PLAN
5.P103	INTERSTITIAL LEVEL PLUMBING PLAN
5.P401	PLUMBING DETAILS AND SCHEDULES

ELECTRICAL

5.E401	ELECTRICAL DETAILS AND SCHEDULES
5.ED101	FIRST LEVEL POWER/SIGNAL DEMOLITION PLAN
5.ED102	FIRST LEVEL LIGHTING DEMOLITION PLAN
5.EL101	FIRST LEVEL ELECTRICAL LIGHTING PLAN
5.EP200	FIRST LEVEL OVERALL ELECTRICAL POWER PLAN
5.EP201	FIRST LEVEL ELECTRICAL POWER PLAN
5.EP202	INTERSTITIAL LEVEL ELECTRICAL POWER PLAN
5.ET301	FIRST FLOOR ELECTRICAL COMMUNICATIONS PLAN
5.ET302	FIRST FLOOR ELECTRICAL FIRE ALARM PLAN
5.EX200	LIGHTING PROTECTION

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SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

A. Contractor shall provide design-build services to perform work for Sioux Falls VA Health System, Pharmacy Addition for USP 800 Compliance – Sioux Falls, 438-500, as required by vendor drawings and contract documents.

B. Visits to the site by Bidders may be made only by appointment with the Contracting Officer or Contracting Officer's Representative.

C. Equipment vendors may provide technical information related to the project. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.

D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain I.D. Badges from VA.

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

F. Training:

1. All employees of general contractor or subcontractors shall have the 10-hour General Laborers or 30-hour Supervisors OSHA Construction Safety course and other relevant competency training, as determined by PE/COR acting as the Construction Safety Officer with input from the facility Construction Safety Committee.
2. Submit training records of all such employees for approval before the start of work.

G. VHA Directive 2011-36, Safety and Health during Construction, dated 9/22/2011 in its entirety is made a part of this section

1.2 BID INSTRUCTIONS

A. A single award will be made on Item No. I (Base Bid), but in the event the offer exceeds the funds available, a single award will be made on Item No. II or Item No. III, etc., in that order, based on available funding. Offerors should quote a price on each item listed.

1.3 BID SCHEDULE

Project: _____ Contractor: _____

ITEM #	DESCRIPTION	DEDUCT	TOTAL BID (including "deduct")
I	Base Bid	N/A	$
II	Alternate Bid No. 1	$	$
III	Alternate Bid No. 2	$	$
IV	Alternate Bid No. 3	$	$
V	Alternate Bid No. 4	$	$
VI	Alternate Bid No. 5	$	$

Note: The number of "Bid Alternates", if any, vary by solicitation. The above is provided as an example format and is not meant to imply that all solicitations include 5 Alternate Bids. Please adjust as needed per solicitation.

Example Completed Bid Schedule:

Contractor X has a Base Bid of $105,200.00, and a "Deduct" for Alternate Bid No. 1 of $5,000.00, as well as a "Deduct" for Alternative Bid No. 2 of $3,000.00, and a "Deduct" for Alternative Bid No. 3 of $4,000.00. The table immediately below is how their bid would be submitted.

ITEM #	DESCRIPTION	DEDUCT	TOTAL BID (including "deduct")
I	Base Bid	N/A	$105,200.00
II	Alternate Bid No. 1	$5,000.00	$100,200.00
III	Alternate Bid No. 2	$3,000.00	$97,200.00
IV	Alternate Bid No. 3	$4,000.00	$93,200.00

1.4 STATEMENT OF BID ITEM(S)

A. ITEM I, BASE BID: Work includes general construction, alterations, roads, walks, grading, drainage, mechanical and electrical work, utility systems, and necessary removal of existing structures and construction and certain other items.

B. ITEM II: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NO. 1.

C. ITEM III: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1 and 2.

D. ITEM IV: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2 and 3.

E. ITEM V: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2, 3 and 4.

F. ITEM VI: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2, 3, 4 and 5.

G. ITEM VII: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2, 3, 4, 5 and 6.

H. ITEM VIII: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2, 3, 4, 5, 6 and 7.

I. ITEM IX: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2, 3, 4, 5, 6, 7 and 8.

J. ITEM IX: Shall consist of BASE BID less work under DEDUCT ALTERNATE BID NOS. 1, 2, 3, 4, 5, 6, 7, 8 and 9.

K. ALTERNATE BIDS:

1. ALTERNATE BID NO. 1:
2. ALTERNATE BID NO. 2:
3. ALTERNATE BID NO. 3:
4. ALTERNATE BID NO. 4:
5. ALTERNATE BID NO. 5:
6. ALTERNATE BID NO. 6:
7. ALTERNATE BID NO. 7:
8. ALTERNATE BID NO. 8:
9. ALTERNATE BID NO. 9:

1.5 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, from files downloaded from the projects Fedbizops Site.

1.6 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Procedures:

1. General contractor’s employees and subcontractors employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. For working outside the “regular hours” as defined in the contract, the general contractor shall give 3 days notice to the Contracting Officer so that notice can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.

3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order general contractor's employees off the premises in the event of an emergency. The general contractor may return to the site only with the written approval of the Contracting Officer.

B. Document Control:

1. 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.
2. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
3. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.

1.7 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
   101-2012.....Life Safety 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
4. VHA Directive 2005-007

B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to and worker for the Contractor or Sub-Contractor, 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. Provide documentation to the Project Engineer that all construction workers have undergone contractor's safety briefing.

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

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

E. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas and adjoining areas. Construct partitions of 5/8" Type 'C' Fire Rated gypsum board and 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 and locks that use the Fargo VA Best Corporation 7-pin cores.
2. Install fire-rated temporary construction partitions to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.

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

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

H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily.

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. Remove from job site when not being used.

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.

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

N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Project Engineer. Obtain permits from Project Engineer in advance.

O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas daily and correct potential fire hazard situations.

P. Smoking: Smoking is prohibited except in designated smoking rest areas.

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

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

1.8 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. 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.

C. Working space and space available for storing materials shall be as determined by the Project Engineer.

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

E. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit

vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Project Engineer where required by limited working space. Use of such equipment and tools may also be limited in and around historic buildings and structures by the terms of agreements reached under the National Historic Preservation Act; consult the Project Engineer for the terms of any such agreements.

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

F. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Project Engineer. All such actions shall be coordinated with the Project Engineer.

G. Phasing: To insure such executions, Contractor shall furnish the Project Engineer with a schedule of approximate dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the Project Engineer in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such dates to insure accomplishment of this work in successive phases mutually agreeable to Project Engineer and Contractor.

H. All Buildings except Building 2 will be occupied during performance of work.

1. 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 protected 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. Selected immediate areas of alterations will be temporarily vacated while alterations are performed. Coordinate with Project Engineer. Other areas will not be vacated during construction.

I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height, around the construction area. Provide access as required. 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 Engineer.

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

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Project Engineer. Electrical work shall be accomplished with all affected circuits or equipment de-energized.
2. Contractor shall submit a request to interrupt any such services to Project Engineer, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised 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 at no additional cost to the Government.
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 Engineer.
5. In case of a contract construction emergency, service will be interrupted on approval of Project Engineer. Such approval will be confirmed in writing as soon as practical.

K. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.

L. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:

1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.
2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the Project Engineer.

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

1.9 ALTERATIONS

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

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of 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. Any features of the area of building designated by VA for protection or other special treatment per historic preservation standards or agreements (See 1.33).
4. Shall note any discrepancies between drawings and existing conditions at site.
5. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Project Engineer.

B. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Project Engineer together shall make a thorough re-survey of the areas of buildings involved.

They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:

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

C. 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.
4. Protection of any building or site elements identified by VA for special treatment per historic preservation standards or agreements (See 1.33).

1.10 INFECTION PREVENTION MEASURES

A. The Contractor shall contact Engineering Service (239-3760 Ext. 3361 in Building 30 prior to beginning construction in any areas so that a Preconstruction Risk Assessment (PCRA) may be performed and all applicable forms completed. Once completed the Contractor shall obtain a completed and approved copy of the PCRA (ILSM's), Infection Control Precautions, etc.) as noted in the completed forms. The Contractor shall post a copy of the completed form outside of the construction barrier at each work site in plain view and accessible to VA Staff for verification that requirements noted on PCRA Form are being adhered to.

B. Implement the requirements of VAMC's Preconstruction Risk Assessment (PCRA) Form. PCRA 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. Obtain PCRA Form from PE/COR prior to starting construction and check with PE/COR for new versions when moving to other construction areas.

C. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by PCRA Form. The Contractor shall install bult type pressure differential monitoring devices in temporary construction barriers and shall monitor and maintain negative air pressure in construction areas.
   1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the Medical Center.

D. 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 Engineer and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the adjacent rooms are appropriate for their settings. Construction area always negative and corrections required immediately upon discovery or VA notification otherwise work will be stopped immediately.
   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.

E. 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 Engineer. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
   2. Do not perform dust producing tasks within occupied areas without the approval of the Project Engineer. For construction in any areas that will remain jointly occupied by the Medical Center and Contractor's workers, the Contractor shall:
      a. Provide dust proof construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. 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 Engineer.
      b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the

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

c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"), shall be used at all interior transitions from the construction area to occupied Medical Center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times or at a minimum of one hour whichever is less. Contractor shall post a chart indicating when "sticky" mat was changed (individual sheets) with day, time and name of person who changed the "sticky" mat.
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 Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried immediately. Remove and dispose of porous materials.
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.

F. 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.

1.11 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 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 Engineer.
2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government and shall be removed by the Government in advance of work to avoid interfering with Contractor's operation.

(FAR 52.236-9)

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

C. Refer to FAR clause 52.236-7, “Permits and Responsibilities,” which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project. The Contractor is considered an “operator” under the permit and has extensive responsibility for compliance with permit requirements. The apparent low bidder, contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as shown and specified. Some requirement involve the Contractor’s method of operations and operations planning and the Contractor is

responsible for employing best management practices. The affected activities often include, but are not limited to the following:

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

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

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

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

1.13 RESTORATION

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

used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

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

C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone).

1.14 PROFESSIONAL SURVEYING SERVICES

A. 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.

1.15 LAYOUT OF WORK

A. The Contractor shall lay out the work and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated.

(FAR 52.236-17)

B. Establish and plainly mark such lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established 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 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 Engineer before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.

1.16 AS-BUILT DRAWINGS

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

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

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

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

1.17 USE OF ROADWAYS

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

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

1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

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

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

2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their

overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.

3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.

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

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

1.19 TEMPORARY USE OF EXISTING ELEVATORS

A. Outside type hoist shall be used by Contractor for transporting materials and equipment where feasible.

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

1. Contractor makes all arrangements with the Project Engineer for use of elevators. The Project Engineer will ascertain that elevators are in proper condition.
2. Contractor covers and provides maximum protection of following elevator components:
   a. Entrance jambs, heads soffits and threshold plates.
   b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
   c. Finish flooring.
3. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.

1.20 TEMPORARY TOILETS

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

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

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 Contractor shall carefully conserve any utilities furnished without charge.

B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

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

1. Obtain heat by connecting to Medical Center heating distribution system.
    a. Steam is available at no cost to Contractor.

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

1. Obtain electricity by connecting to the Medical Center electrical distribution system. Electricity is available at no cost to the Contractor.

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

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer and obtain approval from the VA Project Engineer prior to making 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 Engineer's discretion) of use of water from Medical Center's system.

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

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

1.22 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.

1.23 CONSTRUCTION MEETING

A. Construction meeting will be held weekly to coordinate the activities of the Contractors.

1. Each meeting shall be attended by VA Representative, A/E Representative and Field Representative of each trade.
2. The General Contractor shall be responsible for supervising the meeting and for recording and distributing the minutes of the meeting to each representative.

1.24 INSTRUCTIONS

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

B. Manuals: Maintenance and operating manuals and one compact disc (two bound hard copies and one .pdf file on CD/DVD each) for each separate piece of equipment shall be delivered to the Project Engineer coincidental with the delivery of the equipment to the job site. Omit all special characters in electronic file names (i.e.: #, %, &, *, :, <,>, ?, /) Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Project Engineer and shall be considered concluded only when the Project Engineer is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the

removal of, and substitution for, any instructor who, in the opinion of the Project Engineer, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.25 PHOTOGRAPHIC DOCUMENTATION

A. During the construction period through completion, provide photographic documentation of construction progress taken daily and submitted weekly.

1.26 LOCAL FARGO VA HEALTH CARE SYSTEM CONSTRUCTION CONTRACTOR ORIENTATION AND POLICIES

A. Contracts: The following staff or resource people will be working with you at the Fargo VA HealthCare System. Please feel free to contact these individuals with any questions:
   1. Chief Engineer: Shawn Bergan (701) 239-3700, ext. 93388 or (701) 239-3760
   2. Project Engineer: Todd Dalzell (701) 239-3700, ext. 93362 or (701) 239-3760 or Dennis Langevin (701) 239-3700, ext. 93365 or (701) 239-3760.

B. Vehicle Traffic Rules: All construction contractors shall park their vehicles in areas assigned by the Contracting Officer or Engineering Service representatives. All persons coming on the premises of the Fargo VA Health Care System must obey the posted traffic and parking rules. Police Service will issue tickets to contractor vehicles parked in areas other than those assigned.

C. Keys/ID Badges: VA ID badges must be worn while you are on Medical Center premises. Contact Engineering Service to obtain an ID badge and any necessary keys. Contract staff are responsible for the security of keys and ID badges issued to them and may be charged for replacement cost. You must notify Engineering (ext. 3361) personnel immediately to report any loss, theft or suspected reproduction of a Medical Center key or access card.

D. Smoking: Smoking is prohibited except in designated smoking shelters or areas.

E. Use of Government Telephones and Fax Machines
   1. Government telephones are for official Government business use. Contract staff may use telephones, for local calls only, to contact your place of employment or to address unforeseen events such as injury on the job, work schedule changes etc.
   2. The Government fax machine located in the M & R Foreman's Office, may be used for local faxes with the approval of Engineering Office staff.

F. Housekeeping
   1. All construction sites shall be kept clean, orderly and in sanitary condition.
   2. All rags/cloth and rubbish soaked with flammable and/or combustible material shall be placed in a covered metal receptacle until being disposed.

3. A clear and unobstructed path must be maintained to all portable fire extinguishers, hose cabinets, pull stations, fire exits and electrical panels.
4. Fire doors and smoke barrier doors shall not be blocked in a manner to prevent their protective operation in the event of a fire.
5. The use of wedges, stops, ropes, or other unapproved methods of holding doors open is prohibited.
6. All indoor trash containers over 20 gallons will be constructed of non-combustible materials and be covered or have a self-extinguishing cover.

G. Storage
1. Any commodities that may be hazardous in combination with each other must be stored so they cannot come in contact with each other.
2. Store flammable and combustible liquids and gasses in approved storage containers.
3. A clear space of 18 inches will be maintained below sprinkler heads.
4. Items stored in tiers will be stacked, blocked, interlocked and limited in height to prevent sliding or collapse.
5. Materials will not be stored directly on the floor.
6. Storage areas will be kept free from accumulation of materials that constitute hazards.
7. Stairwells, stairways and corridors shall not be utilized for storage.
8. Storage will not be permitted within 3 feet of an electric panel in all directions.

H. Hazardous Materials
1. Discovery of any suspected asbestos containing material shall result in the contractor stopping work in the area and reporting the discovery immediately to the Engineering Office (ext. 3361) or one of the contact persons indicated above. Engineering Service shall then evaluate the suspect material and if it contains asbestos shall arrange for the removal of the asbestos.
2. Contractors shall maintain and provide to the VA Project Engineer MSDS's for products used during construction which shall explain the labeling system and all other required information. Report any discovery of an existing hazardous material to Engineering Service, (ext. 3361).

I. Infection Control
1. PURPOSE: To prevent the acquisition of nosocomial infection in patients and healthcare workers during Medical Center renovation or construction activities.

2. The Contractor shall contact Engineering Service (239-3760 or EXT. 3361) prior to beginning construction in any areas so that a Pre-Construction Risk Assessment (PCRA) may be performed and all applicable forms completed. Once completed the Contractor shall obtain a completed and approved copy of a PCRA Form for each area of work in which the Contractor is involved. The Contractor shall conform to all of the requirements (ILSM's, Infection Control Precautions, etc.) as noted on the completed forms. The Contractor shall post a copy of the completed Form outside the construction barrier at each work site in plain view and accessible to VA Staff for verification that requirements noted on PCRA Form are being adhered to.
3. General: The goal of Infection Control is to identify and reduce the risks of acquiring and transmitting infections among patients, employees, service workers and visitors to the Medical Center. During construction or renovation projects, hidden infectious disease hazards may be released into the air, carried on dust particles, on workers clothing or be present in damp areas or areas where water has collected. One particular organism of concern is a fungal organism know as Aspergillus. Aspergillus can be found in decaying leaves and compost, plaster and drywall, and settled dust. These organisms like many others encountered in our everyday lives usually do not cause problems in healthy people, however a hospital is full of sick patients. Aspergillus and other organisms can cause severe illness and even death in some patients. Therefore, it is critical that everyone do their best to help prevent conditions that might lead to the dispersion of this or other infectious organisms by:
    a. Maintaining barrier walls that keep dust and dirt inside the worksite.
    b. Maintaining a state of negative air pressure within the construction site to prevent dust and dirt from dispersing into the Medical Center from the worksite. The Contractor shall install bulb type pressure differential monitoring devices or an alarm system in temporary construction barriers and shall monitor and maintain negative air pressure in construction areas.
    c. Removing demolition debris in a manner that minimizes any contamination of the environment outside the worksite by dust and debris.
    d. Utilizing walk off mats and making sure clothing is free of loose soil and debris when leaving the construction site.

e. Assuring that any water or sludge found during demolition of plumbing or in the construction process is collected and disposed of in a controlled manner.

f. Using only designated entry and exit pathways.

4. Please feel free to contact Infection Control at ext. 3668 if you have questions or concerns.

5. If you find any needles, syringes, sharp medical objects please do not handle or remove yourself. Contact the Medical Center project coordinator or Project Engineer at 239-3760 or at Medical Center extension 3361 for removal.

6. Infection control activities are critical in all areas of the Medical Center. Construction activities causing disturbance of existing dust, or generating new dust must be conducted in ways that will minimize dust generation and dispersion.

7. All construction/maintenance workers and contract workers must follow the infection control procedures as described in this guideline.

8. The following infection control procedures shall be followed at a minimum:

a. BARRIERS – Complete all critical barriers before construction begins.

1) Construction or renovation sites not capable of containment within a single room must be separated from patient-care areas and other critical areas by barriers that keep the dirt and dust inside the work site.

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

3) Temporary barriers and enclosures must be dust proof with airtight seals maintained at the full perimeter of the walls, floors and upper decking, as well as all penetrations. Seal holes, pipes, conduits and punctures appropriately.

4) Tightly sealing doors or an overlapping flap of at least 2 feet in width of a durable poly must be used at points of personnel access, where plastic/poly barriers are approved for use by VA Project Engineer.

5) Elevator shafts or stairways must be isolated outside of the construction field to prevent dispersion of dust from the work site.

b. ENVIRONMENTAL CONTROLS

1) Isolate the HVAC system in areas where work is being done to prevent contamination of the duct system.

2) Maintain negative air pressure within work site. Utilize HEPA-filtration units if air is being re-circulated.

3) Seal holes, pipes, conduits and punctures appropriately.
4) Provide a designated area within the work site where all personnel leaving the work site can vacuum off with a HEPA-filtered vacuum to remove all loose dust and debris from clothing.
5) Vacuum with a HEPA-filtered vacuum and/or wet mop frequently at entrance and exit points.
6) "Sticky" or walk-off mats shall be utilized immediately outside the construction area to remove dust and soil from shoes, cart wheels, etc. as personnel exit the area. The mats must be large enough to cover the entire exit and changed frequently to prevent accumulation of dust. Contractor shall place a form on a wall adjacent to each mat with space to record date, time and exchanger's signature so VA Staff can monitor that mats are changed at required frequency.
7) Contain construction debris during transport in covered containers.
8) Debris must be removed from the construction area on a daily basis in covered carts using specified traffic patterns.
9) Control, collection and disposal must be provided for any drain liquid or sludge encountered when demolishing plumbing.

c. CLEANING
1) The construction zone and adjacent areas must be maintained by wet mopping the area daily or more frequently as needed to minimize dust generation.
2) Final cleaning of the area must be completed prior to acceptance of the completed project area by VA.
3) Do not remove barriers from work area until the project is completed and area is thoroughly cleaned. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction.
4) Clothing shall be free of loose soil and debris before exiting the construction zone.
5) Personnel entering sterile/invasive procedure areas will be provided with a disposable jump suit, head covering and shoe covers to wear while working in the area. They must be removed when exiting the area and new coverings obtained when reentering the areas.
6) Tools and equipment must be damp-wiped prior to entry and exit from sterile and invasive procedure areas.

7) Tools and equipment soiled with blood or body fluids must be cleaned with a hospital-approved disinfectant prior to removing from the area.

d. ENVIRONMENTAL MONITORING AND COMPLETION

1) Infection Control, in cooperation with Engineering and Safety will make periodic visits to the work site to ensure compliance with the infection control guidelines.

2) Whenever safe infection control conditions are not met the appropriate contractor will be notified to correct the conditions immediately.

3) All work will be stopped on a project if a hazardous infection control deficiency exists that would result in patients being put at significant risk.

4) Water supply lines will be flushed before placing newly renovated or constructed areas into service. Industrial Hygiene will assure that water supply lines are safe for use.

J. Construction Safety

1. The Medical Center policy is to provide an environment for patients, visitors and staff that is free from danger. Within the Medical Center, the NFPA Life Safety Code is followed. Interim life safety measures (ILSM's) are applied to all construction projects as necessary and are defined in construction contracts. Minimum ILSM's are:
2. Exits – provide free and unobstructed egress.
3. Free and unobstructed access to emergency department/service for emergency forces.
4. Temporary construction partitions are in accordance with contract requirements.
5. Smoking is permitted in designated areas only.
6. Storage, housekeeping and debris removal policies and procedures that reduce the flammable and combustible fire load are enforced.
7. Hazard surveillance is increased in construction areas.

K. Fire Safety

1. The contractors shall coordinate all construction activities with the VA Engineering Service to determine if fire alarm initiating devices are located within the construction area. Engineering Service shall disable the appropriate alarm initiating devices. Once work in the area is complete it is the contractor's responsibility to contact Engineering Service to have the fire alarm initiation devices enabled.
2. Fire alarm, detection and suppression systems are not to be impaired unless there is work on the system to be performed. If fire alarm, detection and suppression systems are

impaired for more than four hours the contractor shall implement a fire watch, at no additional cost to the Government, in compliance with NFPA requirements and shall obtain VA Engineering Service approval.

3. Additional fire fighting equipment is provided and employees are trained in its use.
4. Hot works permits and fire extinguishers are required when working with open flames, or hot items and for activities that may generate sparks. Contact Engineering Service to obtain a hot work permit.
5. In the event of a fire alarm, “CODE 5” and the location of a fire will be communicated by an overhead announcement. The "all clear" is authorized by the Fargo Fire Department or by the personnel conducting the fire drill and will be communicated by an overhead announcement. If a fire or fire drill is located in or adjacent to the construction area, construction contractor staff shall be responsible for the following:
    a. Be alert to the Code 5 announcement.
    b. Participate in fire drills.
    c. Follow the RACE Plan (Rescue, Alarm, Contain, Extinguish) if fire is discovered by a construction contractor.
    d. Close all corridor doors within the construction area.
    e. Evacuate the immediate area.

L. Utilities

1. Engineering (ext. 3361) is responsible for all utilities within the Medical Center. If there are problems or failures of the utilities, call extension 3361 during normal business hours (Monday through Friday, 8:00 a.m. to 4:30 p.m.). After hours and on weekends, contact the Police Service at ext. 3251 to report problems and failures. A utilities failure and its type/location will be communicated by a “Code 2 – Utility Failure” overhead announcement.
2. All utility service connections shall be reviewed with and approved by Engineering Service just prior to the connection being made with the existing utility. This condition shall apply to both temporary and permanent connections. This final utility system connection check is meant to ensure the following:
    a. The Medical Center is prepared for the connection.
    b. The contractor is prepared for the connection work, which shall include but not be limited to, all safety measures have been taken or are in place, backflow preventers are

in place, hot work permits have been issued, fire watch is in place, fire alarm initiation devices have been disabled if necessary, etc.

M. Emergencies

1. Disasters (“Code 6”): The Medical Center has initiated a process that provides an "all-hazard" approach to disaster management. Construction contractor staff shall ensure corridors are free of obstructions and a foreman or representative shall report to the Engineering Service office for further instructions.
2. Hostage Situations – Immediately report to Police Service (ext. 3251), any incident in which the safety of any person is threatened by another.
3. Bomb Threats (“Code 7”) - React calmly and evacuate. Notify Police Service (ext. 3251) if the threat poses immediate danger to a person or destruction of property. If you discover a suspicious object, do not touch or move the object
4. Severe Weather – In the event of a “Code 8 – Take Cover” overhead announcement, all personnel are expected to take cover in windowless interior corridors that are not on the top floor of the building.
5. “Code Black” – React calmly and evacuate. Avoid area(s) where it has been indicated an armed assailant is in the building or on the ground.

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SECTION 01 32 16.17
PROJECT SCHEDULES
(SMALL PROJECTS – DESIGN/BUILD)

PART 1- GENERAL

1.1 DESCRIPTION:

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

1.2 CONTRACTOR'S REPRESENTATIVE:

A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COR).

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 COR, 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 COR shall identify the five different report formats that the contractor shall provide.

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

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

1.5 THE INTERIM AND FINAL PROJECT SCHEDULE SUBMITTAL

A. Interim Schedule Submittal: Within 21 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. 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 and 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 Project Schedule. The Contracting Officer’s separate approval of the interim 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 interim Project Schedule shall reflect the Contractor's approach to scheduling the complete project and shall include at a minimum, the following activities:

1. All phasing described in Section 01 00 00, GENERAL REQUIREMENTS-OPERATIONS AND STORAGE AREAS- Paragraph “Phasing”
2. Procurement- Submittals, review and approvals, fabrication and delivery, of all key and long lead time procurement items.
3. Design- All design submissions listed in the RFP solicitation, including the specified meeting and review activities.
4. Detailed design and construction activities for the first 120 work days after Notice to Proceed.
5. Summary activities which are necessary (and are not included above) to properly show:
   a. The approach to scheduling the remaining work. The work for each major trade must be represented by at least one summary activity, so that the work cumulatively shows the entire project schedule.
   b. Summary activities shall have the trade code of SUM

B. The interim schedule shall describe the activities to be accomplished and their interdependencies. All work activities (including design), other than procurement activities, shall be cost loaded as specified and will be the basis for progress payments during the period prior to acceptance of the schedule. The interim schedule in its original form shall contain no contract changes or delays which may have been incurred during the interim schedule development period and shall reflect the Contractors schedule as submitted with his RFP solicitation package, or as negotiated prior to Notice to Proceed. All CPM data supporting any time extension requests, in accordance with Article ADJUSTMENT OF CONTRACT COMPLETION, will be derived from the approved final schedule.

C. Final Diagram Submittal: Within 45 calendar days prior to the start of construction, 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 schedule development period and shall reflect the Contractors as bid schedule. These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

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

E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule

until subsequently revised in accordance with the requirements of this section.

F. The Complete Project Schedule shall contain approximately TBD 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, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 – 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).

C. In accordance with FAR 52.236 – 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 – 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.

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

1.7 PROJECT SCHEDULE REQUIREMENTS

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

1. Show activities/events as:
   a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
   b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.

c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.

2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COR 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 COR. 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 COR's approval of the Project Schedule.

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

1.8 PAYMENT TO THE CONTRACTOR:

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

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

1.9 PAYMENT AND PROGRESS REPORTING

A. Monthly schedule update meetings will be held on dates mutually agreed to by the COR 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 COR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:

1. Actual start and/or finish dates for updated/completed activities/events.
2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.

5. Completion percentage for all completed and partially completed activities/events.
6. Logic and duration revisions required by this section of the specifications.
7. Activity/event duration and percent complete shall be updated independently.

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

C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**

D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and

administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
   1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
   2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
   3. Reschedule the work in conformance with the specification requirements.

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

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

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

D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 – 4 (Changes) and VAAR 852.236 – 88 (Changes – Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.

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

1.12 ADJUSTMENT OF CONTRACT COMPLETION

A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.

B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.

C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 – 4 (Changes) and VAAR 852.236 – 88 (Changes – Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.

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

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

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification defines the general requirements and procedures for submittals. A submittal is information submitted for VA review to establish compliance with the contract documents.

B. Detailed submittal requirements are found in the technical sections of the contract specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective technical specifications at no additional cost to the government.

C. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

1.2 DEFINITIONS

A. Preconstruction Submittals: Submittals which are required prior to issuing contract notice to proceed or starting construction. For example, Certificates of insurance; Surety bonds; Site-specific safety plan; Construction progress schedule; Schedule of values; Submittal register; List of proposed subcontractors.

B. Shop Drawings: Drawings, diagrams, and schedules specifically prepared to illustrate some portion of the work. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be integrated and coordinated.

C. Product Data: Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions, and brochures, which describe and illustrate size, physical appearance, and other characteristics of materials, systems, or equipment for some portion of the work. Samples of warranty language when the contract requires extended product warranties.

D. Samples: Physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color

samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project. Field samples and mock-ups constructed to establish standards by which the ensuing work can be judged.

E. Design Data: Calculations, mix designs, analyses, or other data pertaining to a part of work.

F. Test Reports: Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

G. Certificates: Document required of Contractor, or of a manufacturer, supplier, installer, or subcontractor through Contractor. The purpose is to document procedures, acceptability of methods, or personnel qualifications for a portion of the work.

H. Manufacturer's Instructions: Pre-printed material describing installation of a product, system, or material, including special notices and MSDS concerning impedances, hazards, and safety precautions.

I. Manufacturer's Field Reports: Documentation of the testing and verification actions taken by manufacturer's representative at the job site on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must indicate whether the material, product, or system has passed or failed the test.

J. Operation and Maintenance Data: Manufacturer data that is required to operate, maintain, troubleshoot, and repair equipment, including manufacturer's help, parts list, and product line documentation. This data shall be incorporated in an operations and maintenance manual.

K. Closeout Submittals: Documentation necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a phase of construction on a multi-phase contract.

1.3 SUBMITTAL REGISTER

A. The submittal register will list items of equipment and materials for which submittals are required by the specifications. This list may not be all inclusive and additional submittals may be required by the specifications. The Contractor is not relieved from supplying submittals required by the contract documents but which have been omitted from the submittal register.

B. The submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.
C. The VA will provide the initial submittal register in electronic format. Thereafter, the Contractor shall track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the VA.
D. The Contractor shall update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of all work by Contracting Officer.
E. The Contractor shall submit formal monthly updates to the submittal register in electronic format. Each monthly update shall document actual submission and approval dates for each submittal.

1.4 SUBMITTAL SCHEDULING

A. Submittals are to be scheduled, submitted, reviewed, and approved prior to the acquisition of the material or equipment.
B. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow time for potential resubmittal.
C. No delay costs or time extensions will be allowed for time lost in late submittals or resubmittals.
D. All submittals are required to be approved prior to the start of the specified work activity.

1.5 SUBMITTAL PREPARATION

A. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.
B. Collect required data for each specific material, product, unit of work, or system into a single submittal. Prominently mark choices, options, and portions applicable to the submittal. Partial submittals will not be accepted for expedition of construction effort. Submittal will be returned without review if incomplete.
C. If available product data is incomplete, provide Contractor-prepared documentation to supplement product data and satisfy submittal requirements.
D. All irrelevant or unnecessary data shall be removed from the submittal to facilitate accuracy and timely processing. Submittals that contain

the excessive amount of irrelevant or unnecessary data will be returned with review.

E. Provide a transmittal form for each submittal with the following information:
   1. Project title, location and number.
   2. Construction contract number.
   3. Date of the drawings and revisions.
   4. Name, address, and telephone number of subcontractor, supplier, manufacturer, and any other subcontractor associated with the submittal.
   5. List paragraph number of the specification section and sheet number of the contract drawings by which the submittal is required.
   6. When a resubmission, add alphabetic suffix on submittal description. For example, submittal 18 would become 18A, to indicate resubmission.
   7. Product identification and location in project.

F. The Contractor is responsible for reviewing and certifying that all submittals are in compliance with contract requirements before submitting for VA review. Proposed deviations from the contract requirements are to be clearly identified. All deviations submitted must include a side by side comparison of item being proposed against item specified. Failure to point out deviations will result in the VA requiring removal and replacement of such work at the Contractor's expense.

G. Stamp, sign, and date each submittal transmittal form indicating action taken.

H. Stamp used by the Contractor on the submittal transmittal form to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR
(Firm Name)
_____Approved
_____Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: _____
TITLE: _____
DATE: _____

1.6 SUBMITTAL FORMAT AND TRANSMISSION

A. Provide submittals in electronic format, with the exception of material samples. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer.

B. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents.

C. Electronic files must be of sufficient quality that all information is legible. Generate PDF files from original documents so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required.

D. E-mail electronic submittal documents smaller than 5MB in size to e-mail addresses as directed by the Contracting Officer.

E. Provide electronic documents over 5MB through an electronic FTP file sharing system. Confirm that the electronic FTP file sharing system can be accessed from the VA computer network. The Contractor is responsible for setting up, providing, and maintaining the electronic FTP file sharing system for the construction contract period of performance.

F. Provide hard copies of submittals when requested by the Contracting Officer. Up to 3 additional hard copies of any submittal may be requested at the discretion of the Contracting Officer, at no additional cost to the VA.

1.7 SAMPLES

A. Submit two sets of physical samples showing range of variation, for each required item.

B. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified.

C. When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

D. Before submitting samples, the Contractor is to ensure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

E. The VA reserves the right to disapprove any material or equipment which previously has proven unsatisfactory in service.

F. Physical samples supplied maybe requested back for use in the project after reviewed and approved.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

B. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.9 TEST REPORTS

SRE may require specific test after work has been installed or completed which could require contractor to repair test area at no additional cost to contract.

1.10 VA REVIEW OF SUBMITTALS AND RFIS

A. The VA will review all submittals for compliance with the technical requirements of the contract documents. The Architect-Engineer for this project will assist the VA in reviewing all submittals and determining contractual compliance. Review will be only for conformance with the applicable codes, standards and contract requirements.

B. Period of review for submittals begins when the VA COR receives submittal from the Contractor.

C. Period of review for each resubmittal is the same as for initial submittal.

D. VA review period is 15 working days for submittals.

E. VA review period is 10 working days for RFIs.

F. The VA will return submittals to the Contractor with the following notations:

1. "Approved": authorizes the Contractor to proceed with the work covered.
2. "Approved as noted": authorizes the Contractor to proceed with the work covered provided the Contractor incorporates the noted comments and makes the noted corrections.
3. "Disapproved, revise and resubmit": indicates noncompliance with the contract requirements or that submittal is incomplete. Resubmit with appropriate changes and corrections. No work shall proceed for this item until resubmittal is approved.
4. "Not reviewed": indicates submittal does not have evidence of being reviewed and approved by Contractor or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals after taking appropriate action.

1.11 APPROVED SUBMITTALS

A. The VA approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.

B. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is

responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

C. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

D. Retain a copy of all approved submittals at project site, including approved samples.

1.12 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

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SECTION 01 35 26
SAFETY REQUIREMENTS

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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-2015 .....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. Critical Lift. A lift with the hoisted load exceeding 75% of the crane's maximum capacity; lifts made out of the view of the operator (blind picks); lifts involving two or more cranes; personnel being hoisted; and special hazards such as lifts over occupied facilities, loads lifted close to power-lines, and lifts in high winds or where other adverse environmental conditions exist; and any lift which the crane operator believes is critical.

B. 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)).

C. "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.

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

E. Accident/Incident Criticality Categories:

No impact – near miss incidents that should be investigated but are not required to be reported to the VA;

Minor incident/impact – incidents that require first aid or result in minor equipment damage (less than $5000). These incidents must be investigated but are not required to be reported to the VA;

Moderate incident/impact – Any work-related injury or illness that results in:

1. Days away from work (any time lost after day of injury/illness onset);

2. Restricted work;

3. Transfer to another job;

4. Medical treatment beyond first aid;

5. Loss of consciousness;

6. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (5) above or,

7. any incident that leads to major equipment damage (greater than $5000).

These incidents must be investigated and are required to be reported to the VA;

Major incident/impact – Any mishap that leads to fatalities, hospitalizations, amputations, and losses of an eye as a result of contractors' activities. Or any incident which leads to major property damage (greater than $20,000) and/or may generate publicity or high visibility. These incidents must be investigated and are required to be

reported to the VA as soon as practical, but not later than 2 hours after the incident.

E. 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.

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 Contracting Officer Representative.

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 a qualified person who is employed 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/INCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all Moderate and Major as well as all High Visibility Incidents. The APP shall include accident/incident investigation procedure and identify person(s) responsible to provide the following to the Contracting Officer Representative:

1) Exposure data (man-hours worked);

2) Accident investigation reports;

3) Project site injury and illness 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, patient, and public safety 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;

28) Public (Mandatory compliance with ANSI/ASSE A10.34-2012).

C. Submit the APP to the Contracting Officer Representative 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 Contracting Officer Representative, 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 in accordance with FAR Clause 52.236-13, *Accident Prevention*, 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, project overall designated OSHA Competent Person, and Contracting Officer Representative.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 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 Contracting Officer Representative 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 Contracting Officer Representative 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 Contracting Officer Representative.

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.

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). However, the SSHO has be a separate qualified individual from the Prime Contractor's Superintendent and/or Quality Control Manager with duties only as the SSHO.

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 Contracting Officer Representative 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.

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 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 Contracting Officer Representative.

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 Contracting Officer Representative 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 Contracting Officer Representative within one week of the onsite inspection.

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

A. The prime contractor shall establish and maintain an accident reporting, recordkeeping, and analysis system to track and analyze all injuries and illnesses, high visibility incidents, and accidental property damage (both government and contractor) that occur on site. Notify the Contracting Officer Representative as soon as practical, but no more than four hours after any accident meeting the definition of a Moderate or Major incidents, High Visibility Incidents, , or any weight handling and hoisting 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 Contracting Officer Representativedetermine whether a government investigation will be conducted.

B. Conduct an accident investigation for all Minor, Moderate and Major incidents as 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 (or equivalent), and provide the report to the Contracting Officer Representative within 5 calendar days of the accident. The Contracting

Officer Representative 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 Contracting Officer Representative monthly.

D. A summation of all Minor, Moderate, and Major incidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Contracting Officer Representative monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Contracting Officer Representative 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 Contracting Officer Representative 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 Contracting Officer Representative in circumstances of no eye hazards, 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 Contracting Officer Representative in circumstances of no foot hazards.

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

A. 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.

B. 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 Contracting Officer Representative 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. 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 [_III___}, however, work outside the primary project scope area may vary. The required infection control precautions with each class are as follows:

1. Class I requirements:

   a. During Construction Work:

      1) Notify the Contracting Officer Representative.

      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 Contracting Officer Representative.

2. Class II requirements:

a. During Construction Work:

1) Notify the Contracting Officer Representative.

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 // Resident Engineer Contracting Officer Representative.

3. Class III requirements:

a. During Construction Work:

1) Obtain permit from the Contracting Officer Representative.

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 Contracting Officer Representative 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 Contracting Officer Representative.

4. Class IV requirements:

a. During Construction Work:

1) Obtain permit from the Contracting Officer Representative.

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, 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) 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 Contracting Officer Representative 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 Contracting Officer Representative.

C. 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.

D. Products and Materials:

1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes

2. Barrier Doors: Self Closingsolid core wood in steel frame, painted

3. Dust proof 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

E. 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.

F. A dust control program will be established 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 COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

G. 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 Contracting Officer Representative 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 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 Contracting Officer Representative.

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

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. 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 Contracting Officer Representative. 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.

K Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer Representative.

L. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Obtain permits from COR at

least 24 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

M. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative.

N. 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.

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

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

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 Contracting Officer Representative with approval of the Medical Center Director will make the determination if the circumstances would meet

the exception outlined above. An AHA and permit specific to energized work activities will be developed, reviewed, and accepted by the VA prior to the start of that activity.

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 Contracting Officer Representative.

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 and permit for energized work has been reviewed and accepted by the Contracting Officer Representative 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. GFCI protection shall be provided where an employee is operating or using cord- and plug-connected tools related to construction activity supplied by 125-volt, 15-, 20-, or 30-ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30- ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be

implemented in accordance with NFPA 70E - 2015, Chapter 1, Article 110.4(C)(2).

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 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.

C. A detailed lift plan for all lifts shall be submitted to the COR 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing and all other elements of a critical lift plan where the lift meets the definition of a critical lift. Critical lifts require a more comprehensive lift plan to minimize the potential of crane failure and/or catastrophic loss. The plan must be reviewed and accepted by the General Contractor before being submitted to the VA for review. The lift will not be allowed to proceed without prior acceptance 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

1.19 CONFINED SPACE ENTRY

A. All confined space entry shall comply with 29 CFR 1926, Subpart AA 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 COR.

1.20 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 COR. Obtain permits from COR at least 48 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

1.21 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.

1.22 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. 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.

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

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

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

A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to – GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.

B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

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

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

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

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

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

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

AGMA American Gear Manufacturers Association, Inc.
http://www.agma.org

AHAM Association of Home Appliance Manufacturers
http://www.aham.org

AIA American Institute of Architects
http://www.aia.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

SOI Secretary of the Interior

http://www.cr.nps.gov/local-law/arch_stnds_8_2.htm

IGMA Insulating Glass Manufacturers Alliance
http://www.igmaonline.org

SJI Steel Joist Institute
http://www.steeljoist.org

SMACNA Sheet Metal and Air-Conditioning Contractors
National Association, Inc.
http://www.smacna.org

SSPC The Society for Protective Coatings
http://www.sspc.org

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

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

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

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

TPI Truss Plate Institute, Inc.
583 D'Onofrio Drive; Suite 200

Madison, WI 53719
(608) 833-5900

UBC The Uniform Building Code
See ICBO

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

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

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

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

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

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SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for Contractor Quality Control (CQC) for Design-Bid-Build (DBB) construction projects. This section can be used for both project types.

1.2 APPLICABLE PUBLICATIONS

A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. ASTM International (ASTM)

1. ASTM D3740 - (2012a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
2. ASTM E29 - (2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.3 SUBMITTALS

Government approval is required for all submittals. CQC inspection reports shall be submitted under this Specification section and follow the Applicable CQC Control Phase (Preparatory, Initial, or Follow-Up):

1. Preconstruction Submittals
   a. Interim CQC Plan
   b. CQC Plan
   c. Additional Requirements for Design Quality Control (DQC) Plan
2. Design Data
   a. Discipline-Specific Checklists
   b. Design Quality Control
3. Test Reports
   a. Verification Statement

PART 2 PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system that complies with the FAR Clause 52.246.12 titled “Inspection of

Construction". QC consists of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all design and construction operations, both onsite and offsite, and be keyed to the proposed design and construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Office or Authorized designee for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CQC PLAN:

A. Submit no later than 15 days after receipt of Notice to Proceed (NTP) the CQC Plan proposed to implement the requirements of the FAR Clause 52.246.12 titled "Inspection of Construction". The Government will consider an Interim CQC Plan for the first 15 days of operation, which must be accepted within 20 business days of NTP. Design and/or construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an Interim plan applicable to the particular feature of work to be started. Work outside of the accepted Interim CQC Plan will not be permitted to begin until acceptance of a CQC Plan or another Interim CQC Plan containing the additional work scope is accepted.

B. Content of the CQC Plan: Include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record consultants, architects/engineers (A/E), fabricators, suppliers, and purchasing agents:

1. A description of the QC organization, including a chart showing lines of authority and acknowledgement that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.

2. The name, qualifications (in resume format) duties, responsibilities, and authorities of each person assigned a CQC function.
3. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will to the Contracting Officer or Authorized designee. be issued by the CQC System Manager. Furnish copies of these letters
4. Procedures for scheduling, reviewing, certifying, and managing submittals including those of subcontractors, designers of record, consultants, A/E's offsite fabricators, suppliers and purchasing agents. These procedures must be in accordance with Section 01 33 23 Shop Drawings, Product Data, and Samples.
5. Control, verification, and acceptance of testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer or Authorized designee are required to be used)
6. Procedures for tracking Preparatory, Initial, and Follow-Up control phases and control, verification, and acceptance tests including documentation.
7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
8. Reporting procedures, including proposed reporting formats.
9. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of specifications can generally be considered as a definable feature of work, there are frequently

more than one definable feature under a particular section. This list will be agreed upon during the Coordination meeting.

10. Coordinate schedule work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections and Schedule of Special Inspections. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the CQC Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the CQC Plan.

C. Additional Requirements for Design Quality Control (DQC) Plan: The following additional requirements apply to the DQC Plan for DB projects only and not DBB projects:

1. Submit and maintain a DQC Plan as an effective QC program which assures that all services required by this contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents must be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product may not perform the independent technical review (ITR). Correct errors and deficiencies in the design documents prior to submitting them to the Government.
2. Include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific Contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, submit a revised schedule reflecting the change within 7 calendar days. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit at each design phase as part of the project documentation these completed discipline-specific checklists.

3. Implement the DQC Plan by a DQC Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual must be a person who has verifiable engineering or architectural design experience and is a Professional Engineer or Registered Architect within the state of Construction location. Notify the Contracting Officer or Authorized designee, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

D. Acceptance of Plan: Acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel as necessary, to obtain the quality specified.

E. Notification of Changes: After acceptance of the CQC Plan, notify the Contracting Officer or Authorized designee in writing of any proposed change. Proposed changes are subject to acceptance by the Government prior to implementation by the Contractor.

3.3 COORDINATION MEETING:

After the Preconstruction Conference Post-award Conference before start of design or construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized designee to discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 2 business days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CC operations, design activities (if applicable), control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and Contracting Officer or Authorized designee and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION:

A. Personnel Requirements: The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, a Design Quality Manager (if applicable), and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager shall satisfy the requirements of Specification 01 35 26 Safety Requirements and reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer or Authorized designee. Provide adequate office space, filing systems, and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawings submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Government.

B. CQC System Manager: Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC system Manager is required to be a PM or SRE to determine qualifications based on project complexity at construction review. This CQC System manager is on the site at all times during construction and is employed by the General Contractor. The CQC System Manger is assigned as CQC System Manager but has duties as project superintendent in addition to quality control.

C. Additional Requirements: In addition to the above experience and education requirements, the CQC System Manager and Alternate CQC System Manager are required to have completed the Construction Quality

Management (CQM) for Construction course. If the CQC System Manager does not have a current specification, obtain the CQM for Contractors course identification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer or Authorized designee for information on the next scheduled class.

D. Organizational Changes: Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer or Authorized designee for acceptance.

3.5 **SUBMITTALS AND DELIVERABLES:** Submittals have to comply with the requirements in Section 01 33 23 Shop Drawings, Product Data, and Samples. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00 General Commissioning Requirements is included in the contract, the submittals required by the section have to be coordinated with the Section 01 33 23 Shop Drawings, Product Data, and Samples to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL:

A. CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:

1. Preparatory Phase: This phase is performed prior to beginning work on each definable feature of work after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:
   a. A review of each paragraph of applicable specifications, references codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
   b. Review of the Contract drawings.

c. Check to assure that all materials and equipment have been tested, submitted, and approved.
d. Review of provisions that have been made to provide required control inspection and testing.
e. Review Special Inspections required by Section 01 45 35 Special Inspections, that Statement of Special Inspections and the Schedule of Specials Inspections.
f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
g. Examination of required materials, equipment, and sample work to assure that they are on hand conform to approved shop drawings or submitted data, and are properly stored.
h. Review of the appropriate Activity Hazard Analysis (AHA) to assure safety requirements are met.
i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards – contract defined or industry standard if not contract defined - for that feature of work.
j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
k. Discussion of the initial control phase.
l. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the Preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the Preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

B. Initial Phase: This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:
1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the Preparatory meeting.

2. Verify adequacy of controls to ensure full contract compliance. Verify the required control inspection and testing is in compliance with the contract.
3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
4. Resolve all differences.
5. Check safety to include compliance with an upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
6. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the initial phase for definable features of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with Follow-Up phases.
7. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
8. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections.

C. Follow-Up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements until the completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final Follow-Up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections

D. Additional Preparatory and Initial Phases on the same definable features of work if: the quality ongoing work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

A. Testing Procedure: Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance test when specified. Procure the services of a Department of Veteran Affairs approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

1. Verify that testing procedures comply with contract requirements.
2. Verify that facilities and testing equipment are available and comply with testing standards.
3. Check test instrument calibration data against certified standards.
4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
5. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the unique sequential control number identifying the test. If approved by the Contracting Officer or Authorized designee, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer or Authorized designee. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

B. Testing Laboratories: All testing laboratories must be validated through the procedures contained in Specification section 01 45 29 Testing Laboratory Services.

1. Capability Check: The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician’s testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt and steel is required to meet criteria detailed in ASTM D3740 and ASTM E329.

2. Capability Recheck: If the selected laboratory fails the capability check, the Contractor will be assessed a charge equal to value of recheck to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the Contract amount due the Contractor.

C. Onsite Laboratory: The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

A. Punch-Out Inspection: Conduct an inspection of the work by the CQC system Manager near the end of the work, or any increment of the work established by a time stated FAR 52.211-10 – Commencement, Prosecution, and Completion of Work, or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final Inspection.

52.211-10 -- Commencement, Prosecution, and Completion of Work.

As prescribed in 11.404(b), insert the following clause in solicitations and contracts when a fixed-price construction contract is contemplated. The clause may be changed to accommodate the issuance of orders under indefinite-delivery contracts for construction.

Commencement, Prosecution, and Completion of Work (Apr 1984)

The Contractor shall be required to:

(a) commence work under this contract within _____ *// Contracting Officer insert number//* calendar days after the date the Contractor receives the notice to proceed,
(b) prosecute the work diligently, and
(c) complete the entire work ready for use not later than _____.* The time stated for completion shall include final cleanup of the premises.

(End of Clause)

* The Contracting Officer shall specify either a number of days after the date the contractor receives the notice to proceed, or a calendar date.

Alternate I (Apr 1984). If the completion date is expressed as a specific calendar date, computed on the basis of the contractor receiving the notice to proceed by a certain day, add the following paragraph to the basic clause:

The completion date is based on the assumption that the successful offeror will receive the notice to proceed by_____ *// Contracting Officer insert date //.* The completion date will be extended by the number of calendar days after the above date that the Contractor receives the notice to proceed, except to the extent that the delay in issuance of the notice to proceed results from the failure of the Contractor to execute the contract and give the required performance and payment bonds within the time specified in the offer.

B. Pre-Final Inspection: The Government will perform the Pre-Final Inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final Acceptance Inspection with the customer can be scheduled. Correct any items noted on the Pre-Final Inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate construction completion dates.

C. Final Acceptance Inspection: The Contractor's QC Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Authorized designee is required to be in attendance at the Final Acceptance Inspection. Additional Government personnel can also be in attendance. The Final Acceptance Inspection will be formally scheduled by the Contracting Officer's or Authorized designee based upon results of the Pre-Final Inspection. Notify the Contracting Officer through the Resident Engineer office at least 14 days prior to the Final Acceptance Inspection and include the Contractor's assurance that all specific items previously identified ot the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date schedule for the Final Acceptance Inspection. Failure of the Contractor to have all contract work acceptably complete for this

inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with FAR Clause 52.246-12 titled "Inspection of Construction".

3.9 DOCUMENTATION

A. Quality Control Activities: Maintain current records providing factual evidence that required QC activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:
   1. The name and area of responsibility of the Contractor/Subcontractor
   2. Operating plant/equipment with hours worked, idle, or down for repair.
   3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
   4. Test and control activities performed with results and references to specification/drawing requirements. Identify the Control Phase (Preparatory, Initial, and/or Follow-Up). List deficiencies noted, along with corrective action.
   5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specification/drawing requirements.
   6. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
   7. Offsite surveillance activities, including actions taken.
   8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
   9. Instructions given/received and conflicts in plans and specifications.
   10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identification of the Independent Technical Reviewer (ITR) team, the ITR review comments, responses, and the record of resolution of the comments.

B. Verification Statement: Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract.

Furnish the original and one copy of these records in report form to the Government daily with 1 week after the date covered by the report, except that reports need not be submitted for day son which no work is performed. As a minimum, prepare and submit on report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate QC personnel within the CQC System Manager Report.

3.10 **NOTIFICATION OF NONCOMPLIANCE:** The Contracting Officer or Authorized designee will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor should take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

--- End of Section ---

SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 APPLICABLE PUBLICATIONS:

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

B. American Association of State Highway and Transportation Officials (AASHTO):

T27-11 .....Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

T96-02 (R2006) .....Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

T99-10 .....Standard Method of Test for 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 Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

T180-10 .....Standard Method of 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 Method of Test for Density of Soil In-Place by the Sand-Cone Method

T310-13 .....Standard Method of Test for In-place Density and Moisture Content of Soil and Soil-aggregate by Nuclear Methods (Shallow Depth)

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 Methods 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

C136-06 .....Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

C138/C138M-10b .....Standard Test Method for Density (Unit Weight), 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

D422-63(2007) .....Standard Test Method for Particle-Size Analysis of Soils

D698-07e1 .....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

D1140-00(2006) .....Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve

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

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 Paving Materials

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

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

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.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."

B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or

work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

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

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.

2. Provide part time observation of fill placement and compaction and field density testing in building areas and provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.

3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance ASTM D698 and/or ASTM D1557.

2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556, or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.
   a. Building Slab Subgrade: At least one test of subgrade for every 185 m^2 (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 185 m^2 (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
   b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
   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 Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

C. Fill and Backfill Material Gradation: One test per 10 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C136.

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

E. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

3.2 LANDSCAPING:

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

B. Submit laboratory test report of topsoil to Resident Engineer.

3.3 SITE WORK CONCRETE:

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

3.5 CONCRETE:

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

B. Field Inspection and Materials Testing:
   1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
   2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the

Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.

3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m^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. Label each cylinder with an identification number. Resident Engineer may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m^3 (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m^3 (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
    a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.

b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.

11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
15. Observe preparations for placement of concrete:
    a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
    b. Inspect preparation of construction, expansion, and isolation joints.
16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
17. Observe concrete mixing:
    a. Monitor and record amount of water added at project site.
    b. Observe minimum and maximum mixing times.
18. Measure concrete flatwork for levelness and flatness as follows:
    a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
    b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
    c. Provide the Contractor and the Resident Engineer with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.
19. Other inspections:
    a. Grouting under base plates.

b. Grouting anchor bolts and reinforcing steel in hardened concrete.

C. Laboratory Tests of Field Samples:

1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Resident Engineer. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Resident Engineer. In test report, indicate the following information:
   a. Cylinder identification number and date cast.
   b. Specific location at which test samples were taken.
   c. Type of concrete, slump, and percent air.
   d. Compressive strength of concrete in MPa (psi).
   e. Weight of lightweight structural concrete in kg/m^3 (pounds per cubic feet).
   f. Weather conditions during placing.
   g. Temperature of concrete in each test cylinder when test cylinder was molded.
   h. Maximum and minimum ambient temperature during placing.
   i. Ambient temperature when concrete sample in test cylinder was taken.
   j. Date delivered to laboratory and date tested.

3.6 REINFORCEMENT:

A. Review mill test reports furnished by Contractor.

B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.

C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.

D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

3.9 ARCHITECTURAL PRECAST CONCRETE:

A. Inspection at Plant: Forms, placement of reinforcing steel, concrete cover, and placement and finishing of concrete.

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

C. Inspect members to insure specification requirements for curing and finishes have been met.

3.10 MASONRY:

A. Mortar Tests:

1. Laboratory compressive strength test:
   a. Comply with ASTM C780.
   b. Obtain samples during or immediately after discharge from batch mixer.
   c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
   d. Test one sample at 7 days and 2 samples at 28 days.
2. Two tests during first week of operation; one test per week after initial test until masonry completion.

B. Grout Tests:

1. Laboratory compressive strength test:
   a. Comply with ASTM C1019.
   b. Test one sample at 7 days and 2 samples at 28 days.
   c. Perform test for each 230 m^2 (2500 square feet) of masonry.

C. Masonry Unit Tests:

1. Laboratory Compressive Strength Test:
   a. Comply with ASTM C140.
   b. Test 3 samples for each 460 m^2 (5000 square feet) of wall area.

D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m^2 (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.11 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.
i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
2. Bolt Inspection:
a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.

D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

3.12 STEEL DECKING:

A. Provide field inspection of welds of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."

C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.15 TYPE OF TEST:

Approximate Number of Tests Required

A. Earthwork:

Laboratory Compaction Test, Soils (ASTM D698):

__2___

Field Density, Soils (AASHTO T191, T205, or T310)

__2___

Penetration Test, Soils

__2___

B. Landscaping:

Topsoil Test

__1___

C. Aggregate Base:

Laboratory Compaction, (ASTM D1557)

__2___

Field Density, (ASTM D1556)

__2___

Aggregate, Base Course Gradation (AASHTO T27)

__2___

Wear (AASHTO T96)

__2___

Soundness (AASHTO T104)

__2___

D. Concrete:

Making and Curing Concrete Test Cylinders (ASTM C31)

__2___

Compressive Strength, Test Cylinders (ASTM C39)

__2___

Concrete Slump Test (ASTM C143)

__2___

Concrete Air Content Test (ASTM C173)

__2___

Unit Weight, Lightweight Concrete (ASTM C567)

__2___

Aggregate, Normal Weight: Gradation (ASTM C33)

__2___

Deleterious Substances (ASTM C33)

__2___

Soundness (ASTM C33)

__2___

Abrasion (ASTM C33)

__2___

Aggregate, Lightweight Gradation (ASTM C330)

__2___

Deleterious Substances (ASTM C330)

__2___

Unit Weight (ASTM C330)

__2___

Flatness and Levelness Readings (ASTM E1155) (number of days)

__2___

E. Reinforcing Steel:

Tensile Test (ASTM A370)

__1___

Bend Test (ASTM A370)

__1___

Mechanical Splice (ASTM A370)

__1___

G. Masonry:

Making and Curing Test Cubes (ASTM C109)

__1___

Compressive Strength, Test Cubes (ASTM C109)

__1___

Sampling and Testing Mortar, Comp. Strength (ASTM C780)

__1___

Sampling and Testing Grout, Comp. Strength (ASTM C1019)

__1___

Masonry Unit, Compressive Strength (ASTM C140)

11

Prism Tests (ASTM C1314)

1

H. Structural Steel:

Ultrasonic Testing of Welds (ASTM E164)

0

Magnetic Particle Testing of Welds (ASTM E709)

0

Radiographic Testing of Welds (ASTM E94)

0

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

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

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

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

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

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

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

1.2 RELATED WORK

A. Section 02 41 00, DEMOLITION.

B. Section 01 00 00, GENERAL REQUIREMENTS.

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

1.3 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
   1. Excess or unusable construction materials.
   2. Packaging used for construction products.
   3. Poor planning and/or layout.
   4. Construction error.
   5. Over ordering.
   6. Weather damage.
   7. Contamination.
   8. Mishandling.
   9. Breakage.

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

C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.

D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.

E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website http://www.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 Resident Engineer a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
   1. Procedures to be used for debris management.
   2. Techniques to be used to minimize waste generation.
   3. Analysis of the estimated job site waste to be generated:

a. List of each material and quantity to be salvaged, reused, recycled.
b. List of each material and quantity proposed to be taken to a landfill.

4. Detailed description of the Means/Methods to be used for material handling.
   a. On site: Material separation, storage, protection where applicable.
   b. Off site: Transportation means and destination. Include list of materials.
      1) Description of materials to be site-separated and self-hauled to designated facilities.
      2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
   c. The names and locations of mixed debris reuse and recycling facilities or sites.
   d. The names and locations of trash disposal landfill facilities or sites.
   e. Documentation that the facilities or sites are approved to receive the materials.

C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.

D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

A Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration.

PART 2 - PRODUCTS

2.1 MATERIALS

A. List of each material and quantity to be salvaged, recycled, reused.

B. List of each material and quantity proposed to be taken to a landfill.

C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.

B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.

C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.

B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.

B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.

C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

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SECTION 02 21 13
SITE SURVEYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Researching and collecting documents informing surveys.
   2. Performing boundary survey, topographic survey, and utility survey.
   3. Creating survey drawings.

1.2 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American Land Title Association and American Congress on Surveying and Mapping (ALTA-ACSM):
   1. Accuracy Standards for ALTA-ACSM Land Title Surveys.
C. Federal Geographic Data Committee (FGDC):
   1. STD-007.03-98 - Geospatial Positioning Accuracy Standards Part 3: National Standard for Spatial Data Accuracy.
   2. STD-007.04-02 - Geospatial Positioning Accuracy Standards Part 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management.

1.3 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Survey Drawings:
   1. Prints: Two sets of black line, full size prints of each drawing.
   2. Electronic Files: Consistent with computer-aided design (CAD) Standards described at www.cfm.va.gov/til/projReq.asp.

1.4 QUALITY ASSURANCE

A. Land Surveyor: One of the following:
   1. Experienced professional land surveyor licensed in state in which project is located.
   2. Experienced professional civil engineer licensed in state in which project is located and authorized to practice land surveying as civil engineer.

1.5 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. Monuments: Iron pin, with driven 16 mm (5/8 inch) diameter, minimum 600 mm (24 inches) long to prevent displacement.

B. Stakes: Hardwood.

C. Flagging: Plastic, roll form, highly visible, solid color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Research public and VA facility records for deeds, maps, monuments, plats, surveys, title certificates or abstracts, rights-of-way, easements, section line, other boundary line locations, and other documents pertaining to project site.

B. Research public and VA facility utility records for aerial, surface, and subgrade structures and utility service lines and easements.

3.2 PREPARATION

A. Coordinate with Contracting Officer's Representative for site access.

B. Coordinate with adjacent property owners when access to adjoining properties is required.

1. Notify Contracting Officer's Representative when access is denied.

3.3 SURVEYS

A. Perform survey on ground according to FGDC STD-007.3 and FGDC STD-007.4.

B. Boundary Survey:

1. Locate permanent monuments within and along survey boundary.
2. Set permanent monument at property corners when monument is not found.
3. Temporarily mark monument locations with stake and flagging.
4. Reconcile differences between legal description and survey.

C. Topographic Survey:

1. Vertical Control: National Geodetic Survey or existing VA Medical Center benchmark.
2. Establish minimum three permanent benchmarks within survey boundary.
3. Determine project site contours at maximum 300 mm (1 foot) interval.
4. Determine spot elevations at specified locations.

D. Utility Survey:

1. Locate piped utilities and utility structures. Identify service type, sizes, depths, and pressures.
2. Locate fire hydrants.
3. Locate wired utilities and utility structures. Identify service type, rated capacities, and elevations above and below grade.
4. Identify each utility authority including contact person and phone number.

E. Locate permanent structures within survey boundary by perpendicular dimension to property lines.
1. Determine structure plan dimensions, heights, and vertical offsets.
2. Determine projections and overhangs beyond structure perimeter at grade.
3. Determine number of stories and primary building materials.

F. Locate rights-of-way and easements within and adjacent to survey boundary by perpendicular dimension to property line.
1. Locate project site access from rights-of-way by dimension from survey monument. Determine site access width.

3.4 SURVEY DRAWING REQUIREMENTS

A. Consult Contracting Officer's Representative to confirm required survey scale and drawing size.
1. Drawing Size: Maximum 760 by 1070 mm (30 by 42 inches).
2. Boundary Survey Scale: Maximum 1 to 35 (1 inch equals 30 feet).
3. Enlarged Detail Areas: Scale as required to present dimensional data and survey information clearly. Maintain orientation aligned with smaller scale view.
4. Plan Orientation: North at top of drawing sheet.

B. Drawing Notations:
1. Land Surveyor: Name, address, telephone number, signature, seal, and registration number.
2. Survey Dates: Date survey was initially completed and subsequent revision dates.
3. Certification: Certify each drawing adjacent to land surveyor's seal:
a. "I hereby certify that all information indicated on this drawing was obtained or verified by actual measurements in the field and that every effort has been made to provide complete and accurate information."
b. Title, number, and total number of drawings on each drawing.

c. Scale in metric and imperial measurement.
d. Graphic scale in metric and imperial measurement.
e. Graphic symbol and abbreviation legends.
f. North arrow for plan view drawings.
g. Benchmark locations.
h. Horizontal and vertical control datum.
i. Adjacent property owner names.
j. Zoning classifications.
k. Building street numbers.

4. Evidence of Possession: Indicate character and location of evidence of possession affecting project site. Notation absence signifies no observable evidence of possession.

C. Vicinity Map: Indicate project site and nearby roadways and intersections.

D. Record Documents Forming Survey Basis: Indicate titles, source, and recording data of documents relied upon to complete survey.

E. Legal Description: Recorded title boundaries.

F. Land Area: Report in hectares (acres) as defined by the boundaries of the legal description of the surveyed premises, including legal description of the land.

1. Accuracy: 0.005 hectares (0.001 acres) .

G. Boundary Lines: Show point of beginning, length and bearing for straight lines, and angle, radius, point of curvature, point of tangency, and length of curved lines.

1. Include bearing basis and data necessary to mathematically close survey.
2. When recorded and measured bearings, angles, and distances differ, indicate both recorded and measured data.
a. Indicate when recorded description does not mathematically close survey.
3. Indicate found and installed monuments establishing basis of survey.
4. Contiguity, Gores, and Overlaps: Identify discrepancies within and along survey boundary.

H. Lots and Parcels: Indicate entire lots and parcels included within and intersected by survey boundary.

I. Roadways: Indicate names and widths of rights-of-way and roadways within and abutting survey boundary.

1. Indicate changes in rights-of-way lines either completed or proposed.
2. Indicate accesses to roadways.
3. Indicate abandoned roadways.
4. Indicated unopened dedicated roadways.

J. Setbacks: Indicate recorded setback and building restriction lines.

K. Structures and Site Improvements: Indicate buildings, walls, fences, signs, and other visible improvements.

1. Indicate each building dimensioned to property lines and other structures.
2. Indicate exterior dimensions of buildings at ground level. Show area of building footprint and gross floor area of entire building.
3. Indicate maximum measured height of buildings above grade, point of measurement, and number of stories.
4. Indicate spot elevations at building entrances, first floor, service docks, corners, steps, ramps, and grade slabs.
5. Indicate structures and site improvements within 1500 mm (5 feet) of survey boundary.
6. Indicate encroachments on project site, adjoining property, easements, rights-of-way, and setback lines from fire escapes, bay windows, windows and doors opening out, flue pipes, stoops, eaves, cornices, areaways, stoops, other building projections, and site improvements.
7. Identify setback, height, and floor space area restrictions set by applicable zoning and building codes and recorded subdivision maps. Indicate if no restrictions exist.

L. Easements:

1. Indicate easements evidenced by recorded documents.
   a. Indicate when easements cannot be located.
2. Indicate observable easements created by roadways, rights-of-ways, water courses, drains, telephone, telegraph, electric and other wiring, water, sewer, oil, gas, and other pipelines within project site and on adjoining properties when potentially affecting project site.
3. Indicate observable surface improvements of underground easements.

M. Pavements:

1. Indicate location, alignment, and dimensions for vehicular and pedestrian pavements.

2. Indicate pavement encroachments from adjacent properties onto project site and onto adjacent properties from project site.
   a. Dimension encroachments from survey boundary.
3. Indicate roadway centerlines with true bearings and lengths by 15 m (50 feet) stationing.
   a. Describe curves by designating points of curvature and tangency. Include curve data and location of radius and vertex points.
   b. Indicate elevations at station points along roadway centerlines, roadway edges, and top and bottom of curbs.
4. Indicate parking areas, parking striping, and total parking spaces.
   a. Identify accessible parking spaces.
5. Indicate curb cuts, driveways, and other accesses to public ways.

N. Indicate cemetery and burial ground boundaries.

O. Waterways:
1. Indicate boundaries of ponds, lakes, springs, and rivers bordering on or running through project site. Note date of measurement and that boundary is subject to change due to natural causes.
2. Indicate flood plain location and elevation.
3. Indicate watershed extent affecting project site.

P. Indicate topographic contours.

Q. Flood Zone: Indicate applicable flood zone from Federal Flood Insurance Rate Maps, by scaled map location and graphic plotting.

R. Public and Private Utilities:
1. Indicate information source and operating authority for each utility.
2. Indicate utilities existing on or serving project site.
3. Indicate fire hydrants on project site and within 150 m (500 feet) of survey boundary.
4. Indicate manholes, catch basins, inlets, vaults, and other surface indications of subgrade services.
5. Indicate depths or invert elevations, sizes, materials, and pressures of utility pipes.
6. Indicate wires and cables serving, crossing, and adjacent to project site.
7. Indicate exterior lighting, traffic control facilities, security, and communications systems.
8. Indicate utility poles on project site and within 3 m (10 feet) of survey boundary.

9. Indicate dimensions of cross-wires or overhangs affecting project site.

S. Observable Evidence:
   1. Indicate in-progress and recently completed earth moving work, building construction, and building additions.
   2. Indicate in-progress and recently completed pavement construction and repairs.
   3. Indicate areas used as solid waste dump, sump, and sanitary landfill.

T. Trees:
   1. Indicate individual trees with minimum 150 mm (6 inches) diameter measured at 400 mm (48 inches) above grade.
   2. Indicate wooded area perimeter outline and description of predominant vegetation.

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SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

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: Section 01 35 26 Safety Requirements Article, ACCIDENT PREVENTION PLAN (APP).

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

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

E. Asbestos Removal: Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.

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

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

H. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.

I. Infectious Control: Section 01 35 26, SAFETY REQUIREMENTS, Article 1.12, INFECTION CONTROL.

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.
3. 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.
4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.

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

Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.

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

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

1.4 UTILITY SERVICES:

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 DEMOLITION:

A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:

1. As required for installation of new utility service lines.
2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.

B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center Property to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.

D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump

sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

E. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

3.2 CLEAN-UP:

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

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies cast-in-place structural concrete and materials and mixes for other concrete.

1.2 RELATED WORK:

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN:

A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by Resident Engineer. For all other testing, refer to Section 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. Shop Drawings: Reinforcing steel: Complete shop drawings

C. Mill Test Reports:

1. Reinforcing Steel.
2. Cement.

D. Manufacturer's Certificates:

1. Abrasive aggregate.
2. Lightweight aggregate for structural concrete.
3. Air-entraining admixture.
4. Chemical admixtures, including chloride ion content.
5. Waterproof paper for curing concrete.
6. Liquid membrane-forming compounds for curing concrete.
7. Non-shrinking grout.
8. Liquid hardener.
9. Expansion joint filler.
10. Adhesive binder.

E. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology and copy of report of latest CCRL, Inspection of Laboratory.

F. Test Report for Concrete Mix Designs: Trial mixes including water-cement fly ash ratio curves, concrete mix ingredients, and admixtures.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.

B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement and fly ash in separate suitable bins.

C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

1.8 PRE-CONCRETE CONFERENCE:

A. General: At least 15 days prior to submittal of design mixes, conduct a meeting to review proposed methods of concrete construction to achieve the required results.

B. Agenda: Includes but is not limited to:

1. Submittals.
2. Coordination of work.
3. Availability of material.
4. Concrete mix design including admixtures.
5. Methods of placing, finishing, and curing.
6. Finish criteria required to obtain required flatness and levelness.
7. Timing of floor finish measurements.
8. Material inspection and testing.

C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing, and curing concrete; lightweight aggregate manufacturer; admixture manufacturers; Resident Engineer; Consulting Engineer; Department of Veterans Affairs retained testing laboratories for concrete testing and finish (F-number) verification.

D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

1.10 APPLICABLE PUBLICATIONS:

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

B. American Concrete Institute (ACI):

117-10 .....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 Structural 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 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

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

C494/C494M-11 .....Standard Specification for Chemical Admixtures for 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)

D4263-83(2012) .....Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

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

F1869-11 .....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. American Welding Society (AWS):

D1.4/D1.4M-11 .....Structural Welding Code - Reinforcing Steel

F. Concrete Reinforcing Steel Institute (CRSI):

Handbook 2008

H. U. S. Department of Commerce Product Standard (PS):

PS 1 .....Construction and Industrial Plywood

PS 20 .....American Softwood Lumber

PART 2 – PRODUCTS:

2.1 FORMS:

A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.

B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form. 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. Permanent Steel Form for Concrete Slabs: Corrugated, ASTM A653, Grade E, and Galvanized, ASTM A653, G90. Provide venting where insulating concrete fill is used.

E. Corrugated Fiberboard Void Boxes: Double faced, completely impregnated with paraffin and laminated with moisture resistant adhesive, size as shown. Design forms to support not less than 48 KPa (1000 psf) and not lose more than 15 percent of their original strength after being completely submerged in water for 24 hours and then air dried.

F. 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.

G. Concrete products shall comply with following standards for biobased materials:

Material Type	Percent by Weight
Concrete Penetrating Liquid	79 percent biobased material
Concrete form Release Agent	87 percent biobased material
Concrete Sealer	11 percent biobased material

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

H. 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, II, or I/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.

E. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 µm (No. 100) sieve.

F. Mixing Water: Fresh, clean, and potable.

G. Admixtures:

1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
5. Air Entraining Admixture: ASTM C260.
8. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
9. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.

H. Vapor Barrier: ASTM D4397, //0.25 mm (10 mil)//0.38 mm (15 mil).

I. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.

J. Welded Wire Fabric: ASTM A185.

M. Epoxy Coated Reinforcing Bars: ASTM A775.

N. Cold Drawn Steel Wire: ASTM A82.

Q. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.

R. Expansion Joint Filler: ASTM D1751.

S. Sheet Materials for Curing Concrete: ASTM C171.

T. 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.

W. Moisture Vapor Emissions & Alkalinity Control Sealer: 100% active colorless aqueous siliconate solution concrete surface.

1. ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34% solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all finish materials.
2. MVE 15-Year Warranty:
   a. When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminates for a period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminates.

Y. 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.

Z. Adhesive Binder: ASTM C881.

BB. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

CC. Fibers:

1. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m^3 (1.5 lb. per cubic yard). Product shall have a UL rating.

DD. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.

EE. 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 ASTM 618 initially with mix design and for each truck load of fly ash delivered from source. Submit test results performed within 6 months of submittal

date. Notify Resident Engineer immediately when change in source is anticipated.

1. 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.

C. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of Resident Engineer or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. Resident Engineer may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and approval of design mix.

D. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Use Fly Ash as an admixture with 20% replacement by weight in all structural work.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength		Non-Air-Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m^3 (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m^3 (lbs/c. yd)	Max. Water Cement Ratio
35 (5000)[1,3]	375 (630)	0.45	385 (650)	0.40
30 (4000)[1,3]	325 (550)	0.55	340 (570)	0.50
25 (3000)[1,3]	280 (470)	0.65	290 (490)	0.55
25 (3000)[1,2]	300 (500)	*	310 (520)	*

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.
3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
4. Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.

E. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

TABLE II - MAXIMUM SLUMP, MM (INCHES)*

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

F. Slump may be increased by the use of the approved high-range water-reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 225 mm (9 inches). The concrete shall arrive at the job site at a slump of 50 mm to 75 mm (2 inches to 3 inches), and 75 mm to 100 mm (3 inches to 4 inches) for lightweight

concrete. This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.

G. Air-Entrainment: Air-entrainment of normal weight concrete shall conform with Table III. 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	

H. 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.

J. 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).

K. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. For air content requirements see Table III or Table IV.

L. Enforcing Strength Requirements: Test as specified in Section 01 45 29, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, Resident Engineer may require any one or any combination of the following corrective actions, at no additional cost to the Government:

1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
2. Require additional curing and protection.
3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, Resident Engineer may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, Resident Engineer may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the Resident Engineer.

2.4 BATCHING AND MIXING:

A. General: Concrete shall be "Ready-Mixed" and comply with ACI 318 and ASTM C94, except as specified. Batch mixing at the site is permitted. Mixing process and equipment must be approved by Resident Engineer. With each batch of concrete, furnish certified delivery tickets listing information in Paragraph 16.1 and 16.2 of ASTM C94. Maximum delivery temperature of concrete is 38^0C (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 Resident Engineer for consultation during batching, mixing, and placing operations of lightweight structural concrete. Services will be required until field controls indicate that concrete of required

quality is being furnished. Representative shall be thoroughly familiar with the structural lightweight aggregate, adjustment and control of mixes to produce concrete of required quality. Representative shall assist and advise Resident Engineer.

PART 3 – EXECUTION

3.1 FORMWORK:

A. General:

1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and Resident Engineer approves their reuse.
2. Provide forms for concrete footings unless Resident Engineer determines forms are not necessary.
3. Corrugated fiberboard forms: Place forms on a smooth firm bed, set tight, with no buckled cartons to prevent horizontal displacement, and in a dry condition when concrete is placed.

B. Treating and Wetting: Treat or wet contact forms as follows:

1. Coat plywood and board forms with non-staining form sealer. In hot weather, cool forms by wetting with cool water just before concrete is placed.
2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
3. Use sealer on reused plywood forms as specified for new material.

C. Size and Spacing of Studs: Size and space studs, wales and other framing members for wall forms so as not to exceed safe working stress of kind of lumber used nor to develop deflection greater than 1/270 of free span of member.

D. Unlined Forms: Use plywood forms to obtain a smooth finish for concrete surfaces. Tightly butt edges of sheets to prevent leakage. Back up all vertical joints solidly and nail edges of adjacent sheets to same stud with 6d box nails spaced not over 150 mm (6 inches) apart.

E. Lined Forms: May be used in lieu of unlined plywood forms. Back up form lining solidly with square edge board lumber securely nailed to studs with all edges in close contact to prevent bulging of lining. No joints in lining and backing may coincide. Nail abutted edges of sheets to same backing board. Nail lining at not over 200 mm (8 inches) on center along edges and with at least one nail to each square foot of surface

area; nails to be 3d blued shingle or similar nails with thin flatheads.

G. Wall Form Ties: Locate wall form ties in symmetrically level horizontal rows at each line of wales and in plumb vertical tiers. Space ties to maintain true, plumb surfaces. Provide one row of ties within 150 mm (6 inches) above each construction joint. Space through-ties adjacent to horizontal and vertical construction joints not over 450 mm (18 inches) on center.

1. Tighten row of ties at bottom of form just before placing concrete and, if necessary, during placing of concrete to prevent seepage of concrete and to obtain a clean line. Ties to be entirely removed shall be loosened 24 hours after concrete is placed and shall be pulled from least important face when removed.
2. Coat surfaces of all metal that is to be removed with paraffin, cup grease or a suitable compound to facilitate removal.

H. Inserts, Sleeves, and Similar Items: Flashing reglets, steel strips, masonry ties, anchors, wood blocks, nailing strips, grounds, inserts, wire hangers, sleeves, drains, guard angles, forms for floor hinge boxes, inserts or bond blocks for elevator guide rails and supports, and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned, and built into construction, and maintained securely in place.

1. Locate inserts or hanger wires for furred and suspended ceilings only in bottom of concrete joists, or similar concrete member of overhead concrete joist construction.
2. Install sleeves, inserts and similar items for mechanical services in accordance with drawings prepared specially for mechanical services. Contractor is responsible for accuracy and completeness of drawings and shall coordinate requirements for mechanical services and equipment.
3. Do not install sleeves in beams, joists or columns except where shown or permitted by Resident Engineer. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the Resident Engineer, and require no structural changes, at no additional cost to the Government.

4. Minimum clear distance of embedded items such as conduit and pipe is at least three times diameter of conduit or pipe, except at stub-ups and other similar locations.
5. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

I. Construction Tolerances:

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

3.2 PLACING REINFORCEMENT:

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

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

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

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.

3. Mechanical Splices: Develop in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.

a. Initial qualification: In the presence of Resident Engineer, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing laboratory will perform load test.

b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.

E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by Resident Engineer.

F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.

G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

3.3 VAPOR BARRIER:

A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier.

1. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
2. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.
3. Patch punctures and tears.

3.4 SLABS RECEIVING RESILIENT COVERING

A. Slab shall be allowed to cure for 6 weeks minimum prior to placing resilient covering. After curing, slab shall be tested by the Contractor for moisture in accordance with ASTM D4263 or ASTM F1869. Moisture content shall be less than 3 pounds per 1000 sf prior to placing covering.

B. In lieu of curing for 6 weeks, Contractor has the option, at his own cost, to utilize the Moisture Vapor Emissions & Alkalinity Control Sealer as follows:

1. 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, epoxy coatings and overlays.

3.5 CONSTRUCTION JOINTS:

A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 24,000 mm (80 feet) in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by Resident Engineer.

3.6 EXPANSION JOINTS AND CONTRACTION JOINTS:

A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.

B. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal.

C. Provide contraction (control) joints in floor slabs as indicated on the contract drawings. Joints shall be either formed or saw cut, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.7 PLACING CONCRETE:

A. Preparation:

1. Remove hardened concrete, wood chips, shavings and other debris from forms.
2. Remove hardened concrete and foreign materials from interior surfaces of mixing and conveying equipment.
3. Have forms and reinforcement inspected and approved by Resident Engineer before depositing concrete.
4. Provide runways for wheeling equipment to convey concrete to point of deposit. Keep equipment on runways which are not supported by or bear on reinforcement. Provide similar runways for protection of vapor barrier on coarse fill.

B. Bonding: Before depositing new concrete on or against concrete which has been set, thoroughly roughen and clean existing surfaces of laitance, foreign matter, and loose particles.

1. Preparing surface for applied topping:
   a. Remove laitance, mortar, oil, grease, paint, or other foreign material by sand blasting. Clean with vacuum type equipment to remove sand and other loose material.
   b. Broom clean and keep base slab wet for at least four hours before topping is applied.
   c. Use a thin coat of one part Portland cement, 1.5 parts fine sand, bonding admixture; and water at a 50: 50 ratio and mix to achieve the consistency of thick paint. Apply to a damp base slab by scrubbing with a stiff fiber brush. New concrete shall be placed while the bonding grout is still tacky.

C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete is subject to approval of Resident Engineer.

D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.

1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.

3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after its initial set has taken place, or after 45 minutes of elapsed time during concrete placement.

E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch) intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.

1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.8 HOT WEATHER:

Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Resident Engineer.

3.9 COLD WEATHER:

Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, 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 Resident Engineer.

3.10 PROTECTION AND CURING:

A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing, except wet curing period for high-early-strength concrete shall be not less than 3 days. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by Resident Engineer.

1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer's instructions. Apply immediately after finishing. Maximum coverage $10m^2/L$ (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.

3.12 CONCRETE SURFACE PREPARATION:

A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.

B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of

same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 25 mm (1 inch). Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 150 mm (6 inches) surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar. Cement grout composed of one part Portland cement, 1.5 parts fine sand, bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.

C. Upon removal of forms, clean vertical concrete surface that is to receive bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

3.13 CONCRETE FINISHES:

A. Vertical and Overhead Surface Finishes:

1. Unfinished areas: Vertical and overhead concrete surfaces exposed in pipe basements, elevator and dumbwaiter shafts, pipe spaces, pipe trenches, above suspended ceilings, manholes, and other unfinished areas will not require additional finishing.
2. Interior and exterior exposed areas to be painted: Remove fins, burrs and similar projections on surfaces flush, and smooth by mechanical means approved by Resident Engineer, and by rubbing lightly with a fine abrasive stone or hone. Use ample water during rubbing without working up a lather of mortar or changing texture of concrete.

3. Interior and exterior exposed areas finished: Give a grout finish of uniform color and smooth finish treated as follows:
   a. After concrete has hardened and laitance, fins and burrs removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone stone.
   b. Apply grout composed of one part of Portland cement, one part fine sand, smaller than a 600 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 Resident Engineer and floor consultant for evaluation and recommendations for subsequent placements.
2. Set perimeter forms to serve as screed using either optical or laser instruments. For slabs on grade, wet screeds may be used to establish initial grade during strike-off, unless Resident Engineer determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed, they shall be placed using grade stakes set by optical or laser instruments. Use rigid screed guides, as opposed to

wet screeds, to control strike-off elevation for all types of elevated (non slab-on-grade) slabs. Divide bays into halves or thirds by hard screeds.

3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.
4. Use straightedges specifically made for screeding, such as hollow magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.
5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.
6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. Scratch Finish: Finish base slab to receive a bonded applied cementitious application as indicated above, except that bull floats and darbys may be used. Thoroughly coarse wire broom within two hours after placing to roughen slab surface to insure a permanent bond between base slab and applied materials.
8. Float Finish: Slabs to receive unbonded toppings, steel trowel finish, fill, mortar setting beds, or a built-up roof, and ramps, stair treads, platforms (interior and exterior), and equipment pads shall be floated to a smooth, dense uniform, sandy textured finish. During floating, while surface is still soft, check surface for flatness using a 3000 mm (10 foot) highway straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.

9. Steel Trowel Finish: Concrete surfaces to receive resilient floor covering or carpet, monolithic floor slabs to be exposed to view in finished work, future floor roof slabs, applied toppings, and other interior surfaces for which no other finish is indicated. Steel trowel immediately following floating. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure to compact cement paste and form a dense, smooth surface. Finished surface shall be smooth, free of trowel marks, and uniform in texture and appearance.
10. Broom Finish: Finish exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated. Brush in a direction transverse to main traffic. Match texture approved by Resident Engineer from sample panel.
11. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:
    a. Areas covered with carpeting, or not specified otherwise in b. below:
        1) Slab on Grade:
            a) Specified overall value F_F 25/F_L 20
            b) Minimum local value F_F 17/F_L 15
        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
        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.
    c. "Specified overall value" is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.
    d. "Minimum local value" (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on the results of an individual placement and applies to a minimum local area. Minimum local area boundaries may not cross a

construction joint or expansion joint. A minimum local area will be bounded by construction and/or control joints, or by column lines and/or half-column lines, whichever is smaller.

12. Measurements
    a. Department of Veterans Affairs retained testing laboratory will take measurements as directed by Resident Engineer, to verify compliance with FF, FL, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.
    b. Contractor not experienced in using FF and FL criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.
13. Acceptance/ Rejection:
    a. If individual slab section measures less than either of specified minimum local F_F/F_L numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.
    b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall F_F/F_L numbers, then whole slab shall be rejected and remedial measures shall be required.
14. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire rejected slab areas, as directed by Resident Engineer, until a slab finish constructed within specified tolerances is accepted.

3.14 SURFACE TREATMENTS:

A. Use on exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.

B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.

C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Broadcast aggregate uniformly over concrete surface at rate of application of 8% per 1/10th m^2 (7.5 percent per square foot) of area. Trowel concrete surface to smooth dense finish. After curing, rub treated surface with abrasive brick and water to slightly expose abrasive aggregate.

3.16 RESURFACING FLOORS:

Remove existing flooring areas to receive resurfacing to expose existing structural slab and extend not less than 25 mm (1 inch) below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, and dampening. Apply specified bonding grout. Place topping while the bonding grout is still tacky.

3.17 RETAINING WALLS:

A. Use air-entrained concrete.

B. Expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves installed and constructed as shown.

C. Exposed surfaces finished to match adjacent concrete surfaces, new or existing.

D. Place porous backfill as shown.

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SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
B. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
C. Mortar: Section 04 05 13, MASONRY MORTARING.
D. Masonry Facing: Section 04 20 00, UNIT MASONRY.
E. Insulation for Insulated Panels: Section 07 21 13, THERMAL INSULATION.
F. Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
G. Repair of Abraded Galvanized and Painted Surfaces: Section 09 91 00, PAINTING.

1.3 QUALITY ASSURANCE:

A. Fabricator Qualifications: A firm that complies with PCI MNL 117 and the following requirements and is experienced in producing units similar to those indicated for this Project and with a record of successful in-service performance:
   1. Provide engineering units to comply with performance requirements. Furnish Comprehensive Engineering Analysis, performed by a qualified professional engineer who is legally qualified to practice in jurisdiction where Project is located, and who is experienced in providing engineering services of the kind indicated.
   2. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group A, Category A1- Architectural Cladding and Load Bearing Units. Submit PCI certification.
   3. Fabricator must have a minimum of three (3) years' experience in Precast Architectural Concrete work comparable to that shown and

specified in not less than three (3) projects of similar scope with the Government determining the suitability of experience.

B. Erector Qualifications:
   1. A precast concrete erector Qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the project site. Submit a current Certificate of Compliance furnished by PCI designating qualification in Category A (Architectural Systems) for non-load-bearing members for load-bearing members. Submit qualifications.
   2. An erector with a minimum of two (2) years of experience who has completed architectural precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance and who meets the following requirements:
      a. Retains a PCI Certified Field Auditor, at erector's expense, to conduct a field audit of a project in the same category as this Project prior to start of erection. Submit Erectors Post Audit Declaration.

C. Testing Laboratory Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority. Submit a copy of the Certificate of Accreditation and Scope of Accreditation.

D. 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.

E. Sample Panels: Before fabricating units, produce a minimum of two (2) sample panels approximately 1.5 sq. m. (16 sq. ft.) in size for review by Contracting Officer Representative (COR). Incorporate full scale details of architectural features, finishes, textures, and transitions in the sample panels. Approved sample panel will be used for mockup and range sample.
   1. Locate panels where indicated or, if not indicated, as directed by COR.
   2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
   3. After acceptance of repair technique by COR, maintain one (1) sample panel at the manufacturer's plant and one (1) at the project site in

an undisturbed condition as a standard for judging the completed work.

4. When back face of precast concrete unit is to be exposed, show samples of the workmanship, color, and texture of the backup concrete as well as the facing.
5. Demolish and remove sample panels only when directed by COR.

F. Range Samples: After sample panel approval and before production of units for installation, produce a minimum of three (3) samples, approximately 1.5 sq. m. (16 sq. ft.) in size, representing anticipated range of color and texture of project. Following range sample acceptance by the COR, maintain samples at the manufacturer's plant and the Project site as color and texture acceptability reference.

G. Mockups: After sample panel and range sample approval but before production of units, construct full sized mockups to verify selections and to demonstrate aesthetic effects and qualities of materials and execution. Mockup to be representative of the finished work in all respects including glass, aluminum framing, sealants and architectural precast concrete complete with all anchors, connections, flashings, and joint fillers as approved on the final shop drawings. Build mockups to comply with the following requirements, using materials indicated for the completed work:

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

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

1.4 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Provide units and connections capable of withstanding: the design criteria specified on the construction documents, self-weights and weights of materials supported or attached, for the conditions indicated.

1. Design Standards: Comply with ACI 318/ACI 318M and the design recommendations of PCI MNL 120 and PCI MNL 122 applicable to types of units indicated.
2. Limit deflection of precast members as follows:
   Vertical live load – Span / 360.
   Wind load – Height / 400.

B. Design concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live load deflection, shrinkage and creep of primary building structure, and other building movements.

C. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 degrees F.

D. Calculated Fire-Test-Response Characteristics: Where indicated, provide units whose fire resistance has been calculated according to PCI MNL 124.

1.5 SOURCE QUALITY CONTROL:

A. Quality-Control Testing: Test and inspect precast concrete according to Section 01 45 29, TESTING LABORATORY SERVICES and PCI MNL 117 requirements respectively. If using self-consolidating concrete also test and inspect according to PCI TR-6.

B. Testing: When determined by the COR that there is evidence that the concrete strength of precast concrete units may be deficient, employ an independent testing agency at Contractor's expense to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to PCI MNL 117:

1. Submit test results in writing on the same day that tests are performed, with copies to COR, Contractor, and precast concrete fabricator. Include the information required in Section 01 45 29, TESTING LABORATORY SERVICES and the following:
   a. Identification mark and type of precast concrete units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Defective or Damaged Work: Units that do not comply with acceptability requirements, including concrete strength, manufacturing tolerances, and color and texture range are unacceptable. Chipped, spalled or cored

units may be repaired, if repaired units match the visual mock-up. The COR will reject units that do not match the accepted samples and visual mock-up. Remove unacceptable units from the site and replace with precast concrete units that comply with requirements.

1.6 SUBMITTALS:

A. Product Data: For each type of product indicated.

C. Design Mixes: For each concrete mix along with compressive strength and water-absorption tests.

D. Shop (Erection) Drawings: Detail fabrication and installation of units.

1. Indicate member locations with distinctive marks that match marks placed on the panels. Provide plans, elevations, dimensions, corner details, shapes, cross sections and relationships to adjacent materials.
2. Indicate aesthetic characteristics including joints, reveals, and extent and location of each surface finish.
3. Indicate separate face and backup mix locations, and thicknesses. Indicate locations, extent and treatment of dry joints if two-stage casting is proposed.
4. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, and connections.
5. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
6. Indicate sequence of erection.
7. Indicate locations and details of facing materials, anchors, and joint widths.
8. Design Modifications:

   If design modifications are necessary to meet the performance requirements and field conditions, submit design calculations and drawings. Do not adversely affect the appearance, durability or strength of units when modifying details or materials and maintain the general design concept.

E. Comprehensive Engineering Analysis: Submit calculations signed and sealed by a qualified professional engineer responsible for the product design who is registered in the state where the work is located. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate design criteria and loads. Indicate the location, type, magnitude and direction of all imposed loadings from the precast system to the building structural frame.

F. Samples: Design reference samples for initial verification of design intent, approximately 305 by 305 by 50 mm (12 by 12 by 2 inches) , representative of finishes, color, and textures of exposed surfaces of units.

G. Samples for each facing unit required, showing the full range of color and texture expected. Supply sketch of each corner or special shape with dimensions. Supply sample showing color and texture of joint treatment.

H. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel.

I. Qualification Data for fabricator, erector, and professional engineer: List of completed projects with project names and addresses, names and addresses of COR and owners, and PCI Certification documentation.

J. Testing laboratory accreditations.

K. Material Test Reports: From an accredited testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

1. Concrete strengths and mix designs.

L. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Structural-steel shapes and hollow structural sections.
6. Insulation
7. Facing units.
8. Anchors.

M. Description of stone anchor shear and tensile test assembly.

N. Certificate of Compliance.

O. Erectors Post Audit Declaration.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Comply with product handling requirements of PCI MNL 117 at the plant and project site.

B. Deliver all units to the project site in such quantities and at such times to assure compliance with the agreed project schedule and proper setting sequence so as to limit unloading units temporarily on the ground.

C. Lift and support units only at designated points shown on the shop drawings.

D. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

E. Store units with adequate dunnage and bracing, and protect units to prevent contact with soil to prevent staining, and to prevent cracking, distortion, warping, and other physical damage. Place stored units so identification marks are clearly visible for inspection.

1.8 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

1.9 APPLICABLE PUBLICATIONS:

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

B. ASTM International (ASTM):

A27/A27M-13 .....Steel Castings, Carbon, for General Application
A36/A36M-14 .....Carbon Structural Steel
A47/A47M-99(R2014) .....Ferritic Malleable Iron Castings
A108-13 .....Steel Bar, Carbon and Alloy, Cold-Finished
A123/A123M-13 .....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153/A153M-09 .....Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A184/A184M-06e1(R2011) .Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
A240/A240M-14.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications
A276-13a .....Stainless Steel Bars and Shapes
A283/A283M-13 .....Low and Intermediate Tensile Strength Carbon Steel Plates
A307-14 .....Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
A325-14 .....Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

A325M-14 .....Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength (Metric)

A416/A416M-12a .....Steel strand, Uncoated Seven-Wire for Prestressed Concrete

A490-14a .....Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

A490M-14a .....Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength (Metric)

A500/A500M-13 .....Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A563-07(R2014) .....Carbon and Alloy Steel Nuts

A563M-07(R2013) .....Carbon and Alloy Steel Nuts (Metric)

A572/A572M-13a .....High-Strength Low-Alloy Columbium-Vanadium Structural Steel

A615/A615M-14 .....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

A666-10 .....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

A675/A675M-14 .....Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties

A706/A706M-14 .....Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

A767/A767M-09 .....Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

A775/A775M-07b(R2014) ..Epoxy-Coated Steel Reinforcing Bars

A780/A780M-09 .....Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

A884/A884M-14 .....Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement

A934/A934M-13 .....Epoxy-Coated Prefabricated Steel Reinforcing Bars

A1064/A1064M-14 .....Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

B633-13 .....Electrodeposited Coatings of Zinc on Iron and Steel

C33/C33M-13 .....Concrete Aggregates

C40/C40M-11 .....Organic Impurities in Fine Aggregate for Concrete

C144-11 .....Aggregate for Masonry Mortar
C150/C150M-12 .....Portland Cement
C260/C260M-10a .....Air-Entraining Admixtures for Concrete
C330/C330M-14 .....Lightweight Aggregates for Structural Concrete
C373-14a .....Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
C494/C494M-13 .....Chemical Admixtures for Concrete
C618-12a .....Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
C881/C881M-14 .....for Epoxy-Resin-Base Bonding Systems for Concrete
C920-14a .....Elastomeric Joint Sealants
C979/C979M-10 .....Pigments for Integrally Colored Concrete
C989/C989M-14 .....Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
C1017/C1017M-13 .....Chemical Admixtures for Use in Producing Flowing Concrete
C1107/C1107M-14 .....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
C1218/C1218M-99(R2008) .Test Method for Water-Soluble Chloride in Mortar and Concrete
C1240-14 .....Silica Fume Used in Cementitious Mixtures
C1354/C1354M-09 .....Test Method for Strength of Individual Stone Anchorages in Dimension Stone
D412-06a(R2013) .....Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
D2240-05(R2010) .....Test Method for Rubber Property—Durometer Hardness
D4397-10 .....Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
E165/E165M-12 .....Standard Practice for Liquid Penetrant Examination for General Industry
E488/E488M-10 .....Strength of Anchors in Concrete Elements
E709-14 .....Standard Guide for Magnetic Particle Testing
F436-11 .....Hardened Steel Washers
F436M-11 .....Hardened Steel Washers (Metric)

F593-13a .....Stainless Steel Bolts, Hex Cap Screws, and Studs

F844-07a(R2013) .....Washers, Steel, Plain (Flat), Unhardened for General Use

C. American Concrete Institute (ACI):

ACI 211.1-91(R2009) ....Selecting Proportions for Normal, Heavyweight and Mass Concrete (Reapproved 2002)

ACI 211.2-98(R2004) ....Selecting Proportions for Structural Lightweight Concrete

ACI 318/318M-14 .....Building Code Requirements for Structural Concrete

D. American Association of State Highway and Transportation Officials (AASHTO):

AASHTO LRFD-2014 .....LRFD Bridge Design Specifications, U.S., 7th Edition

AASHTO M251-06 .....Elastomeric Bearings

E. American Welding Society (AWS):

C5.4-93 .....Recommended Practices for Stud Welding

D1.1/D1.1M(R2011) .....Structural Welding Code – Steel

D1.4/D1.4M .....Structural Welding Code – Reinforcing Steel

F. American National Standards Institute (ANSI):

A108/A118/A136 .....Installation of Ceramic Tile

A137.1-12 .....Ceramic Tile

G. Precast/Prestressed Concrete Institute (PCI):

Architectural Precast Concrete – Color and Texture Selection Guide

MNL-117-96 .....Quality Control for Plants and Production of Architectural Precast Concrete Products

MNL-120-10 .....Design Handbook – Precast and Prestressed Concrete

MNL-122-07 .....Architectural Precast Concrete

MNL-124-11 .....Design for Fire Resistance of Precast Prestressed Concrete

MNL-127-99 .....Erector’s Manual - Standards and Guidelines for the Erection of Precast Concrete Products

MNL-135-00 .....Tolerance Manual for Precast and Prestressed Concrete Construction

TR-6-03 .....Interim Guidelines for the Use of Self-Consolidating Concrete

H. Military Specifications (MIL. Spec):

MIL-C882E-89 .....Cloth, Duck, Cotton or Cotton-Polyester Blend Synthetic Rubber, Impregnated, and Laminated, Oil Resistant

I. Department of Veterans Affairs:

Physical Security Design Manual for VA Facilities-July 2007

PART 2 - PRODUCTS

2.1 MOLD MATERIALS:

A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; non-reactive with concrete and suitable for producing required finishes:

1. Mold-Release Agent: Commercially produced form-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 indicated. Provide solid backing and form supports to ensure that form liners remain in place during concrete placement. Use 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.

2.2 REINFORCING MATERIALS:

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

C. Weldable Reinforcing Bars: ASTM A706/A706M, deformed.

1. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized and chromate wash treated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M.
3. Steel Bar Mats: ASTM A184/A184M, assembled with clips.
   a. Plain-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn galvanized and chromate wash treated steel wire into flat sheets.
   b. Deformed-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

F. 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.

2.3 CONCRETE MATERIALS:

A. Portland Cement: ASTM C150/C150M, Type I or III.
   1. For surfaces exposed to view in finished structure, use gray or white, same type, brand, and mill source throughout the precast concrete production. Match existing Precast bands.
   2. Standard gray Portland cement may be used for non-exposed backup concrete.

B. Supplementary Cementitious Materials for unexposed surfaces (backup concrete) only.
   1. Fly Ash Admixture: ASTM C618, Class C or F with maximum loss on ignition of 3 percent.
   2. Metakaolin Admixture: ASTM C618, Class N.
   3. Silica Fume Admixture: ASTM C1240 with optional chemical and physical requirement.
   4. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire project.
   1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
      a. Gradation: Uniformly graded to match design reference sample.
      b. Hard durable material aggregate carefully graded from coarse to fine in proportions required to match existing precast.
      c. Eliminate off color material from exposed aggregate.
   2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by COR.
      a. Test sand for color value in accordance with ASTM C40/C40M. Sand producing darker than specified color standard is unacceptable.
      b. Clean washed white sand.
      c. Special fine aggregate produced by crushing exposed coarse aggregate used for finish to match existing precast bands.

D. Lightweight Coarse Aggregate: Except as modified by PCI MNL 117, ASTM C330/C330M, with absorption less than 11 percent and free from expanded clay.

E. Unexposed Surface (Backup) Concrete Aggregates: ASTM C33/C33M or ASTM C330/C330M.

F. Admixtures: Admixtures containing calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture are not permitted.

1. Coloring Admixture: ASTM C979/C979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable and non-fading.
2. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
3. Water-Reducing Admixture: ASTM C494/C494M, Type A.
4. Retarding Admixture: ASTM C494/C494M, Type B.
5. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
6. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
7. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
8. Plasticizing Admixture for Flowable Concrete: ASTM C1017/C1017M.

G. 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.

2.4 STEEL CONNECTION MATERIALS:

A. Carbon-Steel Shapes and Plates: ASTM A36/A36M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be galvanized. Steel with chemistry conforming to the formula $Si + 2.5P \leq 0.09$ is also acceptable.

B. Carbon-Steel Headed Studs: ASTM A108, Grades 1018 through 1020, cold finished and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.

1. Make welds in accordance with AWS D1.1/D1.1M, Type A or B, with arc shields.

C. Carbon-Steel Plate: ASTM A283/A283M.

D. Malleable Iron Castings: ASTM A47/A47M. Grade 32510.

E. Carbon-Steel Castings: ASTM A27/A27M, Grade U-60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for

materials to be galvanized. Steel with chemistry conforming to the formula Si + 2.5P ≤ 0.09 is also acceptable.

G. Carbon-Steel Structural Tubing: ASTM A500/A500M, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A675/A675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A1064/A1064M or ASTM A706/A706M.

J. Carbon-Steel Bolts and Studs: ASTM A307, Grade A, carbon-steel, hex-head bolts and studs; carbon-steel nuts ASTM A563M (A563), Grade A; and flat, unhardened steel washers complying with ASTM F844.

K. High-Strength Bolts and Nuts: ASTM A325M (A325) or ASTM A490M (A490), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, complying with ASTM A563M (A563) and hardened carbon-steel washers complying with ASTM F436M (F436).

L. Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable //
// electrodeposition according to ASTM B633, SC 3, Type 1 //.

1. Galvanizing Repair Paint: High-zinc-dust-content paint with minimum 2 mils (0.002 inch) dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.

M. Welding Electrodes: Provide materials that comply with requirements of AWS D1.1/D1.1M. Submit product data on welding electrodes and rods.

2.5 STAINLESS-STEEL CONNECTION MATERIALS:

A. Stainless-Steel Plate: ASTM A666, Type 304, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless steel washers. Lubricate threaded parts of stainless steel bolts with an anti-seize thread lubricant during assembly.

C. Stainless-Steel Headed Studs: ASTM A276 and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.

2.6 BEARING PADS AND OTHER ACCESSORIES:

A. Provide bearing pads for units as follows:

1. Elastomeric Pads: AASHTO M251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D2240, minimum tensile strength 15.5 MPa (2250 psi) per ASTM D412.

2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 20.7 MPa (3000 psi) with no cracking, splitting or delaminating in the internal portions of the pad. Test one specimen for each 200 pads used in the project. Submit test results.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer according to ASTM D2240. Conforming to Division II, Section 18.10.2 of AASHTO LRFD, or MIL-C-882E.
4. Frictionless Pads: Tetrafluoroethylene (teflon), glass-fiber reinforced, bonded to stainless or mild-steel plates, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

B. Reglets: Stainless steel, ASTM A240/A240M, Type 302 felt or fiber filled or cover face opening of slots.

C. Vents and Weeps: Polyvinyl chloride plastic tubing, 4.7 mm (3/16 inch) inside diameter.

D. Provide sealant backings and sealant into stone-to-stone joints and stone-to-concrete joints in accordance with Section 07 92 00, JOINT SEALANTS.

E. Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install units.

2.7 GROUT MATERIALS:

A. Sand-Cement Grout: Portland Cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144, or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

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 C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of a consistency suitable for application within a 30-minute working time.

C. Epoxy-resin grout: Two-component mineral-filled epoxy-resin: ASTM C881 of type, grade, and class to suit requirements.

2.8 STONE MATERIALS AND ACCESSORIES:

A. Fabricate stone units in sizes, types and shapes to comply with requirements as indicated on contract documents Match existing.
   1. Tolerance of length and width of +0, -3 mm (+0, -1/8 inch).

B. Anchors: Stainless steel, ASTM A666, Type 304, of temper and diameter required to support loads without exceeding allowable design stresses.
   1. Fit each anchor leg with 60 durometer neoprene grommet collar with a width at least twice the diameter of the anchor and a length at least five times the diameter of the anchor.

C. Sealant Filler: ASTM C920, low-modulus, multicomponent, nonsag polyurethane or silicone sealant complying with requirements in Section 07 92 00, JOINT SEALANTS and that is nonstaining to stone substrate.

D. Epoxy Filler: ASTM C881/C881M, 100% solids, sand-filled non-shrinking, non-staining of type, class, and grade to suit application.

E. Bond Breaker: Preformed, compressible, resilient, non-staining, non-waxing, closed-cell polyethylene foam pad, nonabsorbent to liquid and gas, 3 mm (1/8 inch) thick. Polyethylene sheet, ASTM D4397, 0.15 mm to 0.25 mm (6 to 10 mil) thick.

2.9 CONCRETE MIXES:

A. Prepare design mixes to match COR’s sample for each type of concrete required.
   1. Limit use of fly ash and granulated blast-furnace slag to 20 percent replacement of Portland cement by weight; metakaolin and silica fume to 10 percent of Portland cement by weight.

B. Provide design mixes prepared by a qualified independent testing agency or by qualified precast plant personnel at fabricator’s option.

C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318/318M or PCI MNL 117 when tested in accordance with ASTM C1218/C1218M.

D. Normal Weight Concrete Face and Backup Mixtures: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 34.5 MPa (5000 psi).
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Release strength as required by design.

E. Lightweight Concrete Back-Up Mixes: Proportion mixes 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:

1. Compressive Strength (28 Days): 34.5 MPa (5000 psi).
2. Unit Weight: Calculated equilibrium unit weight of 1842 kg per cubic meter (115 lb. per cubic ft.), plus or minus 48 kg per cubic m (3 lb. per cubic ft.), according to ASTM C567/C567M. 3. Release strength as required by design.

F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows.

H. Total air content for various sizes of coarse aggregate for normal weight concrete.

Nominal Maximum Size of Aggregate mm (inch)	Total Air Content, Percent, by Volume	
	Severe Exposure	Moderate Exposure
Less than 9 (3/8)	9	7
9 (3/8)	7-1/2	6
13 (1/2)	7	5-1/2
19 (3/4)	6	5
25 (1)	6	5
38 (1-1/2)	5-1/2	4-1/2

H. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 MOLD FABRICATION:

A. Molds: Construct and maintain molds, mortar tight, within fabrication tolerances and of sufficient strength to withstand pressures due to concrete-placement, vibration operations, and temperature changes and for prestressing and detensioning operations.

1. Form joints are not acceptable on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly and chamfered.

3.4 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. Position anchors for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4.

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing units to supporting and adjacent construction.

C. Provide cast-in reglets, slots, holes, and other accessories in units as indicated on contract documents.

D. Provide cast-in openings larger than 254 mm (10 inches) in any dimension. Do not drill or cut openings or reinforcing without approval of COR.

E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabrication, placing, and supporting reinforcement.

1. Place reinforcing steel and prestressing strand to maintain at least 19 mm (3/4 inch) minimum concrete cover. Increase cover requirements for reinforcing steel to 38 mm (1-1/2 inches) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
3. 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 A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
4. Accurately position, support, and secure reinforcement against displacement during concrete- placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.

I. Identify pickup points of units and orientation in structure with permanent markings, complying with markings indicated on shop drawings. Imprint or permanently mark casting date on each unit on a surface that will not show in finished structure.

J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat accelerated heat curing using low-pressure live steam radiant heat and moisture.

K. Repair damaged units to meet acceptability requirements of PCI MNL 117 and the COR.

L. Reinforce architectural precast concrete units to resist handling, transportation and erection stresses, and specified in-place loads, whichever governs.

M. 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.

N. Place face mixture to a minimum thickness after consolidation of the greater of 25 mm (1 inch) or 1.5 times the nominal maximum aggregate size, but not less than the minimum reinforcing cover of 19 mm (3/4 inch) 38 mm (1-1/2 inches).

1. Use a single design mixture for those units in which more than one major face (edge) is exposed.
2. Where only one (1) face of unit is exposed, at the fabricator's option, either of the following mixture design/casting techniques may be used:
   a. A single design mix throughout the entire thickness of panel.
   b. Separate mixtures for face and backup concrete; using cement and aggregates for each type as appropriate, for consecutive placement in the mold. Use cement and aggregate specified for face mixture. Use cement and aggregate for backup mixture complying with specified criteria or as selected by the fabricator.

O. Thoroughly consolidate placed concrete by internal or external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration in accordance with PCI TR-6.

P. Comply with PCI MNL 117 procedures for hot- and cold-weather concrete placement.

3.7 FINISHES:

A. Provide exposed panel faces free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight and sharp. Finish exposed-face surfaces of units to match existing.

1. PCI's "Architectural Precast Concrete –Color and Texture Selection Guide," of plate numbers indicated.
2. As-Cast Surface Finish: Provide surfaces free of excessive air voids, sand streaks, and honeycombs.
3. Textured-Surface Finish: Impart by form liners to provide surfaces free of air voids, sand streaks, and honeycombs, with uniform color and texture.
4. Bushhammer Finish: Use power and hand tools to remove matrix and fracture coarse aggregates.
5. Exposed Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
7. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections and insulation from acid attack.
8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.

B. Finish exposed surfaces of units to match face-surface finish.

C. Finish unexposed surfaces of units by float finish.

3.8 ERECTION PREPARATION:

A. Deliver anchorage devices that are embedded in or attached to the building structural frame or foundation before start of such work.

Furnish locations, setting diagrams, and templates for the proper installation of each anchorage device.

B. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.9 ERECTION:

A. Erect units level, plumb and square within the specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
4. Unless otherwise shown provide for uniform joint widths of 19 mm (3/4 inch).

B. Connect units in position by bolting, welding, grouting, or as otherwise indicated on approved Erection Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting or grouting are completed.

1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.
2. Welding: Comply with and AWS D1.1/D1.1M and AWS D1.4/1.4M requirements for welding, welding electrodes, appearance of welds, and methods used in connecting welding work.
   a. Protect units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
   b. When welds are not specified, provide continuous fillet welds, using not less than the minimum fillet as specified by AWS.

c. Clean weld affected metal surfaces and apply a minimum 2 mils (0.002 inch) dry thickness coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A780/A780M.

d. Visually inspect welds critical to precast connections. Visually check welds for completion and remove, reweld or repair defective welds.

3. At bolted connections, provide lock washers, tack welding, or other acceptable means to prevent loosening of nuts after final adjustment.

a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connection apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

4. Grouting Connections: Grout connections where required or indicated on shop (erection drawings). Retain flowable grout in place until strong enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

C. Attachments: Upon approval of COR, precast pre-stressed products may be drilled or "shot" for fasteners or small openings, provided reinforcing or pre-stressing steel is not damaged or cut.

1. Should spalling occur, repair according to this specification section.

D. Venting and Weeps: Where precast concrete panels form the outer wythe of cavity wall construction, vent the cavity wall.

1. Use polyvinyl chloride plastic tubing to vent the cavity.
2. Place plastic vent tubes "tilted down and out" in horizontal and vertical joints.
3. Space vent tubes in accordance with shop drawings, but not less than two vents per panel or approximately 1219 mm (4 feet) on centers.

E. Setting: Where shown, fill joints with cement mortar specified in Section 04 05 13, MASONRY MORTARING .

1. Clean surfaces forming beds and other joints for precast concrete panels of dust, dirt, and other foreign matter, and wet thoroughly to prevent suction before precast concrete, elements are set.

2. Set precast element level and true to line with uniform joints filled completely with mortar.
3. Rake out joints 25 mm (1-inch) deep for pointing or sealants.
4. Joints required to have only sealant to be kept free of mortar for full depth.
5. Keep exposed faces of precast concrete elements free of mortar.
6. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.

F. Pointing: Wash and brush clean, leaving joints free from loose mortar, dust and other foreign material.
1. Carefully point with a slightly concave joint.

G. Sealing of Joints: Where shown and where required to make work watertight: clean, dry and seal joints between precast concrete elements and between precast elements and adjoining materials as specified in Section 07 92 00, JOINT SEALANTS.

3.10 ERECTION TOLERANCES:

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

3.12 REPAIRS:

A. When permitted by COR, repair damaged units.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 6.1 m (20 feet).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.

D. Remove and replace damaged units when repairs do not meet requirements.

E. Repair damaged units to meet acceptability of PCI MNL 117.

F. Wire brush, clean, and paint damaged prime painted components with the same type of shop primer.

3.13 CLEANING:

A. Clean surfaces of precast concrete to be exposed to view, as necessary, prior to shipping.

B. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
   1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
   2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

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SECTION 04 01 00
MAINTENANCE OF MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Repointing existing damaged masonry joints.

1.2 RELATED REQUIREMENTS

A. Mortars for new masonry: Section 04 05 13, MASONRY MORTARING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. ASTM International (ASTM):
   1. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
   2. C144-11 - Aggregate for Masonry Mortar.
   3. C150/C150M-15 - Portland Cement.
   4. C207-06(2011) - Hydrated Lime for Masonry Purposes.
   5. C216-15 - Facing Brick (Solid Masonry Units Made from Clay or Shale).
   6. C270-14a - Mortar for Unit Masonry.
   7. C295/C295M-12 - Petrographic Examination of Aggregates for Concrete.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Replacement units indicating manufacturer recommendation for each application.
C. Samples:
   1. Pointing Mortar: Molded, 150 mm (6 inches) long for each type, texture, and color.
D. Test reports:
   1. Preconstruction test results of existing masonry mortar and units.
   2. Recommended mortar mix and mortar materials sources.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Documented experience in completion of work, similar in design, material, and extent specified.

B. Preconstruction Testing:
   1. Existing Brick: according to ASTM C67.
   2. Existing Mortar: according to ASTM C295/C295M.
      a. Recommend mortar mix compatible with existing and mortar material sources required to match existing color and texture.

C. Mockups: Prepare mockup in size indicated on Drawings, demonstrating quality and aesthetics of masonry unit replacement and cleaning.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store materials covered, protected from weather, and elevated above grade.
   1. Prevent contamination of aggregates.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:
   1. Cold Weather Requirements: Maintain mortar ingredients and substrate within temperature range between 4 degrees C (40 degrees F) and 49 degrees C (120 degrees F) when outside temperature is less than 4 degrees C (40 degrees F).
   2. Hot Weather Requirements: Protect mortar-joint from evaporation of moisture from mortar material. When required, provide adequately shaded work area.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mortar Components:
   1. Hydrated Lime: ASTM C207, Type S.

2. Aggregate: ASTM C144.
3. Portland Cement: ASTM C150/C150M, Type I.
4. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Provide each product from one manufacturer and from one production run.

2.3 REPLACEMENT MASONRY UNITS

A. Face Brick:
1. ASTM C216, // Grade SW, Type FBS matching existing.
2. Efflorescence: Rated slight efflorescent when tested according to ASTM C67.
B. Other Masonry Units: Match existing.

2.4 MIXES

A. Tuck Pointing Mortar: ASTM C270; Appendix X3.
1. Type N.

2.5 ACCESSORIES

A. Cleaning Agent: Soapless, non-acidic, detergent, specially prepared for cleaning brick concrete masonry.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
1. Protect from mortar droppings and cleaning operations.
C. Remove existing fixtures and fittings concealing masonry joints to permit repointing and repair.

3.2 EXISTING MORTAR JOINTS

A. Cut out existing bed and head mortar joints, to uniform depth of 19 mm (3/4 inches), or to sound mortar without damaging edges and faces of existing masonry units to remain.
B. Remove dust and debris from joints.
1. Do not rinse when temperature is below freezing.

3.3 TUCK POINTING

A. Dampen joints immediately before tuck pointing. Allow masonry units to absorb surface water.

B. Tightly pack tuck pointing mortar into joints in thin layers, 6 mm (1/4 inch) thick, maximum.
C. Allow layer to become slightly hardened before applying next layer.
D. Pack final layer flush with surfaces of masonry units.

3.4 MASONRY UNIT REPLACEMENT

A. Cut out mortar joints surrounding masonry units requiring replacement.
   1. Remove existing masonry units creating opening for replacement masonry unit installation.
   2. Remove mortar, dust, and debris from opening perimeter surfaces.
   3. Prevent debris from falling into cavity.
B. Dampen surfaces of surrounding existing masonry before installing replacement masonry units.
   1. Allow existing masonry to absorb surface moisture before installing replacement units.
   2. Butter contact surfaces of existing masonry and replacement masonry units with mortar.
   3. Center replacement masonry units in opening and press into position.
   4. Remove excess mortar.
   5. Tuck point replacement masonry units to ensure full head and bed joints.

3.5 JOINT TOOLING

A. Tool repointed and replaced masonry joints when mortar becomes slightly hardened.
B. Produce smooth, compacted, joint matching existing.

3.6 CLEANING

A. Remove mortar splatter from exposed surfaces immediately.
B. Clean exposed masonry surfaces on completion.
C. Remove mortar droppings and other foreign substances from wall surfaces.
D. Wet surfaces with clean water.
E. Wash with cleaning agent.
F. Brush masonry surfaces with stiff fiber brushes while washing.
G. Immediately after washing, rinse with clean water.
   1. Remove traces of detergent, foreign streaks or stains.

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SECTION 04 05 13
MASONRY MORTARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Masonry mortar installed by other sections.

1.2 RELATED REQUIREMENTS

A. Mortar used in Section:

1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
2. Section 04 20 00, UNIT MASONRY.

B. Mortar Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
2. C91/C91M-12 - Masonry Cement.
3. C144-11 -Aggregate for Masonry Mortar.
4. C150/C150M-15 - Portland Cement.
5. C207-06(2011) - Hydrated Lime for Masonry Purposes.
6. C270-14a - Mortar of Unit Masonry.
7. C595/C595M-15e1 - Blended Hydraulic Cements.
8. C780-15 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
9. C979/C979M-10 - Pigments for Integrally Colored Concrete.
10. C1329/C1329M-15 - Mortar Cement.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.

C. Test Reports: Certify each product complies with specifications.

1. Mortar.
2. Admixtures.

D. Certificates: Certify each product complies with specifications.

1. Portland cement.
2. Masonry cement.
3. Mortar cement.

4. Hydrated lime.
5. Fine aggregate.
6. Color admixture.

E. Qualifications: Substantiate qualifications comply with specifications.
1. Testing laboratory.

1.5 QUALITY ASSURANCE

A. Preconstruction Testing:
1. Engage independent testing laboratory to tests and submit reports.
a. Deliver samples to laboratory in number and quantity required for testing.
2. Test mortar and materials specified.
3. Mortar:
a. Test for compressive strength and water retention according to ASTM C270.
b. Minimum Mortar compressive strengths 28 days:
1) Type M: 17.2 MPa (2,500 psi).
2) Type S: 12.4 MPa (1,800 psi).
3) Type N: 5.1 MPa (750 psi).
4. Non Staining Cement: Test for water soluble alkali.
a. Water Soluble Alkali: Maximum 0.03 percent.
5. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store masonry materials under waterproof covers on planking clear of ground.
1. Protect loose, bulk materials from contamination.
B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hydrated Lime: ASTM C207, Type S.

B. Aggregate for Masonry Mortar: ASTM C144 and as follows:

1. Light colored sand for mortar for laying face brick.
2. Test sand for color value according to ASTM C40/C40M. Sand producing color darker than specified standard is unacceptable.

C. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, IP.

D. Masonry Cement: ASTM C91/C91M. Type N, S, Or M.

1. Use white masonry cement whenever white mortar is specified.

E. Mortar Cement: ASTM C1329/C1329M, Type N, S or M.

F. Portland Cement: ASTM C150/C150M, Type I.

1. Use white Portland cement wherever white mortar is specified.

G. Pigments: ASTM C979/C979M; inorganic, inert, mineral pigments only, unaffected by atmospheric conditions, nonfading, alkali resistant, and water insoluble.

H. Water: Potable, free of substances that are detrimental to mortar, masonry, and metal.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide each product from one manufacturer and from one production run.

2.3 MIXES

A. Pointing Mortar for New Work:

1. For Cast Stone or Precast Concrete: Proportion by volume; one part white Portland cement, two parts white sand, and 1/5 part hydrated lime.

B. Masonry Mortar: ASTM C270.

1. Admixtures:
   a. Do not use mortar admixtures, and color admixtures unless approved by Contracting Officer's Representative.
   b. Do not use antifreeze compounds.

C. Colored Mortar:

1. Maintain uniform mortar color for exposed work, throughout.
2. Match existing mortar color.
3. Alteration Work Mortar Color: Match existing mortar unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

D. Color Admixtures:

1. Proportion as specified by manufacturer.
2. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.

3.2 MIXING

A. Measure ingredients by volume using known capacity container.
B. Mix for 3 to 5 minutes in a mechanically operated mortar mixer.
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 Stiffened Because of Water Loss Through Evaporation:
   1. Re-temper by adding water to restore to proper consistency and workability.
   2. Discard mortar reaching initial set or unused within two hours of mixing.
E. Pointing Mortar:
   1. Mix dry ingredients with enough water to produce damp mixture of workable consistency retaining shape when formed into ball.
   2. Allow mortar to stand in dampened condition for 60 to 90 minutes.
   3. Add water to bring mortar to a workable consistency before use.

3.3 MORTARING

A. Type M Mortar: Use for precast concrete panels, and parging below grade. Type S Mortar: Use for masonry containing vertical reinforcing bars (non-engineered) masonry below grade.
B. Brick Veneer Over Frame Back Up Walls: Use Type S Portland cement-lime mortar.
C. Type N Mortar: Use for other masonry work.

3.4 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
   1. Take and test samples during progress of work according to ASTM C780.

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SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Grout for filling hollow concrete masonry cores.

1.2 RELATED REQUIREMENTS

A. Grout used in Section:
   1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
   2. Section 04 20 00, UNIT MASONRY.
B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES.
C. Ready-Mixed Grout: Section 09 30 13, CERAMIC/PORCELAIN TILING.
D. Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American National Standards Institute (ANSI):
   1. A118.6-10 - Standard Cement Grouts for Tile Installation.
C. ASTM International (ASTM):
   1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
   2. C150/C150M-15 - Portland Cement.
   3. C207-06(2011) - Hydrated Lime for Masonry Purposes.
   4. C404-11 - Aggregates for Masonry Grout.
   5. C476-11 - Grout for Masonry.
   6. C595/C595M-15e1 - Blended Hydraulic Cement.
   7. C979/C979M-10 - Pigments for Integrally Colored Concrete.
   8. C1019-14 - Sampling and Testing Grout.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Description of each product.
C. Sustainable Construction Submittals:
   1. Recycled Content: Identify pre-consumer recycled content percentage by weight.
D. Test Reports: Certify each product complies with specifications.
   1. Grout, each type.
   2. Cement.

3. Aggregate.

E. Certificates: Certify each product complies with specifications.

1. Blended hydraulic cement.
2. Portland cement.
3. Grout.
4. Hydrated lime.
5. Aggregate.
6. Color admixture.

1.5 QUALITY ASSURANCE

A. Preconstruction Testing:

1. Engage independent testing laboratory to perform tests and submit reports.
   a. Deliver samples to laboratory in number and quantity required for testing.
2. Grout:
   a. Test compressive strength according to ASTM C1019 standard.
3. Cement:
   a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
   b. Nonstaining cement containing more than 0.03 percent water soluble alkali.
4. Aggregate:
   a. Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

1.7 STORAGE AND HANDLING

A. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grout Components:
   1. Hydrated Lime: ASTM C207, Type S.
   2. Aggregate For Masonry Grout: ASTM C404, Size 8.
   3. Blended Hydraulic Cement: ASTM C595, Type IS, IP.
   4. Portland Cement: ASTM C150, Type I.
   5. Liquid Acrylic Resin:
      a. A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.
   6. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

A. Provide each product from one manufacturer and from one production run.

2.3 MIXES

A. Grout: ASTM C476; fine grout and coarse grout.
   1. Color Admixture:
      a. Pigments: ASTM C979, inert, stable to atmospheric conditions, nonfading, alkali resistant, and water insoluble.
      b. Use mineral pigments only. Organic pigments are not acceptable.

B. Ready-Mixed Grout: ANSI A118.8.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Clean mortar from masonry cells protruding more than 13 mm (1/2 inch) to permit grout flow.
D. Remove debris from grout spaces.
E. Verify reinforcement is correctly placed before placing grout.

3.2 MIXING

A. Mix grout in mechanically operated mixer.
   1. Mix grout for five minutes, minimum.
B. Measure ingredients by volume using container of known capacity.
C. Mix water with grout dry ingredients.

1. Slump Range: 200 to 275 mm (8 to 11 inches).

3.3 GROUTING

A. Install grout according to Section 04 20 00, UNIT MASONRY.

B. Use fine grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is 50 mm (2 inches) or less.

C. Use either fine grout or coarse grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is greater than 50 mm (2 inches).

D. Use grout for filling bond beam or lintel units.

- - E N D - -

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concrete masonry unit (CMU) assemblies for:
   1. Exterior walls.

1.2 RELATED REQUIREMENTS

A. Sealants and Sealant Installation: Section 07 92 00, JOINT SEALANTS.
B. Color and Texture of Masonry Units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American Concrete Institute (ACI):
   1. 315-99 - Details and Detailing of Concrete Reinforcement.
   2. 530.1/ASCE 6/TMS 602-13 - Specification for Masonry Structures.
C. ASTM International (ASTM):
   1. A615/A615M-15ae1 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   2. A951/A951M-14 - Steel Wire for Masonry Joint Reinforcement.
   3. A1064/A1064M-15 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   4. C34-13 - Structural Clay Load-Bearing Wall tile.
   5. C55-14a - Concrete Building Brick.
   6. C56-13 - Structural Clay Nonloadbearing Tile.
   7. C62-13a - Building Brick (Solid Masonry Units Made from Clay or Shale).
   8. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
   9. C90-14 - Load-Bearing Concrete Masonry Units.
   10. C126-15 - Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
   11. C216-15 - Facing Brick (Solid Masonry Units Made From Clay or Shale).
   12. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
   13. C744-14 - Prefaced Concrete and Calcium Silicate Masonry Units.
   14. D1056-14 - Flexible Cellular Materials - Sponge or Expanded Rubber.
   15. D2240-05(2010) - Rubber Property-Durometer Hardness.
   16. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

D. American Welding Society (AWS):
   1. D1.4/D1.4M-11 - Structural Welding Code - Reinforcing Steel.
E. Brick Industry Association (BIA):
   1. TN 11B-88 - Guide Specifications for Brick Masonry, Part 3.
F. Federal Specifications (Fed. Spec.):
   1. FF-S-107C(2) - Screws, Tapping and Drive.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Submittal Drawings:
   1. Fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies.
   2. Special masonry shapes, profiles, and placement.
   3. Masonry units for typical window and door openings, and, for special conditions as affected by structural conditions.
C. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Installation instructions.
D. Samples:
   1. Face brick: Sample panel, 200 mm by 400 mm (8 inches by 16 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
   2. Concrete masonry units, when exposed in finish work.
   3. Anchors and Ties: Each type.
   4. Joint Reinforcing: 1200 mm (48 inches) long each type.
E. Test reports: Certify products comply with specifications.
   1. Face brick.
   2. Solid and load-bearing concrete masonry units, including fire-resistant rated units.

1.5 QUALITY ASSURANCE

A. Welders and Welding Procedures Qualifications: AWS D1.4/D1.4M.
B. Mockups:
   1. Before starting masonry, build a mockup panel minimum 1800 mm by 1800 mm (6 feet by 6 feet) with 600 mm (24 inch) 90 degree return for outside corner.
      a. Use masonry units from random cubes of units delivered on site.

b. Include structural backup, reinforcing, ties, and anchors.

2. Mockup panel approved by Contracting Officer's Representative set workmanship and aesthetic quality for masonry work.
3. Clean sample panel to test cleaning methods.
4. Remove mockup panel when directed by Contracting Officer's Representative.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products above grade, protected from contamination.
B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Hot and Cold Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.Match existing Brick
B. Provide each product from one manufacturer and from one production run.

2.3 UNIT MASONRY PRODUCTS

A. Brick:
1. Face Brick:
a. ASTM C216, Grade SW, Type FBS.

b. Brick when tested according to ASTM C67: Classified slightly efflorescent or better.

c. Size:

1) Modular.Match existing size and profie.

2. Building Brick: ASTM C62, Grade MW for backup and interior work; Grade SW where in contact with earth.

3. Two Faces Exposed: Grade S, Type II.

B. Concrete Masonry Units (CMU):

1. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.

a. Unit Weight: Normal weight Lightweight.

2. Sizes: Modular, 200 mm by 400 mm (8 inches by 16 inches) nominal face dimension; thickness as indicated on drawings.

3. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.

4. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (1 inch) minimum radius rounded vertical exterior corners (bullnose units).

C. Concrete Brick: ASTM C55.

2.4 ANCHORS, TIES, AND REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A615/A615M; Grade 60, deformed bars.

B. Joint Reinforcement:

1. Form from wire complying with ASTM A951/A951M.

2. Hot dipped galvanized after fabrication.

3. Width of joint reinforcement 40 mm (1.6 inches) less than nominal thickness of masonry wall or partition.

4. Cross wires welded to longitudinal wires.

5. Joint reinforcement minimum 3000 mm (10 feet) long, factory cut.

6. Joint reinforcement with crimp formed drip is not acceptable.

7. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.

8. Ladder Design:

a. Longitudinal wires deformed 4 mm (0.16 inch) 5 mm (0.20 inch) diameter wire.

b. Cross wires 2.6 mm (0.10 inch) diameter.

9. Trussed Design:

a. Longitudinal and cross wires minimum 4 mm (0.16 inch nominal) diameter.

b. Longitudinal wires deformed.

10. Multiple Wythes and Cavity Wall Ties:
    a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.
    b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe minimum 75 mm (3 inches) spaced 400 mm on center (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).

C. Adjustable Veneer Anchor for Framed Walls:
    1. Two piece, adjustable anchor and tie.
    2. Anchor and tie may be either loop or angle type; provide 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 anchor and be embedded minimum 50 mm (2 inches) into bed joint of 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 minimum 50 mm (2 inches) into the bed joint of masonry veneer and provide upstanding leg to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.

D. Dovetail Anchors:
    1. Corrugated steel dovetail anchors formed of 1.5 mm (0.06 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 minimum 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 (0.02 inch) thick galvanized steel (with felt or fiber filler).

E. Individual Ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to rectangular shape minimum 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 acceptable.
2. Adjustable Cavity Wall Ties:
   a. Adjustable wall ties may be furnished 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 rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into bed joint 50 mm (2 inches).
   e. Form other piece to 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having 75 mm (3 inch) long bent section for engaging 105 mm (4-1/8 inch) wide piece to form adjustable connection.

F. Wall Ties, (Mesh or Wire):

1. Mesh wall ties formed of ASTM A1064/A1064M, W0.5, 2 mm, (0.08 inch) 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, (0.12 inch) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

G. Corrugated Wall Tie:

1. Form from 1.5 mm (0.06 inch) thick corrugated, galvanized steel 30 mm (1-1/4 inches) wide by lengths to extend minimum 100 mm (4 inches) into joints of masonry plus 38 mm (1-1/2 inch) turn-up.
2. Provide 5 mm (3/16 inch) hole in turn-up for fastener attachment.

H. Adjustable Steel Column Anchor:

1. Two piece anchor consisting of a 6 mm (1/4 inch) diameter steel rod to be welded to steel with offset ends, rod to permit 100 mm (4 inch) vertical adjustment of wire anchor.
2. Triangular shaped wire anchor 100 mm (4 inches) wide formed from 5 (3/16 inch) diameter galvanized wire, to extend minimum 75 mm (3 inches) into joints of masonry.

I. Adjustable Steel Beam Anchor:
1. Z or C type steel strap, 30 mm (1 1/4 inches) wide, 3 mm (1/8 inch) thick.
2. Flange hook minimum 38 mm (1 1/2 inches) long.
3. Length to embed in masonry minimum 50 mm (2 inches) in 100 mm (4 inch) nominal thick masonry and 100 mm (4 inches) in thicker masonry.
4. Bend masonry end minimum 40 mm (1 1/2 inches).

J. Ridge Wall Anchors:
1. Form from galvanized steel minimum 25 mm (1 inch) wide by 5 mm (3/16 inch) thick by 600 mm (24 inches) long, plus 50 mm (2 inch) bends.
2. Other lengths as indicated on drawings.

2.5 ACCESSORIES

A. Weeps:
1. Weep Hole Wicks: Glass fiber ropes, 10 mm (3/8 inch) minimum diameter, 300 mm (12 inches) long.
2. Weep Tubing: Round, polyethylene, 9 mm (3/8 inch) diameter, 100 mm (4 inches) long.
3. Weep Hole: Flexible PVC louvered configuration with rectangular closure strip at top.

B. Cavity Drain Material: Open mesh polyester sheets or strips to prevent mortar droppings from clogging the cavity.

C. Preformed Compressible Joint Filler:
1. Thickness and depth to fill joint.
2. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
3. Non-Combustible Type: ASTM C612, Type 5, Max. Temp.1800 degrees F.

D. Box Board:
1. Mineral Fiber Board: ASTM C612, Type 1.
2. 25 mm (1 inch) thickness.
3. Other spacing material having similar characteristics is acceptable subject to Contracting Officer's Representative's approval.

E. Masonry Cleaner:
   1. Detergent type cleaner selected for each type masonry.
   2. Acid cleaners are not acceptable.
   3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

F. 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.

G. Welding Materials: AWS D1.4/D1.4M, type to suit application.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings .
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Keep finish work free from mortar smears or spatters, and leave neat and clean.

C. Wall Openings:
   1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
   2. When 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 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 minimum 100 mm (4 inches) above suspended ceiling or to overhead construction where no ceiling occurs.
   a. Reinforced masonry partitions.

F. Lintels:
1. Lintels are not required for openings less than 1000 mm (40 inches) wide that have hollow metal frames.
2. Openings 1025 mm (41 inches) wide to 1600 m (63 inches) wide without structural steel lintel or frames, require lintel formed of concrete masonry lintel or bond beam units // or structural facing tile lintel units // filled with grout and reinforced with one No. 16 (No. 5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
3. Precast concrete lintels of 25 MPa (3,000 psi) concrete, same thickness as partition, and with one No. 16 (No. 5) deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, is acceptable in lieu of reinforced CMU masonry lintels.
4. Use steel lintels, for openings greater than 1600 m (63 inches) wide, brick masonry openings, and elevator openings unless shown otherwise.
5. Doors having overhead concealed door closers require steel lintel, and pocket for closer box.
6. Lintel Bearing Length: Minimum 100 mm (4 inches) at both 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 one-half running bond, unless indicated 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. Minimum Masonry Unit Length: 100 mm (4 inches).
5. Use minimum 100 mm (4 inches) nominal thick masonry for free standing furring, unless indicated otherwise.
6. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

H. Before connecting new masonry with previously laid masonry, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

I. Structural Steel Encased in Masonry:
   1. Where structural steel is encased in masonry and voids between steel and masonry are filled with mortar, provide minimum 25 mm (1 inch) mortar free expansion space between masonry and steel by applying box board material to steel before masonry is laid.
   2. Do not install spacing material where steel is bearing on masonry or masonry is bearing on steel.

J. 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. Fill 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 minimum one web of hollow masonry units.

K. Wetting and Wetting Test:
   1. Test and wet brick and clay tile according to BIA TN 11B.
   2. Do not wet concrete masonry units or glazed structural facing tile before laying.

L. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

M. Construct formwork to conform to shape, line and dimensions indicated on drawings. Make sufficiently tight to prevent mortar, grout, or concrete leakage. Brace, tie and support formwork as required to maintain position and shape during construction and curing of reinforced masonry.

N. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other reasonable temporary construction loads.

O. Minimum Curing Times Before Removing Shores and Forms:
   1. Girders and Beams: 10 days.
   2. Slabs: 7 days.
   3. Reinforced Masonry Soffits: 7 days.

3.2 INSTALLATION - ANCHORAGE

A. Veneer to Framed Walls:

1. Install adjustable veneer anchors.
2. Fasten anchor to stud through sheathing with self-drilling and tapping screw, one at both ends of loop type anchor.
3. Space anchors maximum 400 mm (16 inches) on center vertically at each stud.

B. Veneer to Concrete Walls:
1. Install dovetail slots in concrete vertically at 400 mm (16 inches) on centers.
2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
3. Anchor new masonry facing to existing concrete with adjustable cavity wall ties spaced at 400 mm, (16 inches) maximum vertical intervals, and at 400 mm (16 inches) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.

C. 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 400 mm (16 inches) horizontally.
3. At openings, provide additional ties spaced maximum 900 mm (36 inches) 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 adjustable cavity 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: Install joint reinforcing for multiple wythes and cavity wall ties spaced maximum 400 mm (16 inches) vertically.
6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals maximum 400 mm (16 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.

D. Anchorage of Abutting Masonry:
1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (24 inches) 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 adjustable wall ties. Extend ties minimum 100 mm (4 inches) into joints of new masonry. Fasten ties 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.

E. Masonry Furring:
1. Anchor masonry furring less than 100 mm (4 inches) nominal thick to masonry walls or to concrete with adjustable wall ties or dovetail anchors.
2. Space at maximum 400 mm (16 inches) on center in both directions.

F. Anchorage to Steel Beams or Columns:
1. Use adjustable beam anchors on each flange.
2. At columns weld 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.

3.3 INSTALLATION - REINFORCEMENT

A. Joint Reinforcement:
1. Install joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing is acceptable in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
4. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry.

5. Wherever brick masonry is backed up with stacked bond masonry, install multiple wythe joint reinforcement in every two courses of CMU backup, and in corresponding joint of facing brick.

B. Steel Reinforcing Bars:
   1. Install reinforcing bars in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for horizontal reinforcement. Install in wall cavities of reinforced masonry walls where indicated on drawings.
   2. Bond Beams:
      a. Form Bond beams of load-bearing concrete masonry units filled with grout and reinforced with two No. 15m (No. 5) reinforcing bars unless shown otherwise. Do not cut reinforcement.
      b. Brake bond beams only at expansion joints and at control joints, if shown.
   3. Stack Bond:
      a. Locate additional joint reinforcement in vertical and horizontal joints as indicated on drawings.
      b. Anchor vertical reinforcement into foundation or wall or bond beam below.
      c. Provide temporary bracing for walls over 8 feet tall until permanent horizontal bracing is completed.
   4. Grout openings:
      a. Leave cleanout holes in double wythe walls during construction by omitting units at base of one side of wall.
      b. Locate 75 mm by 75 mm (3 inches. by 3 inches.) min. cleanout holes at location of vertical reinforcement.
      c. Keep grout space clean of mortar accumulation and debris. Clean as work progresses and immediately before grouting.

3.4 INSTALLATION - BRICK EXPANSION AND CMU CONTROL JOINTS

A. Provide brick expansion joint (EJ) and CMU control joints (CJ) where indicated on drawings.

B. Keep joint free of mortar and other debris.

C. 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 both sides of shear key.

D. Interrupt joint reinforcement at expansion and control joints.

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

3.5 INSTALLATION - BUILDING EXPANSION AND SEISMIC JOINTS

A. Keep expansion and seismic joints open and 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. Fill opening in exposed face of expansion and seismic joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.6 INSTALLATION - ISOLATION JOINT

A. Where full height walls and partitions lie parallel or perpendicular to and under structural beams and shelf angles, provide minimum 9 mm (3/8 inch) separation between walls and partitions and bottom of beams and shelf angles.

B. Insert continuous full width strip of non-combustible type compressible joint filler.

C. Fill opening in exposed face of isolation joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.7 INSTALLATION - BRICKWORK

A. Lay clay brick according to BIA TN 11B.

B. Laying:

1. Lay brick in one-half running bond with bonded corners, unless indicated 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, and jamb.
4. Where length of cut brick is greater than one half length, maintain vertical joint location.
5. Lay exposed brickwork joints symmetrical about center lines of openings.
6. Do not structurally bond multi-wythe brick walls, unless indicated on drawings.

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 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.

E. Cavity Walls:
1. Keep air space clean of mortar accumulations and debris.
2. Lay the interior wythe of the masonry wall full height where air barrier is required on cavity face. Coordinate to install air barrier before laying outer wythe.
3. Insulated Cavity Type Exterior Walls:
a. Install insulation against cavity face of inner masonry wythe.
b. Place insulation between rows of ties or joint reinforcing. Adhere insulation to masonry surface with a bonding agent as recommended by insulation manufacturer.
c. Lay outer masonry wythe up with air space between insulation and masonry units.

3.8 POINTING

A. Fill joints with pointing mortar using rubber float trowel to apply mortar solidly into raked joints.

B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.

C. Tool exposed joints to smooth concave joint.

D. At joints with existing work, match existing joint.

3.9 INSTALLATION OF REINFORCED BRICK MASONRY

A. Mortar Jointing and Bedding:

1. Pattern Bond: Lay exterior wythes in pattern bond shown, or if not shown, lay in 1/2 running bond with vertical joints in each course centered on units in courses above and below. Lay inner wythes (if any) with units in each wythe bonded by lapping minimum 50 mm (2 inches). Bond and interlock each course of each wythe at corners and intersections. Do not use units with less than 100 mm (4 inch) nominal horizontal face dimension at corners or jambs.
2. Lay exterior wythes with bed (horizontal) and head (vertical) joints between units completely filled with mortar. Top of bed joint mortar may be sloped toward center of walls. Butter ends of units with sufficient mortar to completely fill head joints and shove into place. Do not furrow bed joints or slush head joints. Remove any mortar fins which protrude into grout space.
3. Maintain joint widths shown for head and bed joints, except for minor variations required to maintain pattern bond. If not shown, lay with 9 mm (3/8 inch) head and bed joints.
4. Maintain joint widths shown for head and bed joints, but adjust thickness of bed joints, if required, to allow for minimum 6 mm (1/4 inch) thickness of mortar between reinforcement and masonry units, except 6 mm (1/4 inch) bars (if any) may be laid in 13 mm (1/2 inch) thick bed joints and 5 mm (0.2 inch) diameter or smaller wire reinforcing may be laid in 9 mm (3/8 inch) thick bed joints.

3.10 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within tolerances according to ACI 530.1/ASCE 6/TMS 602 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) - 9 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).

3.11 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 detergent solution. Do not use muriatic acid.
2. Brush with stiff fiber brushes while washing, and immediately wash with clean water.
3. Remove traces of detergent, foreign streaks, or stains of any nature.

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural steel shapes, plates, and bars.
   2. Structural pipe.
   3. Bolts, nuts, and washers.

1.2 RELATED REQUIREMENTS

A. Materials Testing And Inspection During Construction: Section 01 45 29, TESTING LABORATORY SERVICES.
B. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.
C. Steel Decking: Section 05 31 00, STEEL DECKING.
D. .
E. Steel Framing: // Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS
F. Steel Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
G. Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American Institute of Steel Construction (AISC):
   1. AISC Manual - Steel Construction Manual, 14th Ed.
   2. 303-10 - Code of Structural Steel Buildings and Bridges.
   3. 360-10: Specification for Structural Steel Buildings.
C. The American Society of Mechanical Engineers (ASME):
   1. B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.
D. American Welding Society (AWS):
   1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
E. ASTM International (ASTM):
   1. A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
   2. A36/A36M-14 - Carbon Structural Steel.
   3. A53/A53M-12 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.
   4. A123/A123M-15 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. A242/A242M-13 - High-Strength Low-Alloy Structural Steel.

6. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
7. A307-14 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
8. A325-14 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
9. A490-14a - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
10. A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
11. A501/A501M-14 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
12. A572/A572M-15 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. A992/A992M-15 - Structural Shapes.
14. F2329/F2329M-15 - Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.

F. Master Painters Institute (MPI):
1. No. 18 - Primer, Zinc Rich, Organic.

G. Military Specifications (Mil. Spec.):
1. MIL-P-21035 - Paint, High Zinc Dust Content, Galvanizing, Repair.

H. Occupational Safety and Health Administration (OSHA):
1. 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
2. 29 CFR 1926-2001 - Safety Standards for Steel Erection.

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

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.

C. Test Reports: Certify products comply with specifications.
1. Welders' qualifying tests.

D. Certificates: Certify each product complies with specifications.
1. Structural steel.

2. Steel connections.
3. Welding materials.
4. Shop coat primer paint.

E. Qualifications: Substantiate qualifications comply with specifications.
1. Welders and welding procedures.

F. Record Surveys: Signed and sealed by responsible surveyor or engineer.

1.5 QUALITY ASSURANCE

A. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.

B. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. W-Shapes:
1. ASTM A992/A992M.
2. ASTM A572/A572M; Grade // 50
3. ASTM A529; Grade // 50

B. Channel and Angles:
1. ASTM A36/A36M.
2. ASTM A572/A572M; Grade // 50
3. ASTM A529; Grade // 50

C. Plates and Bars:
1. ASTM A36/A36M.
2. ASTM A572/A572M; Grade // 50
3. ASTM A529; Grade // 50

D. Hollow Structural Sections:
1. ASTM A500/A500M.

E. Structural Pipe: ASTM A53/A53M, Grade B.

F. Bolts, Nuts and Washers: Galvanized for galvanized framing and plain finish for other framing.
1. High-strength bolts, including nuts and washers: ASTM A325 or ASTM A490.
2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.

3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ASME B18.22.1.

G. Welding Materials: AWS D1.1, type to suit application.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

2.3 FABRICATION

A. Fabricate structural steel according to Chapter M, AISC 360.

B. Shop and Field Connections:

1. Weld connections according to AWS D1.1/D1.1M. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
2. High-Strength Bolts: High-strength bolts tightened to a bolt tension minimum 70 percent of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers).

2.4 FINISHES

A. Shop Priming:

1. Prime paint structural steel according to AISC 303, Section 6.
   a. Interstitial Space Structural Steel: Prime paint, unless indicated to receive sprayed on fireproofing.

B. Shop Finish Painting: Apply primer and finish paint as specified in Section 09 91 00, PAINTING.

C. Do not paint:

1. Surfaces within 50 mm (2 inches) of field welded joints.
2. Surfaces indicated to be encased in concrete.
3. Surfaces receiving sprayed on fireproofing.
4. Beam top flanges receiving shear connector studs applied.

D. Structural Steel Galvanizing: ASTM A123/A123M, hot dipped, after fabrication. Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.

1. Galvanize structural steel framing installed at exterior locations.

E. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot-dipped.

2.5 ACCESSORIES

A. General: Shop paint steel according to AISC 303, Section 6.

B. Finish Paint System: Primer and finish as specified in Section 09 91 00, PAINTING.

C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect structural steel according to AISC 303 and AISC 360.

B. Set structural steel accurately at locations and elevations indicated on drawings.

C. Maintain erection tolerances of structural steel within AISC 303 requirements.

1. Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.

D. Weld and bolt connections as specified for shop connections.

3.2 FIELD PAINTING

A. After welding, clean and prime weld areas to match adjacent finish.

B. Touch-up primer damaged by construction operations.

C. Apply galvanizing repair paint to galvanized coatings damaged by construction operations.

D. Finish Painting: As specified in Section 09 91 00, PAINTING.

3.3 FIELD QUALITY CONTROL

A. Record Survey:

1. Engage registered land surveyor or registered civil engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS to perform survey.

2. Measure and record structural steel framing plumbness, level, and alignment after completing bolting and welding and before installation of work supported by structural steel.

3. Identify deviations from allowable tolerances specified in AISC Manual.

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SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies open web, joists

1.2 RELATED WORK:

A. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.

B. Finish Painting: Section 09 91 00, PAINTING.

1.3 DESIGN REQUIREMENTS:

Design all elements with the latest published version of applicable Codes.

1.3 TOLERANCES:

Deviation from a straight line between ends of any installed joist shall not exceed 10 mm in 3 m (3/8 inch in 10 feet).

1.4 REGULATORY REQUIREMENTS:

STEEL JOIST INSTITUTE: Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, (Latest Edition).

1.5 SUBMITTALS:

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

B. Shop and Erection Drawings: Complete and stamped by a professional engineer registered in the State of South Dakota.

1. Fabrication drawings including details and schedules for the fabrication and assembly of each joist.
2. Erection drawings showing the size and location of each joist, bridging, cross bracing, bearing details, connections, welds, bolts and bearing plates.

C. Certificates: STEEL JOIST INSTITUTE compliance.

1.6 QUALITY ASSURANCE:

Provide documentation that the joist manufacturer is a member of the Steel Joist Institute and has satisfactorily completed work of a similar scope and nature.

1.7 APPLICABLE PUBLICATIONS:

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

B. American Institute of Steel Construction (AISC):

1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design (Latest Edition).

2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition).

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

A307-07.....Carbon Steel Bolts and Studs, 400 MPa (60,000 psi) Tensile Strength

A325-09.....Structural Bolts, Steel, Heat Treated, 800/700 MPa (120/105 ksi) Minimum Tensile Strength

A490-08.....Heat-Treated Steel Structural Bolts, 1000 MPA (150 ksi) Minimum Tensile Strengths

D. American Welding Society (AWS):

D1.1-08.....Structural Welding Code – Steel

E. SSPC: The Society for Protective Coatings:

Steel Structures Painting Manual, Volumes 1 and 2

F. Steel Joist Institute (STEEL JOIST INSTITUTE):

Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders (Latest Edition).

G. U.S. Army Corps of Engineers:

CRD-C-621.....Specification for Non-Shrink Grout

PART 2 - PRODUCTS

2.1 OPEN WEB STEEL JOISTS:

K-Series conforming to STEEL JOIST INSTITUTE standard specifications.

2.3 ACCESSORIES – FITTINGS:

A. Accessories and fittings, including end supports and bridging, in accordance with standard STEEL JOIST INSTITUTE specification under which joists were designed.

B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.

C. High-strength bolts, including nuts and washers: ASTM A325 or A490 heavy hexagon structural bolts.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Fabrication and assembly in accordance with applicable standard STEEL JOIST INSTITUTE specification:

1. Make chord splices with full penetration welds capable of developing the ultimate strength in tension of the parent material. Make no allowance for the strength of back-up bars or other material incidental to welding.
2. Provide shop-welded connection plates at panel points to receive supplemental framing.

3. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
4. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable STEEL JOIST INSTITUTE specifications.
5. Ceiling Extensions: Provide ceiling extension in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 12 mm (1/2 inch) of finished wall surface unless otherwise indicated.
6. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with STEEL JOIST INSTITUTE specifications. Provide bridging anchors for ends of bridging lines terminating at walls or beams. Provide bridging adequate to resist the loads indicated on the Contract Documents.
7. End Anchorage: Provide end anchorages, including bearing plates, to secure joists to adjacent construction, complying with STEEL JOIST INSTITUTE specifications, unless otherwise indicated. Design all end anchorages to resist a minimum net uplift of 1.6 kPa (35 pounds per square foot) of supported area.
8. Header Units: Provide header units to support all joists at openings in floor or roof system not framed with steel shapes.
9. Provide supplemental steel support framing for metal deck where normal deck bearing is precluded by other framing members and minor openings.

3.2 SHOP PAINTING:

A. Shop painting in accordance with applicable STEEL JOIST INSTITUTE standard specification.
B. Shop paint joists and accessories with a rust-inhibiting primer paint. For joists which will be finish painted, limit paint to a primer which is compatible with specified finish paint. In high humidity areas, shop paint joists with a zinc-rich primer to receive top coats per the paint system manufacturer's recommendations.

3.3 ERECTION:

A. Installation of joists in accordance with applicable STEEL JOIST INSTITUTE standard specification.
B. Handle joists in a manner to avoid damaging of joists. Remove damaged joists from site, except when field repair is approved and such repairs are satisfactorily made in accordance with manufacturer's recommendations.

C. Accurately set joists and end anchorage in accordance with the applicable STEEL JOIST INSTITUTE standard specification. Secure joists resting on masonry or concrete bearing surfaces by welding or bolting to the steel bearing plates as indicated on the Contract Documents. Secure bridging and anchoring in place prior to application of any construction loads. Distribute any temporary loads so that carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging where joist lengths are 12 m (40 feet) and longer. Where joist lengths are 12 m (40 feet) and longer, install a center row of bolted diagonal bridging to provide lateral stability before slackening of hoisting lines.

3.4 FIELD PAINTING:

A. Clean abraded, corroded, and field welded areas and touch up with same type of paint used in shop painting.

B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

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SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Corrugated metal form deck supporting concrete fill as floor substrate.
   2. Single pan fluted metal roof deck as roof substrate.

1.2 RELATED REQUIREMENTS

A. Structural Steel Shapes: Section 05 21 00, STRUCTURAL STEEL FRAMING.
B. Color: Section 09 06 00, SCHEDULE FOR FINISHES.
C. Finish Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. AISI - American Iron and Steel Institute.
   1. S100-12 - Specification for the Design of Cold-formed Steel Structural Members.
C. American Welding Society (AWS):
   1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
   2. D1.3/D1.3M-08 - Structural Welding Code - Sheet Steel.
D. ASTM International (ASTM):
   1. A36/A36M-14 - Carbon Structural Steel.
   2. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
   4. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. E119-15 - Fire Tests of Building Construction and Materials.
E. FM Global (FM):
   1. 1-28-15 - Wind Design.
   2. Factory Mutual Research Approval Guide.
F. Master Painters Institute (MPI):
   1. No. 18 - Primer, Zinc Rich, Organic.
G. Military Specifications (Mil. Spec.):
   1. MIL-P-21035B - Paint, High Zinc Dust Content, Galvanizing Repair.

H. Steel Deck Institute (SDI):
   1. No. 31-07 - Design Manual for Composite Deck, Form Decks, and Roof Decks.

I. UL LLC (UL):
   1. Listed - Online Certifications Directory.
   2. 580-13 - Tests for Uplift Resistance of Roof Assemblies.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show layout, connections to supporting members, anchorage, sump pans, accessories, deck openings and reinforcements.
   2. Show similar information necessary for completing installation as shown and specified, including supplementary framing, ridge and valley plates, cant strips, cut openings, special jointing or other accessories.
   3. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.
   4. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.

C. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Show steel decking section properties and structural characteristics.

D. Certificates: Certify each product complies with specifications.
   1. Fire Resistance Product Listing: For each metal deck type and thickness supporting concrete slab or fill.
   2. Show steel decking is UL Listed for specified application.
   3. Show noise reduction coefficient test results.

E. Qualifications: Substantiate qualifications comply with specifications.
   1. Welders and welding procedures.

F. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

1.5 QUALITY ASSURANCE

A. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in "Factory Mutual Research Approval Guide" for "Class 1" fire rated construction.

B. Welders and Welding Procedures Qualifications: AWS D1.3/D1.3M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design steel decking and accessories according to AISI S100.

1. Wind Uplift Resistance and Corner Conditions:
   a. See plans.
   b. Other Roof Areas: 1.4 kPa (30 psf), minimum.
2. Fire Resistance: ASTM E119; as component of 1 hour rated roof assembly.
3. Noise Reduction Coefficient (NRC): Minimum 0.90 when tested according to ASTM C423.
4. Design side and end closures and attachment to supporting steel to safely support wet weight of concrete and construction loads.
   a. Cantilever Closure Deflection: 3 mm (1/8 inch), maximum.

2.2 MATERIALS

A. Painted Steel Sheet: ASTM A1008/A1008M, Grade C or D, shop primed.

B. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section 09 91 00, PAINTING primer coating shall be compatible with specified finish painting.

C. Steel Shapes: ASTM A36/A36M.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 METAL ROOF DECK

A. Metal Roof Deck: UL Listed as metal roof deck panels.

1. Steel decking of the type, depth, thickness, and section properties as shown.

B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces as permanent support for superimposed loads.
   1. Deck Style:
      a. Wide Rib (Type B) deck.
   2. Depth and Thickness: As indicated on drawings.
   3. Material: Painted sheet steel.

C. Do not use steel deck for hanging supports of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

D. Include integral system for steel decking units used for interstitial levels.
   1. Provide system suitable for simple point of attachment for light duty hanger devices.
   2. Provide system suitable to allow for flexibility for attaching hangers for support of suspended ceilings, electrical, plumbing, heating, or air conditioning items, weight not to exceed 50 kg/m2 (10 psf).
   3. Provide a minimum spacing pattern of 300 mm (12 inches) on centers longitudinally and 600 mm (24 inches) on centers transversely.
   4. Maximum allowable load suspended from any hanger: 23 kg (50 pounds).
   5. System consisting of fold-down type hanger tabs or lip hanger is acceptable.

2.5 FABRICATION

A. Fabricate steel decking in sufficient lengths to extend over 3 or more supports, except for interstitial levels.
   1. Cut metal deck units to proper length in shop.

B. Fabricate accessories required to complete installation of steel decking.
   1. Exposed to View: Fabricate from sheet steel matching metal decking.
   2. Concealed from View: Fabricate from galvanized sheet steel.

C. Sheet Metal Accessories:
   1. Metal Cover Plates: For end-abutting decking, to close gaps at changes in deck direction, columns, walls and openings.
      a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
   2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges.
      a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.

3. Metal Closure Strips: For openings between decking and other construction. Form to configurations required to provide tight-fitting closures at open ends of flutes and sides of decking.
   a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
4. Ridge and Valley Plates: Minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 1/24 (1/2 inch per foot).
   a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the drawings. Fabricate cant strips with minimum 125 mm (5 inch) face width.
   a. Sheet Steel: Minimum 0.8 mm (0.03 inch) thick.
6. Seat Angles for Deck: Provide where beam does not frame into column.
7. Sump Pans for Roof Drains: Fabricated from single piece galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges minimum 75 mm (3 inches) wide. Recess pans minimum 38 mm (1-1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Drain holes will be field cut.
   a. Sheet Steel: Minimum 1.7 mm (0.06 inch) thick.

2.6 FINISHES

A. Shop prime painted sheet steel with two coats of primer.

2.7 ACCESSORIES

A. Primer: Manufacturer's standard primer compatible with finish painting specified in Section 09 91 00, PAINTING.
B. Welding Materials: AWS D1.1, type to suit application.
C. Galvanizing Repair Paint: MPI No. 18.
D. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Remove contaminates from structural steel surfaces where steel decking will be welded.
D. Verify structural steel framing installation is completed, plumbed, and aligned with temporary bracing installed where required.

E. Coordinate with structural steel erector to prevent overloading of structural members when placing steel decking for installation.

3.2 ERECTION

A. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace deck units that become damaged after erection and before casting concrete at no cost additional to the Government.

B. Place steel decking at right angles to supporting members with ends located over supports.

C. Lap end joints 50 mm (2 inches), minimum.

D. Fluted Form Deck Fastening:

1. Fasten form deck to steel supporting members by welding.
    a. Welds: 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength.
    b. Weld Spacing: as noted on drawings.
    c. Where two units abut, fasten each unit individually to supporting steel framework.
2. End Closure Fastening: Tack weld or self-tapping No. 8 or larger machine screws at 900 mm (3 feet) on center.
    a. Longitudinal End Closure Fastening: Tack weld only.
3. Weld side laps of adjacent decking units.
    a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.

E. Corrugated Form Deck Fastening:

1. Weld end laps of corrugated form deck units in valley of side lap and at middle of sheet.
    a. Weld Spacing: as noted on drawings.
2. Weld corrugated deck to intermediate supports in X-pattern. Weld in valley of side laps on every other support and in valley of center corrugation on remaining support.
    a. Weld Spacing: Maximum 760 mm (30 inches) on center.

F. Roof Deck Fastening:

1. Fasten split or partial decking panels to structure in every valley.
2. Fasten decking to each supporting member at ribs where side laps occur.
    a. Power driven fasteners is acceptable in lieu of welding if strength equivalent to welding specified above is provided.

Submit test data and design calculations verifying equivalent design strength.

3. Mechanically fasten decking side laps with self-tapping No. 8 or larger machine screws.
   a. Fastener Locations: as noted on drawings
4. Provide additional fastening necessary to comply with UL Listing FM Approval for specified performance.

G. Cutting and Fitting:
1. Field cut steel decking to accommodate columns and other penetrating items.
2. Cut openings located and dimensioned on Structural Drawings.
3. Coordinate openings for other penetrations shown on approved submittal drawings but not shown on Structural Drawings.
   a. Cut and reinforce required opening.
4. Make cuts neat and trim using metal saw, drill or punch-out device. Cutting with torches is prohibited.
5. Do not make cuts in the metal deck that are not shown on the approved metal decking submittal drawings.
   a. When additional openings are required, submit scaled drawing, locating required opening and other openings and supports in immediate area.
   b. Do not cut the opening until drawing is approved by Contracting Officer's Representative.
   c. Provide additional reinforcing and framing required for opening.
   d. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected steel decking.
6. Opening Reinforcement: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work.

H. Touch up damaged factory finishes.
1. Apply touch up paint to damaged shop painted surfaces.

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

1. Interior load-bearing steel stud walls.

3. Exterior non-load-bearing steel stud curtain wall.

1.2 RELATED WORK:

A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.

B. Open web steel joists: Section 05 21 00, STEEL JOIST FRAMING.

C. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

D. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.

1.4 SUBMITTALS:

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

B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.

C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

1.5 APPLICABLE PUBLICATIONS:

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

B. American Iron and Steel Institute (AISI):

Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)

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

A36/A36M-08 .....Standard Specifications for Carbon Structural Steel

A123/A123M-09 .....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-09 .....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A307-10 .....Standard Specifications for Carbon Steel Bolts and Studs

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

C955 .....Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

C1107/C1107M-08 .....Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

E488-96(R2003) .....Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

E1190-95(R2007) .....Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

D. American Welding Society (AWS):

D1.3/D1.3M-08 .....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

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

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Sheet Steel for joists, studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G90 , with a yield of 340 MPa (50 ksi) minimum.

B. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G90, with a yield of 230 MPa (33 ksi) minimum.

C. Galvanizing Repair Paint: MIL-P-21035B.

D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 WALL FRAMING:

A. Steel Studs: Complying with ASTM C 955. Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:

1. Minimum Base-Steel Thickness(uncoated)as noted on drawings
2. Flange Width:1-5/8 inches
3. Web: Punched

B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: as noted on drawings.

2. Flange Width: as noted on drawings.

2.4 FRAMING ACCESSORIES:

A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Web stiffeners.

4. Gusset plates.

5. Deflection track and vertical slide clips.

6. Stud kickers and girts.

7. Joist hangers and end closures.

8. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS:

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

B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer’s standard elsewhere.

2.6 REQUIREMENTS:

A. Welding in accordance with AWS D1.3

B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Framing components may be preassembled into panels. Panels shall be square with components attached.

B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.

C. Hold members in place until fastened.

D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

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

3.2 ERECTION:

A. Handle and lift prefabricated panels in a manner as to not distort any member.

B. Securely anchor tracks to supports as shown.

C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.

D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.

E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.

F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.

G. Install headers in all openings that are larger than the stud spacing in that wall.

H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.

I. Studs in one piece for their entire length, splices will not be permitted.

J. Provide a load distribution member at top track where joist is not located directly over bearing stud.

K. Provide joist bridging and web stiffeners at reaction points where shown.

L. Provide end blocking where joist ends are not restrained from rotation.

M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.

N. Provide temporary bracing and leave in place until framing is permanently stabilized.

O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.

P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 TOLERANCES:

A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.

C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 FIELD REPAIR:

Touch-up damaged galvanizing with galvanizing repair paint.

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies wood blocking, , sheathing, furring, nailers, , rough hardware, and light wood construction.

1.2 RELATED WORK:

A. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.

B. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.

1.4 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 152 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.6 GRADING AND MARKINGS:

A. Any unmarked lumber or plywood panel for its grade and species will not be allowed on VA Construction sites for lumber and material not normally grade marked, provide manufacturer’s certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material meet the specified the specified requirements.

1.7 APPLICABLE PUBLICATIONS:

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

B. American Forest and Paper Association (AFPA):

NDS-15 .....National Design Specification for Wood Construction

WCD1-01 .....Details for Conventional Wood Frame Construction

C. American Institute of Timber Construction (AITC):

A190.1-07 .....Structural Glued Laminated Timber

D. American Society of Mechanical Engineers (ASME):

B18.2.1-12(R2013) .....Square and Hex Bolts and Screws

B18.2.2-10 .....Square and Hex Nuts
B18.6.1-81(R2008) .....Wood Screws

E. American Plywood Association (APA):
E30-11 .....Engineered Wood Construction Guide

F. ASTM International (ASTM):
A653/A653M-13 .....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
C954-11 .....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
C1002-14 .....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs
D198-14 .....Test Methods of Static Tests of Lumber in Structural Sizes
D2559-12a .....Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions
D3498-03(R2011) .....Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
F844-07a(R2013) .....Washers, Steel, Plan (Flat) Unhardened for General Use
F1667-13 .....Nails, Spikes, and Staples

G. American Wood Protection Association (AWPA):
AWPA Book of Standards

H. Commercial Item Description (CID):
A-A-55615 .....Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)

I. Forest Stewardship Council (FSC):
FSC-STD-01-001(Ver. 4-0) FSC Principles and Criteria for Forest Stewardship

J. Military Specification (Mil. Spec.):
MIL-L-19140E .....Lumber and Plywood, Fire-Retardant Treated

K. Environmental Protection Agency (EPA):
40 CFR 59(2014) .....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

M. U.S. Department of Commerce Product Standard (PS)

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

PS 20-10 .....American Softwood Lumber Standard

PART 2 - PRODUCTS

2.1 LUMBER:

A. Unless otherwise specified, each piece of lumber must bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.

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

C. Lumber Other Than Structural:

1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
2. Framing lumber: Minimum extreme fiber stress in bending of 7584 kPa (1100 PSI).
3. Furring, blocking, nailers and similar items 101 mm (4 inches) and narrower Standard Grade; and, members 152 mm (6 inches) and wider, Number 2 Grade.
4. Board Sub-flooring: Shiplap edge, 25 mm (1 inch) thick, not less than 203 mm (8 inches) wide.

D. Sizes:

1. Conforming to PS 20.
2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

E. Moisture Content:

1. Maximum moisture content of wood products is to be as follows at the time of delivery to site.
   a. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
   b. Lumber over 50 mm (2 inches) thick: 25 percent or less.

F. Fire Retardant Treatment:
   1. Comply with Mil Spec. MIL-L-19140.
   2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

G. Preservative Treatment:
   1. Do not treat Heart Redwood and Western Red Cedar.
   2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members provided 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 AWPA Book use category system standards U1 and T1, except any process involving the use of Chromated Copper Arsenate (CCA) or other agents classified as carcinogenic for pressure treating wood is not permitted.

2.4 STRUCTURAL-USE PANELS:

A. Comply with APA E30.

B. Bearing the mark of a recognized association or independent agency that maintains continuing control over quality of panel which identifies compliance by end use, Span Rating, and exposure durability classification.

C. Wall Sheathing:
   1. APA Rated sheathing panels, durability classification of Exposure 1 or Exterior Span Rating of 24/16.

2.5 ROUGH HARDWARE AND ADHESIVES:

D. Screws:
   1. Wood to Wood: ASME 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. Provide 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. Provide special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

F. Framing:
1. Fabricate of ASTM A653/A653M, Grade A; steel sheet not less than 1.3 mm (0.052 inch) thick unless specified otherwise. Apply standard plating to steel connectors after punching, forming and assembly of parts.
2. Framing Angles: Angle designed with bendable legs to provide three (3) way anchors.
3. Straps:
a. Designed to provide wind and seismic ties with sizes as shown or specified.
b. Strap ties not less than 32 mm (1-1/4 inches) wide.
c. Punched for fastener.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

A. Conform to applicable requirements of the following:
1. AFPA WCD1 for nailing and framing unless specified otherwise.
2. APA for installation of plywood or structural use panels.

B. Fasteners:
1. Nails.
a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA WCD1 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.
d. Use 8d or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
e. Use 16d or larger nails for nailing through 50 mm (2 inch) thick lumber.

f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.

2. Bolts:
   a. Fit bolt heads and nuts bearing on wood with washers.
   b. Countersink bolt heads flush with the surface of nailers.
   c. Embed in concrete and solid masonry or provide expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
   d. Provide toggle bolts to hollow masonry or sheet metal.
3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
   a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
   b. ASTM C954 for steel over 0.84 mm (0.033 inch) thick.
4. Power actuated drive pins may be provided where practical to anchor to solid masonry, concrete, or steel.
5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Provide metal plugs, inserts or similar fastening.
6. Screws to Join Wood:
   a. Where shown or option to nails.
   b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
   c. Spaced same as nails.

D. Cut notch, or bore in accordance with AFPA WCD1 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. Provide longest lengths practicable.
3. Provide 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 610 mm (24 inches) between ends.
   c. Stagger nails from side to side of wood member over 127 mm (5 inches) in width.
6. Unless otherwise shown, provide wall furring 25 mm by 75 mm (1 inch by 3 inch) continuous wood strips installed plumb on walls, using wood shims where necessary so face of furring forms a true, even plane. Space furring not over 406 mm (16 inches) on centers, butt

joints over bearings and rigidly secure in place. Anchor furring on 406 mm (16 inches) centers.

N. Sheathing:

1. Provide plywood or structural-use panels for sheathing.
2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
3. Set screws not less than 9 mm (3/8 inch) from edges.

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SECTION 07 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermal insulation.
    a. Batt or blanket insulation at exterior framed and furred walls.

1.2 RELATED REQUIREMENTS

A. Safing Insulation: Section 07 84 00, FIRESTOPPING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. C552-15 - Cellular Glass Thermal Insulation.
2. C553-13 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
3. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
4. C954-15 - 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.
5. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
6. D312/D312M-15 - Asphalt Used in Roofing.
7. E84-15a - Surface Burning Characteristics of Building Materials.
8. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show insulation type, thickness, and R-value for each location.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Adhesive indicating manufacturer recommendation for each application.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.
B. Protect products from damage during handling and construction operations.
C. Protect foam plastic insulation from UV exposure.

1.7 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

A. Insulation Thickness:
1. Provide thickness indicated when R-value is not shown on drawings.
B. Insulation Types:
1. Provide one insulation type for each application.

2.2 THERMAL INSULATION

A. Exterior Framing or Furring Insulation:
1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.
B. Inside Face of Exterior Wall Insulation:
1. Mineral Fiber Board: ASTM C612, Type IB or II.
2. .

2.3 ACCESSORIES

A. Fasteners:
1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.
2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 50 mm (2 inches) diameter.
3. Impaling Pins: Steel pins with head minimum 50 mm (2 inches) diameter.

a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
b. Adhesive: Type recommended by manufacturer to suit application.

B. Insulation Adhesive:
1. Nonflammable type recommended by insulation manufacturer to suit application.

C. Tape:
1. Pressure sensitive adhesive on one face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.
C. Install board insulation with joints close and flush, in regular courses, and with end joints staggered.
D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal penetrations, terminations, facing joints, facing cuts, tears, and unlapped joints with tape.
E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

A. Perimeter Insulation In Contact with Soil:
1. Vertical insulation:
a. Fill joints of insulation with same material used for bonding.
b. Bond polystyrene board to surfaces with adhesive.
c. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

2. Horizontal insulation under concrete floor slab:
   a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
   b. Extend insulation from foundation walls towards center of building minimum 600 mm (24 inches).

B. Exterior Framing or Furring Insulation:
1. General:
   a. Open voids are not acceptable.
   b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
   c. Pack behind outlets, around pipes, ducts, and services encased in walls.
   d. Hold insulation in place with pressure sensitive tape.
   e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.
2. Metal Studs:
   a. Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.

C. Inside Face of Exterior Wall Insulation:
1. Location: On interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to face of studs to support interior wall finish where indicated.
2. Bond insulation to solid vertical surfaces with adhesive. Fill joints with adhesive cement.
3. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings maximum 300 mm (12 inches) on center. Stagger fasteners at board joints. Install fasteners at each corner.

3.4 CLEANING

A. Remove excess adhesive before adhesive sets.

3.5 PROTECTION

A. Protect insulation from construction operations.
B. Repair damage.

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SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

B. Roof and deck insulation, substrate board, vapor retarder, and cover board on substrates ready to receive roofing or waterproofing membrane.

C. Repairs and alteration work to existing roof insulation.

1.2 RELATED REQUIREMENTS

A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13,

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

1. Standard 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. ASTM International (ASTM):

1. C552-15 - Cellular Glass Thermal Insulation.
2. C726-05 - Mineral Fiber Roof Insulation Board.
3. C1177/C1177M-13 - Glass Mat Gypsum Substrate for Use as Sheathing.
4. C1278/C1278M-07a(2015) - Fiber-Reinforced Gypsum Panel.
5. C1289-15 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
6. C1396/C1396M-14a - Gypsum Board.
7. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
8. D312-06 - Asphalt Used in Roofing.
9. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
10. E84-15a - Surface Burning Characteristics of Building Materials.
11. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

D. National Roofing Contractors Association (NRCA):

1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.

E. U.S. Department of Agriculture (USDA):

1. USDA BioPreferred Program Catalog.

F. UL LLC (UL):

1. Listed - Online Certifications Directory.

G. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
   1. DOC PS 1-09 - Structural Plywood.
   2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show size, configuration, and installation details.
      a. Nailers, cants, and terminations.
      b. Layout of insulation showing slopes, tapers, penetrations, and edge conditions.

C. Manufacturer's Literature and Data:
   1. Description of each product.

D. Samples:
   1. Roof insulation, each type.
   2. Fasteners, each type.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Same installer as Division 07 roofing section installer.

1.6 DELIVERY

A. Comply with recommendations of NRCA Manual.

B. Deliver products in manufacturer's original sealed packaging.

C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.

D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Comply with recommendations of NRCA Manual.

B. Store products indoors in dry, weathertight facility.

C. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:

1. Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant substrate board, vapor retarder, insulation, and cover board against material and manufacturing defects as part of Division 07 roofing system warranty.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Insulation Thermal Performance:

1. Overall Average R-Value: RSI-57 (R-33), minimum.
2. Any Location R-Value: RSI-17 (R-10), minimum.

B. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.

C. Insulation on Metal Decking: UL labeled indicating compliance with one of the following:

1. UL Listed.

2.2 PRODUCTS - GENERAL

A. Provide each product from one manufacturer.

1. Insulation Recycled Content:
   a. Mineral Fiber: 75 percent total recycled content, minimum.
   b. Fiberglass: 20 percent total recycled content, minimum.
   c. Rigid Foam: 9 percent total recycled content, minimum.
   d. Glass Fiber Reinforced Rigid Foam: 6 percent total recycled content, minimum.

2.3 ADHESIVES

A. Primer: ASTM D41/D41M.

B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane

adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

F. Roof Cement: Asbestos free, ASTM D2822/D2822M, Type I or Type II; or, ASTM D4586/D4586M, Type I or Type II.

2.4 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.

C. Tapered Roof Insulation System:

1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. 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).

2.5 INSULATION ACCESSORIES

A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.

B. Cants and Tapered Edge Strips:

1. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
2. Tapered Edge Strips: 1/12 (1 inch per 12 inches), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
   a. Cellulosic Fiberboard: ASTM C208.
   b. Mineral Fiberboard: ASTM C726.

C. apor Retarder:

1. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV, asphalt impregnated.
2. Self-Adhering Sheet Vapor Retarder: ASTM D1970/D1970M, minimum 1.0 mm (40 mils) thick membrane of HDPE film fully coated with asphalt adhesive, or 0.76 to 1.0 mm (30 to 40 mils) thick membrane of butyl rubber based adhesive backed by a layer of high density

cross-laminated polyethylene; maximum permeance rating of 6 ng/Pa/s/sq. m (0.1 perms).

D. Substrate Board:
   1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, Type X, 16 mm (5/8 inch) thick, factory primed.

E. Cover Board:
   1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, 16 mm (5/8 inch) thick, factory primed.

2.6 ACCESSORIES

A. Fasteners: Corrosion-resistant carbon steel fasteners and galvalume-coated steel or plastic round plates for fastening substrate board and insulation to roof deck.

B. Nails: ASTM F1667; type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

3.3 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with requirements of UL for insulated steel roof deck.

C. Attach substrate board and other products to meet requirements of Division 07 roofing section.

3.4 SUBSTRATE BOARD INSTALLATION

A. Fasten substrate board to top flanges of steel decking to resist uplift pressures according requirements for specified roofing system.
   1. Locate the long dimension edge joints solidly bearing on top of decking ribs.

3.5 VAPOR RETARDER INSTALLATION

A. Vapor Retarder Installation, 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. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.

3.6 INSULATION INSTALLATION

A. Insulation Installation, General:
   1. 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. Provide thickness required to comply with specified thermal performance.
   2. Insulation on Metal Decks: Provide insulation in minimum thickness recommended by insulation manufacturer to span deck flutes. Support edges of insulation on metal deck ribs.
   3. When actual insulation thickness differs from drawings, coordinate alignment and location of roof drains, flashing, gravel stops, fascias and similar items.
   4. Where tapered insulation is used, maintain insulation thickness at high points and roof edges shown on drawings.
      a. Low Point Thickness: Minimum 38 mm (1-1/2 inches).
   5. Use minimum two layers of insulation when required thickness is 68 mm (2.7 inch) or greater.

C. Lay insulating units with close joints, in regular courses and with end joints staggered.
   1. Stagger joints between layers minimum 150 mm (6 inches).

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing.

E. Seal cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tightly 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 Insulation:
      a. Fasten insulation according to requirements in Division 07 roofing section.
      b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.

2. 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.

3.7 COVER BOARD INSTALLATION

A. Install cover boards over insulation with long joints in continuous straight lines with staggered end joints.

B. Offset cover board joints from insulation joints 150 mm (6 inches), minimum.

C. "Mechanically Fastened Insulation" requirements.

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SECTION 07 27 27
FLUID-APPLIED MEMBRANE AIR BARRIERS, VAPOR RETARDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fluid-applied vapor-retarding air barrier at exterior above grade wall assemblies.
   2. Connection to adjacent air barrier components providing a durable, continuous, full building air barrier.

1.2 RELATED REQUIREMENTS

A. General Quality Assurance and Quality Control Requirements: Section 01 45 29 TESTING LABORATORY SERVICES.
B. Masonry Unit Air Barrier Substrates: Section 04 20 00 UNIT MASONRY
C. Flashing Components of Factory Finished Roofing and Wall Systems Air Barriers Requiring Air Barrier Transitions: Division 07 roofing and wall system sections.
D. Metal Flashing Requiring Air Barrier Transitions: Section 07 60 00 FLASHING AND SHEET METAL.
E. Joint Sealants: Section 07 92 00 JOINT SEALANTS.
F. Exterior Wall Openings Requiring Air Barrier Transitions: Division 08 sections for aluminum-framed entrances and storefronts aluminum windows glazed aluminum curtain walls louvers and vents .
G. Wall Sheathings Air Barrier Substrates: Section 09 29 00 GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. Air Barrier Association of America (ABAA):
   1. Quality Assurance Program.
C. ASTM International (ASTM):
   1. C920-14a - Elastomeric Joint Sealants.
   2. C1193-13 - Use of Joint Sealants.
   3. D412-06a(2013) - Vulcanized Rubber and Thermoplastic Elastomers-Tension.
   4. E84-15a - Surface Burning Characteristics of Building Materials.
   5. E96/E96M-15 - Water Vapor Transmission of Materials.
   6. E162-15a - Surface Flammability of Materials Using a Radiant Heat Energy Source.

7. E783-02(2010) - Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
8. E1186-03(2009) - Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
9. E2178-13 - Air Permeance of Building Materials.
10. E2357-11 - Determining Air Leakage of Air Barrier Assemblies.

D. U.S. Environmental Protection Agency (EPA):
1. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Consumer and Commercial Products.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
1. Indicate size, configuration, and fabrication and installation details.

B. Manufacturer's Literature and Data:
1. Description of each product.
2. Installation instructions.

C. Sustainable Construction Submittals:

D. Test reports:
1. Submit field inspection and test reports.

E. Certificates: Certify each product complies with specifications.

F. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer with project experience list.
2. Installer with project experience list.
a. Certify installer approval by air barrier manufacturer.

G. Installation Audit:
1. Submit audit report.

1.5 QUALITY ASSURANCE

A. Coordinate work with adjacent and related work to provide continuous, unbroken, durable air barrier system.

B. Manufacturer Qualifications:
1. Regularly and presently manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
3. Accreditation by ABAA.

C. Installer Qualifications:
1. Regularly and presently installs specified products.

2. Approved by manufacturer.
3. Applicators certified according to ABAA Quality Assurance Program.
4. Applicators trained and certified by manufacturer of air barrier system.
5. Full time on-site field supervisor has completed three projects of similar scope within last year.
6. Field Supervisor: Holds Sealant, Waterproofing, and Restoration Institute (SWRI) Wall Coating Validation Program Certificate, or similar qualification acceptable to Contracting Officer's Representative.

D. Testing Agency Qualifications:
1. Accredited by International Accreditation Service, Inc. or American Association for Laboratory Accreditation.
2. Certified perform ABAA Quality Assurance Program installer audits.
3. Staff experienced in installation of specified system and qualified to perform observation and inspection specified and determine compliance with project requirements.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight, conditioned facility.
B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:
1. Work Area Ambient Temperature Range: 4 to 32 degrees C (40 to 90 degrees F) continuously, beginning 48 hours before installation.

B. Surface Requirements: visibly dry, and complying with manufacturer's instructions.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Air-Barrier Assembly Air Leakage: Maximum 0.2 L/s/sq. m (0.04 cfm/sq. ft.) of surface area at 75 Pa (1.57 psf) differential pressure when tested according to ASTM E2357.

2.2 PRODUCTS - GENERAL

A. Provide air barrier system components from one manufacturer.

2.3 AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier:
   1. Elastomeric, modified bituminous or synthetic polymer membrane.
   2. Air Permeance: ASTM E2178: 0.2 L/s/sq. m (0.04 cfm/sq. ft.) of surface area at 75 Pa (1.57 psf) differential pressure.
   3. Vapor Permeance: ASTM E96/E96M: Maximum 5.8 ng/Pa/s/sq. m (0.1 perms).
   4. Elongation: Ultimate, ASTM D412, Die C: 500 percent, minimum.
   5. Thickness: Minimum 1.0 mm (40 mils) dry film thickness, applied in single continuous coat.
   6. Surface Burning Characteristics: When tested according to ASTM E84S.
      a. Flame Spread Rating: 25 maximum.
      b. Smoke Developed Rating: 450 maximum.

2.4 ACCESSORIES

A. Primer: Waterborne primer complying with VOC requirements, recommended air barrier manufacturer to suit application.

B. Counterflashing Sheet: Modified bituminous, minimum 1.0 mm (40 mils) thick, self-adhering composite sheet consisting of minimum 0.8 mm (33 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 pcf) density, with maximum flame-spread index of 25 when tested according to ASTM E84.

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 C920, 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 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Correct substrate deficiencies:
   1. Remove projections and excess materials and fill voids with substrate patching material.
   2. Remove contaminants capable of affecting subsequently installed product's performance.
D. Prepare and treat substrate joints and cracks according to ASTM C1193 and membrane air barrier manufacturer's instructions.

3.2 INSTALLATION - AIR BARRIER

A. Install products according to manufacturer's instructions and approved submittals drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
B. Install air barrier components according to requirements of ABAA Quality Assurance Program.
C. Apply primer.
D. Install transition strips and accessory materials.
E. Seal air barrier to adjacent components of building air barrier system.
F. Install flexible opening transition at each opening perimeter. Extend transition onto each substrate minimum 75 mm (3 inches).
   1. Fill gaps at perimeter of openings with foam sealant.
G. At penetrations, seal transition strips around penetrating objects with termination mastic.
   1. Fill gaps at perimeter of penetrations with sprayed polyurethane foam sealant.
H. At top of through-wall flashings, seal with continuous transition strip of manufacturer's recommended material to suit application.
I. Apply air barrier in full contact with substrate to produce continuous seal with transitions.
J. Apply fluid membrane in thickness recommended by manufacturer, and minimum specified thickness.

K. Leave air barrier exposed until tested and inspected and tested by Contracting Officer's Representative.

3.3 FIELD QUALITY CONTROL

A. Field Inspections and Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
   1. Perform inspections and tests before concealing air barrier with subsequent work.

B. Inspections:
   1. Compatibility of materials within air barrier system and adjacent materials.
   2. Suitability of substrate and support for air barrier.
   3. Suitability of conditions under which air barrier is applied.
   4. Adequacy of substrate priming.
   5. Application and treatment of joints and edges of transition strips, flexible opening transitions, and accessory materials.
   6. Continuity and gap-free installation of air barrier, transition strips, and accessory materials.

C. Field Tests:
   1. Qualitative air-leakage testing according to ASTM E1186.
   2. Quantitative air-leakage testing according to ASTM E783.

D. Inspection and Test Frequency: Determined by installed air barrier surface area.
   1. Up to 900 sq. m (10,000 sq. ft.): One inspection.
   2. 901 - 3,300 sq. m (10,001 - 35,000 sq. ft.): Two inspections.
   3. 3,300 - 7,000 sq. m (35,001 - 75,000 sq. ft.): Three inspections.
   4. 7,001 - 11,600 sq. m (75,001 - 125,000 sq. ft.): Four inspections.
   5. 11,601 - 19,000 sq. m (125,001 - 200,000 sq. ft.): Five inspections.
   6. Over 19,000 sq. m (200,000 sq. ft.): Six inspections.

E. Submit inspection and test reports to Contracting Officer's Representative within seven calendar days of completing inspection and test.

F. Audit:
   1. Provide installer and site inspection audit by ABAA.
   2. Coordinate scheduling of work and associated audit inspections.
   3. Cooperate with ABAA's testing agency. Allow access to work and staging areas.
   4. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection.

5. Pay for site inspections by ABAA to verify conformance with the ABAA Quality Assurance Program.

G. Defective Work:

1. Correct deficiencies, make necessary repairs, and retest as required to demonstrate compliance with specified requirements.

3.4 CLEANING

A. Remove masking materials.

B. Clean spills and overspray using cleaning agents recommended by manufacturers of affected construction.

3.5 PROTECTION

A. Protect air barrier from construction operations.

B. Protect air barrier from exposure to UV light exposure exceeding manufacturer's recommendation.

C. Replace overexposed materials and retest.

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SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

1.2 RELATED REQUIREMENTS

A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13,

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

1. FX-1-01(R2006) - Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):

1. 7-10 - Minimum Design Loads for Buildings and Other Structures.

D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

1. 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

E. ASTM International (ASTM):

1. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
2. C140/C140M-15 - Sampling and Testing Concrete Masonry Units and Related Units.
3. D6878/D6878M-13 - Thermoplastic Polyolefin Based Sheet Roofing.

F. National Roofing Contractors Association (NRCA):

1. Manual-15 - The NRCA Roofing Manual: Membrane Roofing Systems.

G. U.S. Department of Agriculture (USDA):

H. UL LLC (UL):

1. 580-06 - Tests for Uplift Resistance of Roof Assemblies.
2. 1897-15 - Uplift Tests for Roof Covering Systems.

I. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.

1. Required Participants:
   a. Contracting Officer's Representative.
   b. Inspection and Testing Agency.
   c. Contractor.
   d. Installer.
   e. Manufacturer's field representative.
   f. Other installers responsible for adjacent and intersecting work, including roof deck, flashings, roof penetrations, roof accessories, utility penetrations, rooftop curbs and equipment.
2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
   a. Installation schedule.
   b. Installation sequence.
   c. Preparatory work.
   d. Protection before, during, and after installation.
   e. Installation.
   f. Terminations.
   g. Transitions and connections to other work.
   h. Inspecting and testing.
   i. Other items affecting successful completion.
   j. Pullout test of fasteners.
   k. Material storage, including roof deck load limitations.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Roof membrane layout.
   2. Roofing membrane fastener pattern and spacing.
   3. Roofing membrane seaming and joint details.
   4. Roof membrane penetration details.
   5. Base flashing and termination details.
   6. Walk Pad layout and details.

C. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Minimum fastener pullout resistance.
   3. Installation instructions.

4. Warranty.

D. Samples:
   1. Roofing Membrane: 150 mm (6 inch) square.
   2. Base Flashing: 150 mm (6 inch) square.
   3. Fasteners: Each type.
   4. Roofing Membrane Seam: 300 mm (12 inches) square.

E. Certificates: Certify products comply with specifications.
   1. Fire and windstorm classification.
   2. High wind zone design requirements.
   3. Energy performance requirements.

F. Qualifications: Substantiate qualifications comply with specifications.
   1. Installer, including supervisors with project experience list.
   2. Manufacturer's field representative with project experience list.

G. Field quality control reports.

H. Temporary protection plan. Include list of proposed temporary materials.

I. Operation and Maintenance Data:
   1. Maintenance instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Approved by roofing system manufacturer as installer for roofing system with specified warranty.
   2. Regularly installs specified products.
   3. Installed specified products with satisfactory service on five similar installations for minimum five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.
   4. Employs full-time supervisors experienced installing specified system and able to communicate with Contracting Officer's Representative and installer's personnel.

B. Manufacturer's Field Representative:
   1. Manufacturer's full-time technical employee or independent roofing inspector.
   2. Individual certified by Roof Consultants Institute as Registered Roof Observer.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Comply with NRCA Manual storage and handling requirements.

B. Store products indoors in dry, weathertight facility.

C. Store adhesives according to manufacturer's instructions.

D. Protect products from damage during handling and construction operations.

E. Products stored on the roof deck must not cause permanent deck deflection.

1.9 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.
2. Weather Limitations: Install roofing only during dry current and forecasted weather conditions.

1.10 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant roofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the roofing system materials or workmanship of the installer.

1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Roofing System: Thermoplastic Polyolefin (TPO) sheet roofing mechanically fastened to roof deck.

2.2 SYSTEM PERFORMANCE

A. Design roofing system complying with specified performance:

1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
2. Energy Performance:
   a. EPA Energy Star Listed for low-slope roof products.

2.3 PRODUCTS - GENERAL

A. Provide roof system components from one manufacturer.

2.4 TPO ROOFING MEMBRANE

1. TPO Sheet: ASTM D6878/D6878M, internally fabric or scrim reinforced, 1.5 mm (60 mils) thick, with no backing.

2.5 MEMBRANE ACCESSORY MATERIALS

A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.

B. Factory Formed Flashings: Inside and outside corners, pipe boots, and other special flashing shapes to minimize field fabrication.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Metal Termination Bars: Manufacturer's standard, stainless-steel or aluminum, 25 mm wide by 3 mm thick (1 inch wide by 1/8 inch thick) factory drilled for fasteners.

E. Battens: Manufacturer's standard, galvannealed or galvanized steel sheet, 25 mm wide by 1.3 mm thick (1 inch wide by 0.05 inch thick), factory punched for fasteners.

F. Fasteners: Manufacturer's standard coated steel with metal or plastic plates, to suit application.

G. Primers, Sealers, T-Joint Covers, Lap Sealants, and Termination Reglets: As specified by roof membrane manufacturer.

H. 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.

2.6 WALKWAY PADS

A. Manufacturer's standard, slip-resistant rolls, minimum 900 mm (3 feet) wide by 5 mm (3/16 inch) thick.

2.7 ACCESSORIES

A. Temporary Protection Materials:

1. Expanded Polystyrene (EPS) Insulation: ASTM C578.
2. Plywood: NIST DOC PS 1, Grade CD Exposure 1.
3. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine and verify substrate suitability with roofing Installer and roofing inspector present.
   1. Verify roof penetrations are complete, secured against movement, and firestopped.
   2. Verify roof deck is adequately secured to resist wind uplift.
   3. Verify roof deck is clean, dry, and in-plane ready to receive roofing system.

B. Correct unsatisfactory conditions before beginning roofing work.

3.2 PREPARATION

A. Complete roof deck construction before beginning roofing work:
   1. Curbs, blocking, edge strips, nailers, and other components to which insulation, roofing, and base flashing is attached in place ready to receive insulation and roofing.
   2. Coordinate roofing membrane installation with flashing work and roof insulation work so insulation and flashing are installed concurrently to permit continuous roofing operations.
   3. Complete installation of flashing, insulation, and roofing in same day except for the area where temporary protection is required when work is stopped for inclement weather or end of work day.

B. Dry out surfaces including roof deck flutes, that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates, only.

C. Broom clean roof decks. Remove dust, dirt and debris.

D. Remove projections capable of damaging roofing materials.

E. Existing Membrane Roofs and Repair Areas:
   1. Comply with requirements in Section 07 01 50.19 PREPARATION FOR REROOFING.

3.3 TEMPORARY PROTECTION

A. 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.

B. Install temporary cap flashing over top of base flashings where permanent flashings are not in place to protect against water intrusion into roofing system. Securely anchor in place to prevent blow off and damage by construction activities.

C. Temporarily seal exposed insulation surfaces within roofing membrane.
   1. Apply temporary seal and water cut off by extending roofing membrane beyond insulation and securely embedding edge of the roofing membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant. Weight roofing membrane edge with sandbags, to prevent displacement; space sandbags maximum 2400 mm (8 feet) on center.
   2. Direct water away from work. Provide drainage, preventing water accumulation.
   3. Check daily to ensure temporary seal remains watertight. Reseal open areas and weight down.

D. Before the work resumes, cut off and discard portions of roof membrane in contact with temporary seal.
   1. Cut minimum 150 mm (6 inches) back from sealed edges and surfaces.

E. Remove sandbags and store for reuse.

3.4 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with NRCA Manual installation requirements.

C. Comply with UL 580 for uplift resistance.

D. Do not allow membrane and flashing to contact surfaces contaminated with asphalt, coal tar, oil, grease, or other substances incompatible with TPO.

3.5 ROOFING INSTALLATION

A. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.

B. Begin installation at the low point of the roof and work towards the high point. Lap membrane shingled in water flow direction.

C. Position the membrane free of buckles and wrinkles.

D. Roll membrane out; inspect for defects as membrane is unrolled. Remove defective areas:
   1. Lap edges and ends of sheets 50 mm (2 inches) or more as recommended by the manufacturer.

2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434/D4434M.
3. Check seams to ensure continuous adhesion and correct defects.
4. Finish seam edges with beveled bead of lap sealant.
5. Finish seams same day as membrane is installed.
6. Anchor membrane perimeter to roof deck or parapet wall as indicated on drawings.
7. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.
8. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

E. Membrane Perimeter Anchorage:
1. Install batten at perimeter of each roof area, curb flashing, expansion joints and similar penetrations on top of roof membrane as indicated on drawings.
2. Mechanically Fastening:
   a. Space fasteners maximum 300 mm (12 inches) on center, starting 25 mm (1 inch) from ends.
   b. When battens are cut, round edges and corners before installing.
   c. After mechanically fastening strip cover and seal strip with a 150 mm (6 inch) wide roof membrane strip; heat weld to roof membrane and seal edges.
   d. At fascia-cants turn roofing membrane down over front edge of the blocking, or nailer. Secure roofing membrane to vertical portion of nailer; or, if required by the membrane manufacturer, with fasteners spaced maximum 150 mm (6 inches) on centers.
   e. At parapet walls intersecting building walls and curbs, secure roofing membrane to structural deck with fasteners 150 mm (6 inches) on centers or as shown in NRCA manual.

F. Adhered System:
1. Apply bonding adhesive in quantities required by roof membrane manufacturer.
2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of substrate with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's instruction, roll roofing membrane into adhesive minimizing voids and wrinkles.

4. Repeat for other half of sheet.

G. Mechanically Fastened System Installation:

1. Secure roofing membrane to structural deck with fasteners through battens to achieve specified wind uplift performance.
   a. Drill pilot holes for fasteners installed into cast-in-place concrete. Drill hole minimum 10 mm (3/8 inch) deeper than fastener penetration.
2. When fasteners are installed within membrane laps, locate battens minimum 13 mm (1/2 inch) from the edge of sheets.
3. Apply lap sealant under battens and anchor to deck while lap sealant is still fluid. Cover fastener head with fastener sealer.
4. Where fasteners are installed over roofing membrane after seams are welded, cover fasteners with minimum 200 mm (8 inch) diameter TPO membrane cap centered over fasteners. Where battens are used cover battens with minimum 200 mm (8 inch) wide TPO strip cap centered over batten. Splice caps to roofing membrane and finish edges with lap sealant.

3.6 FLASHING INSTALLATION

A. Install flashings same day as roofing membrane is installed. When flashing cannot be completely installed in one day, complete installation until flashing is watertight and provide temporary covers or seals.

B. Flashing Roof Drains:

1. Install roof drain flashing as recommended by roofing membrane manufacturer.
   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 TPO roofing membrane.
   c. Adhere roofing membrane to metal flashing with bonding adhesive.
2. Turn down the metal drain flashing and roofing membrane into drain body. Install clamping ring and strainer.

C. Installing Base Flashing and Pipe Flashing:

1. Install flashing sheet to pipes, wall or curbs to minimum200 mm (8 inches) above roof surfaces and extending roofing manufacturer's standard lap dimension onto roofing membranes.
   a. Adhere flashing with bonding adhesive.

b. Form inside and outside corners of flashing sheet according to NRCA manual. Form pipe flashing according to NRCA manual.
c. Lap ends roofing manufacturer's standard dimension.
d. Heat weld flashing membranes together and flashing membranes to roofing membranes. Finish exposed edges with lap sealant.
e. Install flashing membranes according to NRCA manual.

2. Anchor top of flashing to walls and curbs with fasteners spaced maximum150 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.

D. Installing Building Expansion Joints:
1. Install base flashing on curbs as specified.
2. Coordinate installation with roof expansion joint system .
3. Install flexible tubing 1-1/2 times the width of joint centered over joint. Cover tubing with flashing sheet adhered to base flashing and lapping base flashing roofing manufacturer's standard dimension. Finish edges of laps with sealant.

E. Repairs to Membrane and Flashings:
1. Remove sections of roofing membrane or flashing that are creased, wrinkled, or fishmouthed.
2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Heat weld to roofing membrane or flashing sheet. Finish edge of lap with lap sealant.

3.7 WALKWAY PAD INSTALLATION

A. Heat weld walkway sheet to roofing membrane at edges. Weld area 50 mm (2 inches) wide by the entire length of the walkway sheet.
B. Finish edges of laps with lap sealant.

3.8 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
1. Fastener Pull Out Tests: ANSI/SPRI FX-1; one test for every 230 sq. m (2,500 sq. ft.) of deck. Perform tests for each combination of fastener type and roof deck type before installing roof insulation.

a. Test at locations selected by Contracting Officer's Representative.
b. Do not proceed with roofing work when pull out resistance is less than manufacturer's required resistance.
c. Test Results:
1) Repeat tests using different fastener type or use additional fasteners achieve pull out resistance required to meet specified wind uplift performance.
2) Patch cementitious deck to repair areas of fastener tests holes.

2. Examine and probe roofing membrane and flashing seams in presence of Contracting Officer's Representative and Manufacturer's field representative.
3. Probe seams to detect marginal bonds, voids, skips, and fishmouths.
4. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through seams where directed by Contracting Officer's Representative.
5. Cut one sample for every 450 m (1500 feet) of seams.
6. Cut samples perpendicular to seams.
7. Failure of samples to pass ASTM D1876 test will be cause for rejection of work.
8. Repair areas where samples are taken and where marginal bond, voids, and skips occur.
9. Repair fishmouths and wrinkles by cutting to lay flat. Install patch over cut area extending 100 mm (4 inches) beyond cut.

B. Manufacturer Services:
1. Inspect initial installation, installation in progress, and completed work.
2. Issue supplemental installation instructions necessitated by field conditions.
3. Prepare and submit inspection reports.
4. Certify completed installation complies with manufacturer's instructions and warranty requirements.

3.9 CLEANING

A. Remove excess adhesive before adhesive sets.
B. Clean exposed roofing surfaces. Remove contaminants and stains.

3.10 PROTECTION

A. Protect roofing system from traffic and construction operations.

1. Protect roofing system when used for subsequent work platform, materials storage, or staging.
2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.

B. Loose lay temporary insulation board overlaid with plywood or OSB.
   1. Weight boards to secure against wind uplift.

C. Remove protective materials immediately before acceptance.

D. Repair damage.

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SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, and formed expansion joint covers are specified in this section.

1.2 RELATED WORK

A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.

C. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.

D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.

E. Color of factory coated exterior architectural metal and anodized aluminum items: Section 09 06 00, SCHEDULE FOR FINISHES.

F. Integral flashing components of manufactured roof specialties and accessories or equipment: Division 22, PLUMBING sections and Division 23 HVAC sections.

G. Paint materials and application: Section 09 91 00, PAINTING.

I. Flashing of Roof Drains: Section 22 14 00, FACILITY STORM DRAINAGE.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

C. American National Standards Institute/Single-Ply Roofing Institute/Factory Mutual (ANSI/SPRI/FM):

4435/ES-1-11 .....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

D. American Architectural Manufacturers Association (AAMA):

AAMA 620-02 .....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum

AAMA 621-02 .....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural

Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

E. ASTM International (ASTM):

A240/A240M-15 .....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A653/A653M-15 .....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process

B32-14 .....Solder Metal

B209-14 .....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

D412-15 .....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

D3656-13 .....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

D4586-12 .....Asphalt Roof Cement, Asbestos Free

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

G. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06 .....Metal Finishes Manual

H. Federal Specification (Fed. Spec):

A-A-1925A .....Shield, Expansion; (Nail Anchors)

UU-B-790A .....Building Paper, Vegetable Fiber

I. International Code Commission (ICC): International Building Code, Current Edition

1.4 PERFORMANCE REQUIREMENTS

A. Wind Design Standard: Fabricate and install copings/roof-edge flashings tested per ANSI/SPRI/FM ES-1 to resist design pressure indicated on Drawings.

1.5 SUBMITTALS

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

B. Shop Drawings: For all specified items, including:
   1. Flashings
   2. Copings
   3. Fascia-cant

C. Manufacturer's Literature and Data: For all specified items, including:
   1. Two-piece counterflashing
   2. Thru wall flashing
   3. Fascia-cant

D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

A. 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//.

2.2 FLASHING ACCESSORIES

A. Fasteners:
   1. 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. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
   3. Rivets: Not less than 3 mm (1/8 inch) diameter.

4. Expansion Shields: Fed Spec A-A-1925A.

E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.

G. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B. Concealed Locations (Built into Construction):

c

1. Stainless steel: 0.25 mm (0.010 inch) thick.
2. Galvanized steel: 0.5 mm (0.021 inch) thick.

C. Exposed Locations:

1. Stainless steel: 0.4 mm (0.015 inch).

D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

A. Jointing:

1. In general, joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of material 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.
4. Flat and lap joints shall be made in direction of flow.

B. Expansion and Contraction Joints:

1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
2. Space joints as shown or as specified.
3. Space expansion and contraction joints for copper, stainless steel, and copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).

4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:
1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:
1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips or minimum 1.25 mm (0.050 inch) thick aluminum.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 0.8 mm (0.031 inch) thick stainless steel1.6 mm (0.0625 inch) thick aluminum.

E. Drips:
1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, wall copings, by folding edge back 13 mm (1/2

inch) and bending out 45 degrees from vertical to carry water away from the wall.

2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:

1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

G. Metal Options:

1. Where options are permitted for different metals use only one metal throughout match existing.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.
3. Where copper gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, or stainless steel.

2.5 FINISHES

A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.

B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.

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 621, high performance organic coating.

2.6 THROUGH-WALL FLASHINGS

A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
   1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
   2. Fabricate so keying nests at overlaps.

B. For Masonry Work When Concealed Except for Drip:
   1. Either copper, stainless steel, or copper clad stainless steel.
   2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
   3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.

C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
   1. Use same metal and thickness as counter flashing.
   2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
   3. Form exposed portion as snap lock receiver for counter flashing upper edge.

E. Window Sill Flashing and Lintel Flashing:
   1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
   2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
   3. Turn up back edge as shown.
   4. Form exposed portion with drip as specified or receiver.

F. Door Sill Flashing:
   1. Where concealed, use either 0.5 Kg (20 oz) copper, 0.5 mm (0.018 inch) thick stainless steel, or 0.5 mm (0.018 inch) thick copper clad stainless steel.
   2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
   3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

2.7 BASE FLASHING

A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
   1. Use either copper, or stainless steel, thickness specified unless specified otherwise.
   2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use either 0.5 Kg (20 oz) copper or 0.5 mm (0.018 inch) stainless steel.
   3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
   4. Use either copper, or stainless steel at pipe flashings.

B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).

C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.

D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.

E. Pipe Flashing: (Other than engine exhaust or flue stack)
   1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
   2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
   3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
      a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
      b. Allow for loose fit around and into the pipe.
   4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
      a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
      b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. Match Existing, unless specified otherwise.

B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:

1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
4. Manufactured assemblies may be used.
5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.

C. One-piece Counterflashing:
1. Back edge turned up and fabricate to lock into reglet in concrete.
2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).

D. Two-Piece Counterflashing:
1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
2. Counterflashing upper edge designed to snap lock into receiver.

E. Surface Mounted Counterflashing; one or two piece:
1. Use at existing or new surfaces where flashing can not be inserted in vertical surface.
2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

F. Pipe Counterflashing:

1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.
3. Fabricate draw band of same metal as counter flashing. Use 0.6 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.

2.14 REGLETS

A. Fabricate reglets of one of the following materials:
1. Stainless steel, not less than 0.3 mm (0.012 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.

2.15 INSULATED EXPANSION JOINT COVERS

A. Either type optional, use only one type throughout.

B. Types:
1. Construct of two preformed, stainless steel strips, not less than 0.4 mm (0.015 inch) thick, mechanically and adhesively bonded to both sides of a 2 mm (1/16 inch) thick neoprene or butyl sheet, or to a 0.4 mm (32 mil) thick reinforced chlorinated polyethylene sheet. Adhesively attach a 10 mm (3/8 inch) thick sheet of closed

cell, neoprene foam insulation, to the underside of the neoprene, butyl, or chlorinated polyethylene sheet.

2. Constructed of a 2 mm (1/16 inch) thick vinyl sheet, flanged at both sides with stainless steel strips not less than 0.4 mm (0.015 inch) thick. Vinyl sheet locked and encased by the stainless steel strip and prepunched for nailing. A 10 mm (3/8 inch) thick closed cell polyvinyl chloride foam insulating strip shall be heat laminated to the underside of the vinyl sheet between the stainless steel strips.

C. Expansion joint covers shall have factory fabricated mitered corners, crossing tees, and other necessary accessories. Furnish in the longest available lengths.

D. Metal flange of sufficient width to extend over the top of the curb and down curb sides 50 mm (2 inches) with hemmed edge for lock to edge strip.

2.17 SCUPPERS

A. Fabricate scuppers with minimum of 100 mm (4 inch) wide flange.

B. Provide flange at top on through wall scupper to extend to top of base flashing.

C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.

D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.

E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.

F. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.

G. 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. 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.
6. 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).

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.

3.3 BASE FLASHING

A. Install where roof membrane type base flashing is not used and where shown.
   1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
   2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
   3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
   4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.

B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.

C. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

3.5 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.

3.7 COPINGS

A. General:
   1. On walls topped with a wood plank, install a continuous edge strip on the front 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.

3.8 EXPANSION JOINT COVERS, INSULATED

A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.
B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.
C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

3.9 ENGINE EXHAUST PIPE OR STACK FLASHING

A. Set collar where shown and secure roof tabs or flange of collar to structural deck with 13 mm (1/2 inch) diameter bolts.
B. Set flange of sleeve base flashing not less than 100 mm (4 inch) beyond collar on all sides as specified for base flashing.
C. Install hood to above the top of the sleeve 50 mm (2 inch) and to extend from sleeve same distance as space between collar and sleeve beyond edge not sleeve:
1. Install insect screen to fit between bottom edge of hood and side of sleeve.
2. Set collar of hood in high temperature sealant and secure with one by 3 mm (1/8 inch) bolt on stainless steel draw band type, or stainless steel worm gear type clamp. Install sealant at top of head.

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SECTION 07 84 00
FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.

B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK:

A. 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.
PART 2 - PRODUCTS.

C. Installer qualifications.

D. Inspector qualifications.

E. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.

F. List of FM, UL, or WH classification number of systems installed.

G. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

H. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

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 QUALITY ASSURANCE:

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

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL’s “Qualified Firestop Contractor Program Requirements.” Submit qualification data.

C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

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. ASTM International (ASTM):

E84-14 .....Surface Burning Characteristics of Building Materials

E699-09 .....Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components

E814-13a .....Fire Tests of Through-Penetration Fire Stops

E2174-14 .....Standard Practice for On-Site Inspection of Installed Firestops

E2393-10a .....Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

C. FM Global (FM):

Annual Issue Approval Guide Building Materials

4991-13 .....Approval of Firestop Contractors

D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

723-10(2008) .....Standard for Test for Surface Burning Characteristics of Building Materials

1479-04(R2014) .....Fire Tests of Through-Penetration Firestops

E. Intertek Testing Services - Warnock Hersey (ITS-WH):

Annual Issue Certification Listings

F. Environmental Protection Agency (EPA):

40 CFR 59(2014) .....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS:

A. Provide 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. Firestop systems to accommodate building movements without impairing their integrity.

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 101 mm (4 in.) nominal pipe or 0.01 sq. m (16 sq. in.) in overall cross sectional area.

C. Firestop sealants used for firestopping or smoke sealing to have the following properties:

1. Contain no flammable or toxic solvents.
2. Release 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 installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
   a. Sealants: 250 g/L.
   b. Sealant Primers for Nonporous Substrates: 250 g/L.
   c. Sealant Primers for Porous Substrates: 775 g/L.

D. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to 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.

E. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.

F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.

G. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.

H. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 101 mm (4 in.) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS:

A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.

B. Provide mineral fiber filler and bond breaker behind sealant.

C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM 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:

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

B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items,

substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Remove dirt, grease, oil, laitance and form-release agents from concrete, 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 (6 inches) on each 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.

C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION:

A. Do not begin firestopping 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:

A. As work on each floor is completed, remove materials, litter, and debris.

B. Clean up spills of liquid type materials.

C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK:

A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).

B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section covers interior and exterior sealant and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK (INCLUDING BUT NOT LIMITED TO THE FOLLOWING):

A. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.

1.3 QUALITY ASSURANCE:

A. Installer Qualifications: An experienced installer with a minimum of three (3) years' experience and 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. Submit qualification.

B. Source Limitations: Obtain each type of joint sealant through one (1) source from a single manufacturer.

C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.

D. Lab Tests: Submit samples of materials that will be in contact or affect joint sealants to joint sealant manufacturers for tests as follows:
   1. Adhesion Testing: Before installing elastomeric sealants, test their adhesion to protect joint substrates according to the method in ASTM C794 to determine if primer or other specific joint preparation techniques are required.
   2. Compatibility Testing: Before installing elastomeric sealants, determine compatibility when in contact with glazing and gasket materials.
   3. Stain Testing: Perform testing per ASTM C1248 on interior and exterior sealants to determine if sealants or primers will stain

adjacent surfaces. No sealant work is to start until results of these tests have been submitted to the Contracting Officer Representative (COR) and the COR has given written approval to proceed with the work.

1.4 CERTIFICATION:

A. Contractor is to submit to the COR written certification that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

1.5 SUBMITTALS:

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

B. Installer qualifications.

C. Contractor certification.

E. Manufacturer's installation instructions for each product used.

F. Cured samples of exposed sealants for each color.

G. Manufacturer's Literature and Data:

1. Primers
2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

H. Manufacturer warranty.

1.6 PROJECT CONDITIONS:

A. Environmental Limitations:

1. Do not proceed with installation of joint sealants under following conditions:
   a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C (40 degrees F).
   b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 DELIVERY, HANDLING, AND STORAGE:

A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.

B. Carefully handle and store to prevent inclusion of foreign materials.

C. Do not subject to sustained temperatures exceeding 32 degrees C (90 degrees F) or less than 5 degrees C (40 degrees F).

1.8 DEFINITIONS:

A. Definitions of terms in accordance with ASTM C717 and as specified.

B. Backing Rod: A type of sealant backing.

C. Bond Breakers: A type of sealant backing.

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

1.9 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their sealant for a minimum of five (5) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.10 APPLICABLE PUBLICATIONS:

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

B. ASTM International (ASTM):

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

C612-14 .....Mineral Fiber Block and Board Thermal Insulation

C717-14a .....Standard Terminology of Building Seals and Sealants

C734-06(R2012) .....Test Method for Low-Temperature Flexibility of Latex Sealants after Artificial Weathering

C794-10 .....Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants

C919-12. .....Use of Sealants in Acoustical Applications.

C920-14a .....Elastomeric Joint Sealants.

C1021-08(R2014) .....Laboratories Engaged in Testing of Building Sealants
C1193-13 .....Standard Guide for Use of Joint Sealants.
C1248-08(R2012) .....Test Method for Staining of Porous Substrate by Joint Sealants
C1330-02(R2013) .....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
C1521-13 .....Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
D217-10 .....Test Methods for Cone Penetration of Lubricating Grease
D1056-14 .....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber
E84-09 .....Surface Burning Characteristics of Building Materials

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

D. Environmental Protection Agency (EPA):
40 CFR 59(2014) .....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SEALANTS:

A. Exterior Sealants:
1. Vertical surfaces, provide non-staining ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
2. Horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T.
3. Provide location(s) of exterior sealant as follows:
a. Joints formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Provide sealant at exterior surfaces of exterior wall penetrations.
b. Metal to metal.
cMasonry to Precast Concrete.d. Voids where items penetrate exterior walls.

B. Floor Joint Sealant:
1. ASTM C920, Type S or M, Grade P, Class 25, Use T.

2. Provide location(s) of floor joint sealant as follows.
   a. Seats of metal thresholds exterior doors.
   b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

C. Interior Sealants:
1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system are to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
   a. Architectural Sealants: 250 g/L.
   b. Sealant Primers for Nonporous Substrates: 250 g/L.
   c. Sealant Primers for Porous Substrates: 775 g/L.//
2. Vertical and Horizontal Surfaces: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
3. Food Service: Use a Vinyl Acetate Homopolymer, or other low VOC, non-toxic sealant approved for use in food preparation areas.
4. Provide location(s) of interior sealant as follows:
   a. Typical narrow joint 6 mm, (1/4 inch) or less at walls and adjacent components.
   b. Perimeter of doors, windows, access panels which adjoin concrete or masonry surfaces.
   c. Interior surfaces of exterior wall penetrations.
   d. Joints at masonry walls and columns, piers, concrete walls or exterior walls.
   e. Perimeter of lead faced control windows and plaster or gypsum wallboard walls.
   f. Exposed isolation joints at top of full height walls.

D. Acoustical Sealant:
1. Conforming to ASTM C919; flame spread of 25 or less; and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant have a consistency of 250 to 310 when tested in accordance with ASTM D217; remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734; and be non-staining.
2. Provide location(s) of acoustical sealant as follows:
   a. Exposed acoustical joint at sound rated partitions.
   b. Concealed acoustic joints at sound rated partitions.
   c. Joints where item pass-through sound rated partitions.

2.2 COLOR:

A. Sealants used with exposed masonry are to match color of mortar joints.

B. Sealants used with unpainted concrete are to match color of adjacent concrete.

C. Color of sealants for other locations to be light gray or aluminum, unless otherwise indicated in construction documents.

2.3 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 or synthetic rubber (ASTM C509), nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 degrees C (minus 26 degrees 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.

2.4 WEEPS:

A. Weep/Vent Products: Provide the following unless otherwise indicated or approved.

1. ROUND PLASTIC TUBING: MEDIUM-DENSITY POLYETHYLENE, 10 MM (3/8-INCH) OD BY THICKNESS OF STONE OR MASONRY VENEER. 2.4 FILLER:

A. Mineral fiberboard: ASTM C612, Class 1.

B. Thickness same as joint width.

C. Depth to fill void completely behind back-up rod.

2.5 PRIMER:

A. As recommended by manufacturer of caulking or sealant material.

B. Stain free type.

2.6 CLEANERS-NON POROUS SURFACES:

A. Chemical cleaners compatible with sealant and acceptable to manufacturer of sealants and sealant backing material. Cleaners to be 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 (The Professionals' Guide).

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 but are not limited to the following:
   a. Concrete.
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. Nonporous surfaces include but are not limited to the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces..

C. Do not cut or damage joint edges.

D. Apply non-staining 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 or as indicated by pre-construction joint sealant substrate test.
   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. Avoid application to or spillage onto adjacent substrate surfaces.

3.3 BACKING INSTALLATION:

A. Install backing 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 backing rod and position the rod at proper depth.

C. Cut fillers installed by others to proper depth for installation of backing rod and sealants.

D. Install backing 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 backing rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

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 degrees C and 38 degrees C (40 degrees and 100 degrees F).

2. Do not install 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 install 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 exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C1193 unless shown or specified otherwise in construction documents. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Remove any excess sealant from adjacent surfaces of joint, leaving the working in a clean finished condition.
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. Submit test reports.
11. Replace sealant which is damaged during construction process.

B. Weeps: Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, at all flashing, and as indicated on construction documents.
   1. Use round plastic tubing to form weep holes.
   2. Space weep holes formed from plastic tubing not more than 406 mm (16 inches) o.c.
   3. Trim tubing material used in weep holes flush with exterior wall face after sealant has set.

C. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.

D. Interior Sealants: Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cutouts to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform 10 tests for first 305 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform one test for each 305 m (1000 feet) of joint length thereafter or one test per each floor per elevation.

B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

C. Inspect tested joints and report on following:
   1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
   2. Compare these results to determine if adhesion passes sealant manufacturer’s field-adhesion hand-pull test criteria.
   3. Whether sealants filled joint cavities and are free from voids.
   4. Whether sealant dimensions and configurations comply with specified requirements.

D. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that

original sealant surfaces are clean and new sealant contacts original sealant.

3.7 CLEANING:

A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by manufacturer of the adjacent material or if not otherwise indicated by the caulking or sealant manufacturer.

B. Leave adjacent surfaces in a clean and unstained condition.

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SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow metal doors hung in hollow metal frames at interior locations.
2. Hollow metal door frames for wood doors and borrowed lights at interior locations.
3. Glazed openings and louvers in hollow metal doors.

1.2 RELATED REQUIREMENTS

A. Door Hardware: Section 08 71 00, DOOR HARDWARE.

B. Glazing: Section 08 80 00, GLAZING.

C. Card Readers and Biometric Devices: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM.

D. Security Monitors: Section 28 23 00, VIDEO SURVEILLANCE.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standard Institute (ANSI):

1. A250.8-2014 - Standard Steel Doors and Frames.

C. ASTM International (ASTM):

1. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
2. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip.
3. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
4. E90-09 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. Master Painters Institute (MPI):

1. No. 18 - Primer, Zinc Rich, Organic.

E. National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500-06 - Metal Finishes Manual.

F. National Fire Protection Association (NFPA):

1. 80-16 - Fire Doors and Other Opening Protectives.

G. UL LLC (UL):

1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
2. 1784-15 - Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Include schedule showing each door and frame requirements fire label and smoke control label for openings.
   3. Installation instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Regularly manufactures specified products.
   2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

1.6 DELIVERY

A. Fasten temporary steel spreaders across the bottom of each door frame before shipment.

B. Deliver products in manufacturer's original sealed packaging.

C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design hollow metal doors and frames complying with specified performance:

1. Fire Doors and Frames: UL 10C; NFPA 80 labeled.
   a. Fire Ratings: See drawings with schedule.
2. Smoke Control Doors and Frames: UL 1784; NFPA 80 labeled, maximum 0.15424 cu. m/s/sq. m (3.0 cfm/sf) at 24.9 Pa (0.10 inches water gage) pressure differential.

2.2 MATERIALS

A. Stainless Steel: ASTM A240/A240M; Type 304 .

B. Sheet Steel: ASTM A1008/A1008M, cold-rolled.

C. Galvanized Sheet Steel: ASTM A653.

D. Aluminum Sheet: ASTM B209M (ASTM B209).

E. Aluminum Extrusions: ASTM B221M (ASTM B221).

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide hollow metal doors and frames from one manufacturer.

2.4 HOLLOW METAL DOORS

A. Hollow Metal Doors: ANSI A250.8; 44 mm (1-3/4 inches) thick. See drawings for sizes and designs.

1. Interior Doors: Level 2 and Physical Performance Level B, heavy duty; Model 2, seamless at all hollow metal door locations.

B. Door Faces:

1. Interior Doors: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40) coating.

C. Door Cores:

1. Interior Doors: Kraft paper honeycomb.
2. Fire Doors: Manufacturer's standard complying with specified fire rating performance.

2.5 HOLLOW METAL FRAMES

A. Hollow Metal Frames: ANSI A250.8; face welded. See drawings for sizes and designs.

1. Interior Frames:
   a. Level 2 Hollow Metal Doors: 1.3 mm (0.053 inch) thick.
   b. Wood Doors and Borrowed Lights: 1.3 mm (0.053 inch) thick.

2. Interior Borrowed Light Frames: 1.3 mm (0.051 inch) thick.

B. Frame Materials:

1. Interior Frames: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40).

2.6 FABRICATION

A. Hardware Preparation: ANSI A250.8; for hardware specified in Section 08 71 00, DOOR HARDWARE.

B. Hollow Metal Door Fabrication:

1. Close top edge of exterior doors flush and seal to prevent water intrusion.
2. Fill spaces between vertical steel stiffeners with insulation.

C. Fire and Smoke Control Doors:

1. Close top and vertical edges flush.
2. Apply steel astragal to active leaf at pair and double egress doors.
   a. Exception: Where vertical rod exit devices are specified for both leaves swinging in same direction.
3. Fire and Smoke Control / Door Clearances: NFPA 80.

D. Custom Metal Hollow Doors:

1. Provide custom hollow metal doors where nonstandard steel doors are shown on drawings.
   a. Provide door sizes, design, materials, construction, gages, and finish as specified for standard steel doors.
2. Terminated Stops: ANSI A250.8.
3. Borrowed Light and Panel Opening Frames:
   a. Provide integral stop on exterior, corridor, or secure side of door.
   b. Design rabbet width and depth to receive glazing material or panel shown on drawings.
4. Frame Anchors:
   a. Floor anchors:
      1) Provide extension type floor anchors to compensate for depth of floor fills.
      2) Provide 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive floor fasteners.
      3) Provide mullion 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two floor fasteners and frame anchor screws.

4) Provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for floor fasteners and frame anchor screws for sill sections.
   a) Space floor bolts50 mm (24 inches) on center.

b. Jamb anchors:
   1) Place anchors on jambs:
      a) Near top and bottom of each frame.
      b) At intermediate points at maximum 600 mm (24 inches) spacing.
   2) Form jamb anchors from steel minimum 1 mm (0.042 inch) thick.
   3) Anchors for stud partitions: Provide tabs for securing anchor to sides of studs. Provide one of the following:
      a) Welded type.
      b) Lock-in snap-in type.
   4) Anchors for observation windows and other continuous frames set in stud partitions.
      a) Weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.
      b) Space maximum 600 mm (24 inches) on centers.
   5) Modify frame anchors to fit special frame and wall construction.
   6) Provide special anchors where shown on drawings and where required to suit application.

E. Louver Fabrication:
   1. Fabricate louvers as complete units.
   2. Weld stationary blades to frames.
   3. Factory install louvers in door cutouts, welded to door.
   4. Do not lap frame over louver opening.
   5. Miter frame corners and join by concealed mechanical fastenings extending about 57 mm (2-1/4 inches) into ends of each member.
   6. Drill frame and doors for screw attachment:
      a. Space screws 50 mm (2 inches) from end of each leg of frame and maximum 300 mm (12 inches) on center.

2.7 FINISHES

A. Steel Galvanized Steel: ANSI A250.8; shop primed.

B. Finish exposed surfaces after fabrication.

2.8 ACCESSORIES

A. Primers: ANSI A250.8.

B. Barrier Coating: ASTM D1187/D1187M.

C. Welding Materials: AWS D1.1/D1.1M, type to suit application.

D. Clips Connecting Members and Sleeves: Match door faces.

E. Fasteners: Galvanized steel.

1. Metal Framing: Steel drill screws.

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F. Galvanizing Repair Paint: MPI No. 18.

G. Insulation: Unfaced mineral wool.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Apply barrier coating to metal surfaces in contact with cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
2. Install fire doors and frames according to NFPA 80.
3. Install smoke control doors and frames according to NFPA 105.

3.3 FRAME INSTALLATION

A. Plumb, align, and brace frames 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 when shipping spreader is removed.
3. Where construction permits concealment, leave shipping spreaders in place after installation, otherwise remove spreaders when frames are set and anchored.
4. Remove wood spreaders and braces when walls are built and jamb anchors are secured.

B. Floor Anchors:

1. Anchor frame jambs to floor with two expansion bolts.
   a. Use 6 mm (1/4 inch) diameter bolts.
2. Power actuated drive pins are acceptable to secure frame anchors to concrete floors.

C. Jamb Anchors:
1. Metal Framed Walls: Secure anchors to sides of studs with two fasteners through anchor tabs.

D. Frames for Sound Rated Doors: Fill frames with insulation.

E. Touch up damaged factory finishes.
1. Repair galvanized surfaces with galvanized repair paint.
2. Repair painted surfaces with touch up primer.

3.4 DOOR INSTALLATION

A. Install doors plumb and level.

B. Adjust doors for smooth operation.

C. Touch up damaged factory finishes.
1. Repair galvanized surfaces with galvanized repair paint.
2. Repair painted surfaces with touch up primer.

3.5 CLEANING

A. Clean exposed door and frame surfaces. Remove contaminants and stains.

3.6 PROTECTION

A. Protect doors and frames from traffic and construction operations.

B. Remove protective materials immediately before acceptance.

C. Repair damage.

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SECTION 08 14 00
INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior flush wood doors transparent finish.
      a. Fire rated doors.
      b. Smoke rated doors.

1.2 RELATED REQUIREMENTS

A. Door Hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
B. Installation of Doors and Hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES; Section 08 71 00, DOOR HARDWARE //.
C. Door Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American National Standards Institute/Window and Door Manufacturers Association (ANSI/WDMA):
   1. I.S. 1A-13 - Architectural Wood Flush Doors.
C. ASTM International (ASTM):
   1. E90-09 - Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.
D. National Fire Protection Association (NFPA):
   1. 80-16 - Fire Doors and Other Opening Protectives.
   2. 252-12 - Fire Tests of Door Assemblies.
E. UL LLC (UL):
   1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
F. Window and Door Manufacturers Association (WDMA):
   1. TM 7-14 - Cycle-Slam Test.
   2. TM 8-14 - Hinge Loading Test.
   3. TM 10-14 - Screw Holding Capacity.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Submittal Drawings:
   1. Show size, configuration, and fabrication and installation details.
   2. Include details of glazing.

3. Indicate project specific requirements not included in Manufacturer's Literature and Data submittal.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Fire rated doors showing conformance with NFPA 80.

D. Samples:
1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
2. Veneer sample 200 mm by 275 mm (8 inch by 11 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.

E. Test Reports: Indicate each product complies with specifications.
1. Screw Holding Capacity Test.
2. Cycle-Slam Test.
3. Hinge-Loading Test.

F. Operation and Maintenance Data:
1. Care instructions for each exposed finish product.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Regularly and presently manufactures specified products.
2. Manufactures specified products with satisfactory service on five similar installations for minimum five years.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
1. Minimum 0.15 mm (6 mil) polyethylene bags or cardboard packaging to remain unbroken during delivery and storage.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
1. Identify door opening corresponding to Door Schedule.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.
1. Store doors according to ANSI/WDMA I.S. 1A.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.
   a. Comply with door manufacturer's instructions for relative humidity.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant interior factory finished wood doors against material and manufacturing defects.

1. Warranty Period: Lifetime of original installation.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide each product from one manufacturer.

2.2 FLUSH WOOD DOORS

A. General:

1. ANSI/WDMA I.S. 1A, Extra Heavy Duty.
2. Adhesive: Type II.
3. Core: Structural composite lumber, except when mineral core is required for fire rating.
4. Thickness: 44 mm (1-3/4 inches) unless otherwise shown or specified.
5. ANSI/WDMA I.S. 1A.
6. One species throughout project unless scheduled or otherwise shown.
7. Transparent Finished Faces: Match existing species and grade.
   a. Match face veneers for doors for uniform effect of color and grain at joints.
   b. Door Edges: Same species as door face veneer, except maple is acceptable for stile face veneer on birch doors.

c. In existing buildings, where doors are required to have transparent finish, use wood species, grade, and assembly of face veneers to match adjacent existing doors.

8. Painted Finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay.
9. Factory sand doors for finishing.

B. Wood For Stops, Louvers, Muntins and Moldings For Flush Doors Required to Have Transparent Finish:

1. Solid wood of same species as face veneer, except maple is acceptable on birch doors.
2. Glazing:
   a. On non-fire-rated doors, use applied wood stops nailed tightly on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on center.
3. Wood Louvers:
   a. Door manufacturer's standard product, fabricated of solid wood sections.
   b. Wood Slats: minimum 5 mm (3/16 inch) thick.
   c. Stiles routed out to receive slats.
   d. Secure louvers in prepared cutouts with wood stops.
4. Provide adequate blocking for bottom of doors having mechanically operated door bottom seal meeting or exceeding performance duty level per WDMA TM 10 for horizontal door edge screw holding.

C. Fire-Rated Wood Doors:

1. Fire Resistance Rating:
   a. B Label: 1-1/2 hours.
   b. C Label: 3/4 hour.
2. Labels:
   a. Comply with NFPA 252, UL 10C, and labeled by qualified testing and inspection agency showing fire resistance 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 TM 8. Average of 10 test samples for Extra Heavy Duty doors.

b. Direct Screw Withdrawal: WDMA TM 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 according to WDMA TM 7.

4. Hardware Reinforcement:
a. Provide fire and smoke rated doors with hardware reinforcement blocking.
b. Size of lock blocks as required to secure hardware specified.
c. Top, Bottom and Intermediate Rail Blocks: Minimum 125 mm (5 inches) by full core width.
d. Reinforcement blocking in compliance with labeling requirements.
e. Mineral material similar to core is not acceptable.

5. Other Core Components: Manufacturer's standard as allowed by labeling requirements.
6. Glazed Vision Panel Frame: Steel approved for use in labeled doors.
7. Astragal: Steel type for pairs of doors.

D. Smoke Barrier Doors:
1. Glazed Vision Panel Frame: Steel approved for use in labeled doors.
2. Astragal: Steel type for pairs of doors, including double egress doors.

E. Sound Rated Doors:
1. Fabricated as specified for flush wood doors with additional construction requirements to comply with specified sound transmission class (STC).
2. Accessories:
a. Frame Gaskets and Automatic Door Bottom Seal: As specified in Section 08 71 00, DOOR HARDWARE.

2.3 FABRICATION

A. Factory machine interior wood doors to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
1. Factory fit fire rated doors according to NFPA 80.

B. Rout doors for hardware using templates and location heights specified in Section 08 71 00, DOOR HARDWARE.

C. Factory fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (2 inches) of door thickness.

D. Clearances between Doors and Frames and Floors:
1. Fire Rated Doors: Comply with NFPA 80.

a. Doors with Automatic Bottom Seal: Maximum clearance 10 mm (3/8 inch) at threshold.
b. Other Door Bottoms: Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.

2. Door Jambs, Heads, and Meeting Stiles: Maximum 3 mm (1/8 inch).

E. Provide cutouts for glazed openings.

F. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.

G. Identify each door on top edge.

1. Mark with stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, date of manufacture and quality.
2. Mark door or provide separate certification including name of inspection organization.
3. Identify door manufacturing standard, including glue type.
4. Identify veneer and quality certification.
5. Identification of preservative treatment for stile and rail doors.

2.4 FINISHES

A. Field Finished Doors: Seal top and bottom edges of doors with two coats of catalyzed polyurethane or water resistant sealer.

B. Factory Transparent Finish:

1. Factory finish flush wood doors.
   a. ANSI/WDMA I.S. 1A Section F-3 Finish System Descriptions for System 5, Conversion Varnish or System 7, Catalyzed Vinyl.
   b. Use stain when required to produce finish specified in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Verify door frames are properly anchored.
2. Verify door frames are plumb, square, in plane, and within tolerances for door installation.

B. Protect existing construction and completed work from damage.

C. Install astragal on active leaf of pair of smoke doors and one leaf of double egress smoke doors.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. Install fire rated doors according to NFPA 80.
   2. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 PROTECTION

A. After installation, place shipping container over door and tape in place.
   1. Do not apply tape to door faces and edges.
B. Provide protective covering over exposed hardware in addition to covering door.
C. Maintain covering in good condition until removal is directed by Contracting Officer's Representative.

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SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and panels installed in ceilings.

1.2 RELATED REQUIREMENTS

A. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.

B. Field Painting: Section 09 91 00, PAINTING.

C. Access Doors for Plumbing Valves: Section 22 40 00, PLUMBING FIXTURES.

D. Locations of Access Doors for Ductwork Cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Welding Society (AWS):

1. D1.3/D1.3M-08 - Structural Welding Code - Sheet Steel.

C. ASTM International (ASTM):

1. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Sip Process.
2. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
3. A666-15 - Annealed or Cold-Worked Austenitic Stainless Steel sheet, Strip, Plate, and Flat Bar.
4. E119-15 - Fire Test of Building Construction and Materials.

D. National Fire Protection Association (NFPA):

1. 80-16 - Fire Doors and Other Opening Protectives.
2. 251-12 - Fire Tests of Door Assemblies.

E. National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500-06 - Metal Finishes Manual.

F. UL LLC (UL):

1. Listed - Online Certifications Directory.
2. 10B-08 - Standard for Fire Tests of Door Assemblies.
3. 263-11 - Fire Tests of Building Construction and Materials.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show size, configuration, and fabrication and installation details.
C. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Installation instructions.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.
B. Protect products from damage during handling and construction operations.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify field conditions affecting access door fabrication and installation. Show field measurements on Submittal Drawings.
   1. Coordinate field measurement and fabrication schedule to avoid delay.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A1008/A1008M.
B. Galvanized Steel: ASTM A 653/A 653M.
C. Stainless Steel: ASTM A666; Type 302 or Type 304.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Bilco Type E 36” X 36” Roof Hatch Ladder Access or equal.
B. Provide each product from one manufacturer.

2.3 ACCESS DOORS, FIRE-RATED

A. Door Construction:

1. Ceiling Access Door Construction: ASTM E119 or UL 263.
2. Wall Access Doors: NFPA 252 or UL 10B.

B. Label: Class B opening according to UL 10B or test by another nationally recognized laboratory where in rated assemblies, see Life Safety Plan. If 1 hour fire-rated with maximum temperature rise of 120 degrees C (216 degrees F).

C. Door Panel: Minimum 0.9 mm (0.0359 inch) thick steel sheet, with mineral-fiber insulation core, insulated sandwich type construction.

D. Frame: Minimum 1.5 mm (0.0598 inch) thick steel sheet, depth and configuration to suit material and construction type where installed.
1. Frame Flange: Provide at units installed in concrete, masonry, or gypsum board.
2. Exposed Joints in Flange: Weld and grind smooth.

E. Provide automatic closing device.

F. Hinge: Continuous hinge with stainless steel pin.

G. Lock: Self-latching, mortise type with provision for fitting flush a standard screw-in type lock cylinder.
1. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
2. Latch release device operable from inside of door.

H. Anchors for Fire-Rated Access Doors: Comply with requirements of applicable fire test.

2.4 ACCESS DOORS, FLUSH PANEL, NON-RATED

A. Door Panel:
1. 1.9 mm (0.07 inch) thick steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:
1. 1.5 mm (0.06 inch) thick steel sheet, depth and configuration to suit material and construction type where installed.
2. Frame Flange: Provide at units installed in concrete, masonry, and gypsum board.
3. Exposed Joints in Flange: Weld and grind smooth.

C. Hinge:
1. Concealed spring hinge, 175 degrees of opening.
2. Removable hinge pin to allow removal of door panel from frame.

D. Lock:

2.5 1. Confirm with project COR, any access door locations to receive keyed lock. ACCESS DOOR, RECESSED PANEL, NON-RATED

A. Door Panel:
   1. 1.2 mm (0.05 inch) thick steel sheet to form a 25 mm (1 inch) deep recessed pan to accommodate installation of acoustical units and other materials where shown in walls and ceiling.
   2. Reinforce to prevent sagging.

B. Frame:
   1. 1.5 mm (0.06 inch) thick steel sheet of depth and configuration to suit installation in suspension system of ceiling or wall framing.
   2. Extend sides of frame to protect edge of acoustical units when door panel is in open position.
   3. Provide shims, bushings, clips and other devices necessary for installation.

C. Hinge: Continuous steel hinge with stainless steel pin, or concealed hinge.

D. Lock:
   1. Flush screwdriver-operated cam lock.
   2. Plastic sleeve or stainless steel grommet to protect hole made in acoustical unit for screwdriver access to lock.

2.6 FABRICATION - GENERAL

A. Size: Minimum 600 mm (24 inches) square door unless otherwise shown on drawings.

B. Component Fabrication: Straight, square, flat and in same plane where required.
   1. Exposed Edges: Slightly rounded, without burrs, snags and sharp edges.
   2. Exposed Welds: Continuous, ground smooth.
   3. Welding: AWS D1.3/D1.3M.

C. Locks and Non-Continuous Hinges: Provide in numbers required to maintain alignment of door panel with frame. For fire-rated doors, provide hinges and locks as required by fire test.

D. Anchoring: Make provisions in frame for anchoring to adjacent construction. Provide anchors in size, number and location on four sides to secure access door to substrate.

2.7 FINISHES

A. Steel Paint Finish:

1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
   a. One coat primer.
   b. One coat thermosetting topcoat.
   c. Dry-film Thickness: 0.05 mm (2 mils) minimum.
   d. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.

B. Stainless Steel Exposed Surfaces: NAAMM AMP 500; No. 4 polished finish.

2.8 ACCESSORIES

A. Fasteners: Type and size recommended by access door manufacturer, to suit application.
   1. Stainless Steel Access Doors: Stainless steel fasteners.
   2. Other Access Doors: Stainless steel fasteners.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Verify access door locations and sizes provide required maintenance access to installed building services components.

B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions, and concealed above gypsum board and plaster ceilings.

C. Install fire rated access door according to NFPA 80.

D. Install fire-rated doors in fire-rated partitions and ceilings.

E. Install flush access panels in partitions and in gypsum board and plaster ceilings.

3.3 ACCESS DOOR AND FRAME INSTALLATION

A. Wall Installations: Install access doors in openings with sides vertical.

B. Ceiling Installations: Install access doors parallel to ceiling suspension grid or room partitions.
C. Frames without Flanges: Install frame flush with surrounding finish surfaces.
D. Frames with Flanges: Overlap opening, with face uniformly spaced from finish surface.
E. Recessed Panel Access Doors: Install with face of surrounding materials flush with door panel installed finish.
F. Secure frames to adjacent construction with fasteners.
G. Install type, size and quantity of anchoring device suitable for material surrounding opening to maintain alignment, and resist displacement, during normal use of access door.
H. Field Painting Primed Access Doors: Comply with the requirements of Section 09 91 00, PAINTING.

3.4 ADJUSTMENT

A. Adjust hardware so door panel opens freely.
B. Adjust door when closed so door panel is centered in frame.

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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

C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Painting: Section 09 91 00, PAINTING.

E. Card Readers: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.

F. Electrical: Division 26, ELECTRICAL.

G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 GENERAL

A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.

B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).

C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.

D. Hardware for application on metal and wood doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.

E. The following items shall be of the same manufacturer, except as otherwise specified:

1. Mortise locksets.
2. Hinges for hollow metal and wood doors.
3. Surface applied overhead door closers.

1.4 WARRANTY

A. Automatic door operators shall be subject to the terms of FAR Clause 52.246-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:

1. Locks, latchsets, and panic hardware: 5 years.
2. Door closers and continuous hinges: 10 years.

1.5 MAINTENANCE MANUALS

A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

1.6 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies (VISN Locksmith if the VAMC does not have a locksmith).

B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

C. Samples and Manufacturers' Literature:

1. Samples: All hardware items (proposed for the project) that have not been previously approved by Builders Hardware Manufacturers Association shall be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.
2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.

D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates

shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

1.7 DELIVERY AND MARKING

A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to Resident Engineer for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Resident Engineer's office until all other similar items have been installed in project, at which time the Resident Engineer will deliver items on file to Contractor for installation in predetermined locations on the project.

1.8 PREINSTALLATION MEETING

A. Convene a preinstallation meeting not less than 30 days before start of installation of door hardware. Require attendance of parties directly affecting work of this section, including Contractor and Installer, Architect, Project Engineer and VA Locksmith, Hardware Consultant, and Hardware Manufacturer’s Representative. Review the following:

1. Inspection of door hardware.
2. Job and surface readiness.
3. Coordination with other work.
4. Protection of hardware surfaces.
5. Substrate surface protection.
6. Installation.
7. Adjusting.
8. Repair.
9. Field quality control.
10. Cleaning.

1.9 INSTRUCTIONS

A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols. Symbols for hardware sets consist of letters (e.g., "HW") followed by a number. Each number designates a set of hardware items applicable to a door type.

B. Keying: All cylinders shall be keyed into existing Great Grand Master Key System. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be 7 pin type. Keying information shall be furnished at a later date by the Resident Engineer.

1.10 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.

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

F883-04 .....Padlocks

E2180-07.....Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials

C. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):

A156.1-06 .....Butts and Hinges

A156.2-03 .....Bored and Pre-assembled Locks and Latches

A156.3-08 .....Exit Devices, Coordinators, and Auto Flush Bolts

A156.4-08 .....Door Controls (Closers)

A156.5-14 .....Cylinders and Input Devices for Locks.

A156.6-05 .....Architectural Door Trim

A156.8-05 .....Door Controls-Overhead Stops and Holders

A156.11-14 .....Cabinet Locks

A156.12-05 .....Interconnected Locks and Latches

A156.13-05 .....Mortise Locks and Latches Series 1000

A156.14-07 .....Sliding and Folding Door Hardware

A156.15-06 .....Release Devices-Closer Holder, Electromagnetic and Electromechanical

A156.16-08 .....Auxiliary Hardware

A156.17-04 .....Self-Closing Hinges and Pivots

A156.18-06 .....Materials and Finishes

A156.20-06 .....Strap and Tee Hinges, and Hasps

A156.21-09 .....Thresholds

A156.22-05 .....Door Gasketing and Edge Seal Systems

A156.23-04 .....Electromagnetic Locks
A156.24-03 .....Delayed Egress Locking Systems
A156.25-07 .....Electrified Locking Devices
A156.26-06 .....Continuous Hinges
A156.28-07 .....Master Keying Systems
A156.29-07 .....Exit Locks and Alarms
A156.30-03 .....High Security Cylinders
A156.31-07 .....Electric Strikes and Frame Mounted Actuators
A156.36-10 .....Auxiliary Locks
A250.8-03 .....Standard Steel Doors and Frames

D. National Fire Protection Association (NFPA):
80-10 .....Fire Doors and Other Opening Protectives
101-09 .....Life Safety Code

E. Underwriters Laboratories, Inc. (UL):
Building Materials Directory (2008)

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. ANSI A156.1. Provide only three-knuckle hinges, except five-knuckle where the required hinge type is not available in a three-knuckle version (e.g., some types of swing-clear hinges). The following types of butt hinges shall be used for the types of doors listed, except where otherwise specified:
1. Exterior Doors: Type A2112/A5112 for doors 900 mm (3 feet) wide or less and Type A2111/A5111 for doors over 900 mm (3 feet) wide. Hinges for exterior outswing doors shall have non-removable pins. Hinges for exterior fire-rated doors shall be of stainless steel material.
2. Interior Doors: Type A8112/A5112 for doors 900 mm (3 feet) wide or less and Type A8111/A5111 for doors over 900 mm (3 feet) wide. Hinges for doors exposed to high humidity areas (shower rooms, toilet rooms, kitchens, janitor rooms, etc. shall be of stainless steel material.

B. Provide quantity and size of hinges per door leaf as follows:
1. Doors up to 1210 mm (4 feet) high: 2 hinges.
2. Doors 1210 mm (4 feet) to 2260 mm (7 feet 5 inches) high: 3 hinges minimum.
3. Doors greater than 2260 mm (7 feet 5 inches) high: 4 hinges.

4. Doors up to 900 mm (3 feet) wide, standard weight: 114 mm x 114 mm (4-1/2 inches x 4-1/2 inches) hinges.
5. Doors over 900 mm (3 feet) to 1065 mm (3 feet 6 inches) wide, standard weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
6. Doors over 1065 mm (3 feet 6 inches) to 1210 mm (4 feet), heavy weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
7. Provide heavy-weight hinges where specified.
8. At doors weighing 330 kg (150 lbs.) or more, furnish 127 mm (5 inch) high hinges.

C. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above and continuous hinges specified below.

2.3 DOOR CLOSING DEVICES

A. Closing devices shall be products of one manufacturer for each type specified.

2.4 OVERHEAD CLOSERS

A. Conform to ANSI A156.4, Grade 1.

B. Closers shall conform to the following:

1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
2. Where specified, closer shall have hold-open feature.
3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
4. Material of closer body shall be forged or cast.
5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
6. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
7. Closers shall have full size metal cover; plastic covers will not be accepted.
8. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.

9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
10. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
11. Provide parallel arm closers with heavy duty rigid arm.
12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1 ½" (38mm) minimum piston diameter.

2.6 DOOR STOPS

A. Conform to ANSI A156.16.

B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.

2.7 OVERHEAD DOOR STOPS AND HOLDERS

A. Conform to ANSI Standard A156.8. Overhead holders shall be of sizes recommended by holder manufacturer for each width of door. Set overhead holders for 110 degree opening, unless limited by building construction or equipment. Provide Grade 1 overhead concealed slide type: stop-only at rated doors and security doors, hold-open type with exposed hold-open on/off control at all other doors requiring overhead door stops.

2.8 FLOOR DOOR HOLDERS

A. Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

2.9 LOCKS AND LATCHES

A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than seven pins. Cylinders for all locksets shall be removable

core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer's fire label. Provide temporary keying device or construction core to allow opening and closing during construction and prior to the installation of final cores.

B. In addition to above requirements, locks and latches shall comply with following requirements:

1. 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 [AA]. No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance. All lock cases installed on lead lined doors shall be lead lined before applying final hardware finish. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.

2.12 ELECTRIC STRIKES

A. ANSI/ BHMA A156.31 Grade 1.

B. General: Use fail-secure electric strikes at fire-rated doors.

2.13 KEYS

A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	**Quantity**

Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

2.15 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

A. Conform to ANSI Standard A156.6.

B. Provide protective plates and door edging as specified below:

1. Kick plates, mop plates and armor plates of metal, Type J100 series.
2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches). Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
3. Kick plates and/or mop plates are not required on following door sides:
   a. Armor plate side of doors;
   b. Exterior side of exterior doors;
   c. Closet side of closet doors;
   d. Both sides of aluminum entrance doors.

2.18 FLUSH BOLTS (AUTOMATIC)

A. Conform to ANSI A156.3. Dimension of flush bolts shall conform to ANSI A115. Bolts shall conform to Underwriters Laboratories, Inc., requirements for fire door hardware. Flush bolts shall automatically latch and unlatch. Furnish dustproof strikes conforming to ANSI A156.16 for bottom flushbolt. Face plates for dustproof strike shall be rectangular and not less than 38 mm by 90 mm (1-1/2 by 3-1/2 inches).

B. At interior doors, provide auto flush bolts less bottom bolt, unless otherwise specified, except at wood pairs with fire-rating greater than

20 minutes; provide fire pins as required by auto flush bolt and door fire labels.

2.24 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET FOR LIGHT PROOF OR SOUND CONTROL DOORS

A. Conform to ANSI A156.22. Provide mortise or under-door type, except where not practical. For mortise automatic door bottoms, provide type specific for door construction (wood or metal).

C. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door. Provide 2 mutes for each edge of sliding door which would contact door frame.

2.30 FINISHES

A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.

B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.

C. Miscellaneous Finishes:

1. Hinges --exterior doors: 626 or 630.
2. Hinges --interior doors: 652 or 630.
3. Pivots: Match door trim.
4. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
5. Thresholds: Mill finish aluminum.
6. Cover plates for floor hinges and pivots: 630.
7. Other primed steel hardware: 600.

D. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces except where otherwise specified.

E. Special Finish: Exposed surfaces of hardware for dark bronze anodized aluminum doors shall have oxidized oil rubbed bronze finish (dark bronze) finish on door closers shall closely match doors.

2.31 BASE METALS

A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	**Base Metal**
652	Steel
626	Brass or bronze
630	Stainless steel

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA Resident Engineer for approval.

B. Hardware Heights from Finished Floor:

1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
3. Deadlocks centerline of strike 1219 mm (48 inches).
4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
5. Centerline of door pulls to be 1016 mm (40 inches).
6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors except security bedroom, bathroom and anteroom doors which shall have closer installed parallel arm on exterior side of doors. At exterior doors,

closers shall be mounted on interior side. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.

C. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim and surrounding conditions.

D. Where new hinges are specified for new doors in existing frames or existing doors in new frames, sizes of new hinges shall match sizes of existing hinges; or, contractor may reuse existing hinges provided hinges are restored to satisfactory operating condition as approved by Resident Engineer. Existing hinges shall not be reused on door openings having new doors and new frames. Coordinate preparation for hinge cut-outs and screw-hole locations on doors and frames.

E. Hinges Required Per Door:

Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high	3 butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	4 butts
Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

F. Fastenings: Suitable size and type and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.

G. After locks have been installed; show in presence of Resident Engineer that keys operate their respective locks in accordance with keying requirements. (All keys, Master Key level and above shall be sent Registered Mail to the Medical Center Director along with the bitting list. Also a copy of the invoice shall be sent to the Resident Engineer for his records.) Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

3.3 FINAL INSPECTION

A. Installer to provide letter to VA Resident/Project Engineer that upon completion, installer has visited the Project and has accomplished the following:
   1. Re-adjust hardware.
   2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
   3. Identify items that have deteriorated or failed.
   4. Submit written report identifying problems.

3.5 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. The numbers shown in the following sets come from BHMA standards.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:
ADO = Automatic Door Operator
EMCH = Electro-Mechanical Closer-Holder
MHO = Magnetic Hold-Open (wall- or floor-mounted)

- - - E N D - - -

Hardware Set 1

Each to receive:

3	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF48 AA US26D	LS
1	EA	Surface Closer	4040XP Rw/PA AL	LC
1	EA	Kick Plate	KP50 10" x 34" US32D	BU
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 36" x 84"	NG

Hardware Set 2

Each to receive:

3	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF04 AA US26D	LS
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 36" x 84"	NG

Hardware Set 3

Each to receive:

3	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF01 AA US26D	LS
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 36" x 84"	NG

Hardware Set 4

Each to receive:

3	EA	Hinge	T4A3786 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF01 AA US26D	LS
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 48" x 84"	NG

Hardware Set 5

Each to receive:

3	EA	Hinge	T4A3786 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF48 AA US26D	LS
1	EA	Electric Strike	1006CAS 630	HS
1	EA	Surface Closer	4040XP Rw/PA AL	LC
1	EA	Kick Plate	KP50 10" x 40" US32D	BU
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 48" x 84"	NG

POWER SUPPLY AND CARD READER FURNISHED BY OTHERS.

Hardware Set 6

Each to receive:

6	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Flush Bolt	2805 US26D	RO
1	EA	Mortise Lock	MLF04 AA US26D	LS
2	EA	Overhead Stop	452S 652	GJ
1	EA	Gasketing	5050B x 48" x 84"	NG

Hardware Set 7

Each to receive:

3	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF01 AA US26D	LS
1	EA	Surface Closer	4040XP DEL Rw/PA AL	LC
1	EA	Kick Plate	KP50 10" x 34" US32D	BU
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 36" x 84"	NG
1	EA	Door Bottom	225N- 36"	NG

Hardware Set 8

Each to receive:

3	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF48 AA US26D	LS
1	EA	Electric Strike	1006CAS 630	HS
1	EA	Surface Closer	4040XP Rw/PA AL	LC
1	EA	Kick Plate	KP50 10" x 34" US32D	BU
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 36" x 84"	NG

POWER SUPPLY AND CARD READER FURNISHED BY OTHERS.

Hardware Set 9

Each to receive:

3	EA	Hinge	TA2714 4.5" x 4.5" US26D	MK
1	EA	Mortise Lock	MLF01 AA US26D	LS
1	EA	Surface Closer	4040XP DEL Rw/PA AL	LC
1	EA	Kick Plate	KP50 10" x 34" US32D	BU
1	EA	Wall Stop	WS406CCV 630	IV
1	EA	Gasketing	5050B x 36" x 84"	NG

Hardware Set 10

Each to receive:

1	EA	Rim Exit Device	33A-NL-OP 388(Std) US26D	VD
1	EA	Door Pull	39-1C US32D REUSE REMAINING HARDWARE	BU

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies the following:

1. Glass.
2. Glazing materials and accessories for both factory and field glazed assemblies.

1.2 RELATED WORK:

A. Factory glazed by manufacturer in following units:

1. Sound resistant doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
2. Access Control Systems: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
3. Wiring (120 V AC, 15A or 20A): Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER AND CONDUCTORS AND CABLES.
4. Junction and Switch Boxes: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.

1.3 LABELS:

A. Temporary labels:

1. Provide temporary label on each light of glass material identifying manufacturer or brand and glass type, quality and nominal thickness.
2. Label in accordance with NFRC label requirements.
3. Temporary labels are to remain intact until glass and plastic material is approved by Contracting Officer Representative (COR).

B. Permanent labels:

1. Locate in corner for each pane.
2. Label in accordance with ANSI Z97.1 and SGCC label requirements.
   a. Tempered glass.
4. Fire rated glazing assemblies: Mark in accordance with IBC.

1.4 PERFORMANCE REQUIREMENTS:

A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing is to withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation;

failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.

B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
   1. Design Wind Pressures: In accordance with ASCE 7 and in accordance with applicable code.
   2. Wind Design Data: In accordance with ASCE 7 and in accordance with applicable code.
   3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than the structural capacity of the glazing unit, the threshold at which frame engagement is no longer safely assured, 1/100 times the short-side length, or 19 mm (0.75 inch), whichever is less.

C. 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.

1.5 SUBMITTALS:

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. PART 2 - PRODUCTS.

C. Manufacturer's Certificates:
   1. Certificate stating that fire-protection and fire-resistive glazing units meet code requirements for fire-resistance-rated assembly and applicable safety glazing requirements.

D. Manufacturer Warranty.

E. 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.

F. Samples:

1. Size: 305 mm by 305 mm (12 inches by 12 inches).

G. 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:

Field Measurements: Field measure openings before ordering tempered glass products to assure for proper fit of field measured products.

1.8 WARRANTY:

A. Construction Warranty: Comply with the FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their glazing from the date of installation and final acceptance by the Government as follows. Submit manufacturer warranty.

1. Insulating glass units to remain sealed for ten (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 Architectural Manufacturers Association (AAMA):

800 .....Test Methods for Sealants

810.1-77 .....Expanded Cellular Glazing Tape

C. American National Standards Institute (ANSI):

Z97.1-14 .....Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test

D. American Society of Civil Engineers (ASCE):

7-10 .....Wind Load Provisions

E. ASTM International (ASTM):

C542-05(R2011) .....Lock-Strip Gaskets

C716-06 .....Installing Lock-Strip Gaskets and Infill Glazing Materials

C794-10 .....Adhesion-in-Peel of Elastomeric Joint Sealants

C864-05(R2011) .....Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

C920-14a .....Elastomeric Joint Sealants

C964-07(R2012) .....Standard Guide for Lock-Strip Gasket Glazing

C1036-11(R2012) .....Flat Glass

C1048-12 .....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

C1172-14 .....Laminated Architectural Flat Glass

C1349-10 .....Standard Specification for Architectural Flat Glass Clad Polycarbonate

C1376-10 .....Pyrolytic and Vacuum Deposition Coatings on Flat Glass

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

E84-14 .....Surface Burning Characteristics of Building Materials

E119-14 .....Standard Test Methods for Fire Test of Building Construction and Material

E1300-12a .....Load Resistance of Glass in Buildings

E1886-13a .....Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

E1996-14a .....Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes

E2141-12 .....Test Methods for Assessing the Durability of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units
E2190-10 .....Insulating Glass Unit
E2240-06 .....Test Method for Assessing the Current-Voltage Cycling Stability at 90 Degree C (194 Degree F) of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units
E2241-06 .....Test Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units
E2354-10 .....Assessing the Durability of Absorptive Electrochromic Coatings within Sealed Insulating Glass Units
E2355-10 .....Test Method for Measuring the Visible Light Transmission Uniformity of an Absorptive Electrochromic Coating on a Glazing Surface
F1233-08 .....Standard Test Method for Security Glazing Materials and Systems
F1642-12 .....Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

E. Code of Federal Regulations (CFR):
16 CFR 1201-10 .....Safety Standard for Architectural Glazing Materials

F. Glass Association of North America (GANA):
2010 Edition .....GANA Glazing Manual
2008 Edition .....GANA Sealant Manual
2009 Edition .....GANA Laminated Glazing Reference Manual
2010 Edition .....GANA Protective Glazing Reference Manual

G. International Code Council (ICC):
IBC .....International Building Code

H. Insulating Glass Certification Council (IGCC)

I. Insulating Glass Manufacturer Alliance (IGMA):
TB-3001-13 .....Guidelines for Sloped Glazing
TM-3000 .....North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use

J. Intertek Testing Services – Warnock Hersey (ITS-WHI)

K. National Fire Protection Association (NFPA):

80-16 .....Fire Doors and Windows

252-12 .....Fire Tests of Door Assemblies

257-12 .....Standard on Fire Test for Window and Glass Block Assemblies

L. National Fenestration Rating Council (NFRC)

M. Safety Glazing Certification Council (SGCC) 2012:

Certified Products Directory (Issued Semi-Annually).

N. Underwriters Laboratories, Inc. (UL):

9-08(R2009) .....Fire Tests of Window Assemblies

263-14 .....Fire Tests of Building Construction and Materials

752-11 .....Bullet-Resisting Equipment.

O. Unified Facilities Criteria (UFC):

4-010-01-03(R2007) .....DOD Minimum Antiterrorism Standards for Buildings

P. U.S. Veterans Administration:

Physical Security Design Manual for VA Facilities (VAPSDG); Life Safety Protected

Physical Security Design Manual for VA Facilities (VAPSDG); Mission Critical Facilities

Architectural Design Manual for VA Facilities (VASDM)

Q. Environmental Protection Agency (EPA):

40 CFR 59(2014) .....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCT

2.1 GLASS:

A. Provide minimum thickness stated and as additionally required to meet performance requirements.

1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.

B. Obtain glass units from single source from single manufacturer for each glass type.

C. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality q3.

2.2 HEAT-TREATED GLASS:

A. Roller Wave Limits for Heat-Treated Glass: Orient all roller wave distortion parallel to bottom surface of glazing, and provide units complying with the following limitations:
   1. Measurement Parallel to Line: Maximum peak to valley 0.203 mm (0.008 inch).
   2. Measurement Perpendicular to Line: Maximum 0.0254 mm (0.001 inch).
   3. Bow/Warp: Maximum 50 percent of bow and warp allowed by ASTM C1048.

B. Clear Heat Strengthened Glass:
   1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.

D. Clear Tempered Glass:
   1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 INSULATING GLASS UNITS:

A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.

B. Assemble units using glass types specified in Insulating Glass Schedule.

2.4 FIRE PROTECTION AND FIRE RESISTANCE GLAZING:

A. Fire-Protection-Rated Glazing: Glazing units tested for use in fire door assemblies or fire windows, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC, for fire-protection ratings as indicated on construction documents schedule, based upon positive-pressure testing per NFPA 257 or UL 9, and complying with NFPA 80.
   1. Hose-Stream Test: Units must comply, except units having fire-protection rating of 20 minutes.
   3. Labeling: Permanently label fire-protection-rated glazing units in accordance with IBC.
   4. Safety Glazing: Comply with 16 CFR 1201, Category II.
   5. Fire-Protection-Rated Tempered Glass: For 20-minute fire-protection-rated door assemblies, of thickness scheduled.
   6. Fire-Protection-Rated Laminated Ceramic Glazing: Units made from two lites of clear, ceramic glass, 8 mm (5/16 inch) total thickness, for rating scheduled.

B. Fire-Resistance-Rated Glazing: Glazing units tested for use in fire wall assemblies, UL, ITS-WHI or equivalent listed and labeled by

testing agency in accordance with IBC for fire-resistance ratings of wall assemblies as indicated on construction documents, based upon testing according to NFPA 252 and ASTM E119 or UL 263.

1. Labeling: Permanently label fire-resistance-rated glazing units in accordance with IBC.
2. Safety Glazing: Comply with 16 CFR 1201, Category II.

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 are to have a finish that will not corrode or stain while in service. Fire rated glazing to be installed with glazing accessories in accordance with the manufacturer's installation instructions.

B. Setting Blocks: ASTM C864:
   1. Silicone type.
   2. Channel shape; having 6 mm (1/4 inch) internal depth.
   3. Shore A hardness of 80 to 90 Durometer.
   4. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
   5. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
   6. 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: 25 to 76 mm (1 to 3 inches).
   4. Shore A hardness of 40 to 50 Durometer.

D. Glazing Tapes:
   1. Semi-solid polymeric based closed cell 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.
   3. Complying with AAMA 800 for the following types:
      a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

G. 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.

H. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

I. Glazing Sealants: ASTM C920, silicone neutral cure:

1. Type S.
2. Class 25 or 50 as recommended by manufacturer for application.
3. Grade NS.
4. Shore A hardness of 25 to 30 Durometer.
5. VOC Content: For sealants used inside the weatherproofing system, not more than 250 g/L or less when calculating according to 40 CFR 59, (EPA Method 24).

J. Structural Sealant: ASTM C920, silicone acetoxy cure:

1. Type S.
2. Class 25.
3. Grade NS.
4. Shore a hardness of 25 to 30 Durometer.

K. 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.

L. Color:

1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames to 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 are to be black, gray, or neutral color.

M. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units intended for removal for smoke control. Comply with requirements of local Fire Department.

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 is approved shop drawings.

B. Review for 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.

3.2 PREPARATION:

A. For sealant glazing, prepare glazing surfaces in accordance with GANA 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 Glazing Manual, GANA Sealant Manual, IGMA TB-3001, and IGMA TM-3000 unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.

C. Set glazing without bending, twisting, or forcing of units.

D. Do not allow glass to rest on or contact any framing member.

E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

G. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.

K. Insulating Glass Units:
   1. Glaze in compliance with glass manufacturer's written instructions.

2. When glazing gaskets are used, they are to be of sufficient size and depth to cover glass seal or metal channel frame completely.
3. Do not use putty or glazing compounds.
4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
5. Install with tape or gunnable sealant in wood sash.

L. Fire Protective and Fire Resistance Glass:
1. Wire Glass: Glaze in accordance with NFPA 80.
2. Other fire protective and fire resistant glass: Glaze in accordance with manufacturer's installation instructions and NFPA 80.

3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING):

A. Cut glazing tape spline to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
B. Place setting blocks at / 1/4 points with edge block no more than 150 mm (6 inches) from corners.
C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
F. Trim protruding tape edge.

3.5 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
C. Place setting blocks at 1/4 points with edge block no more than 152 mm (6 inches) from corners.
D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.

F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line. Sealant type is to be compatible with glazing tape.

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.

3.6 INSTALLATION - WET METHOD (SEALANT AND SEALANT):

A. Place setting blocks at 1/4 points and install glazing pane or unit.

B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.

C. Fill gaps between glazing and stops with sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.

D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT):

A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.

E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line. Sealant type is to be compatible with glazing tape.

F. Trim protruding tape edge.

3.8 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND):

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 600 mm (24 inch) centers, kept 6 mm (1/4 inch) below sight line.

B. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.9 REPLACEMENT AND CLEANING:

A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COR.

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.

3.10 PROTECTION:

A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

A. Glass Type MG#: Clear fully tempered float glass.

1. Unit Thickness: 6 mm (0.23 inch).
2. Safety glazing label required.

D. Glass Type MG#: Ceramic-coated vision glass; fully tempered float glass.

1. Unit Thickness: 6 mm (0.23 inch).
2. Tint Color: Clear

3.11 FIRE-PROTECTIVE AND FIRE-RESISTANCE GLAZING SCHEDULE:

A. Glass Type FR#: Fire-protection-rated tempered glass.

1. Thickness: 6mm (0.23)
2. Rating: 20- 45- 60- 90- minute.
3. Application: Fire-protection-rated door and window assemblies.

- - - E N D - - -

SECTION 09 05 16
SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies subsurface preparation requirements for areas to receive the installation of applied and resinous flooring. This section includes removal of existing floor coverings, testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling and repair as required.

1.2 RELATED WORK

A. Section 07 92 00, JOINT SEALANTS.

B. Section 09 65 16, RESILIENT SHEET FLOORING Section 09 65 19, RESILIENT TILE FLOORING

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and TEST DATA.

B. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer

C. Product Data:

1. Moisture remediation system
2. Underlayment Primer
3. Cementitious Self-Leveling Underlayment
4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)

D. Test Data:

1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer’s technical representative.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

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

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

D638-*10* *(2010)*	Test Method for Tensile Properties of Plastics
D4259-*88* *(2012)*	Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.
C109/C109M *-12* *(2012)*	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens) Modified Air Cure Only
D7234-*12* *(2012)*	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
E96/E96M - 12 ***(2012)***	Standard Test Methods for Water Vapor Transmission of Materials
F710-*11* *(2011)*	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
F1869-*11* ***(2011)***	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-*11* ***(2011)***	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C348-08 ***(2008)***	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C191-13 ***(2013)***	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING

A. System Descriptions:

1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer’s standard components, compatible with each other and as follows:

1. Liquid applied coating:

a. Resin: epoxy.

b. Formulation Description: Multiple component high solids.

c. Application: Per manufacturer's written installation requirements.

d. Thickness: minimum 10 mils

D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.

E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	$1.9X10^5$psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

A. System Descriptions:

1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.

C. System Characteristics:

1. Wearing Surface: smooth
2. Thickness: Per architectural drawings, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.

D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.

E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.

F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348

G. Dry Time: Underlayment shall receive the application of moisture insensitive tile in 6 hours, floor coverings in 16 hours, and resinous flooring in 3-7 days.

H. Primer: compatible and as recommended by manufacturer for use over intended substrate

I. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer:
   a. Resin: copolymer
   b. Formulation Description: single component ready to use.
   c. Application Method: Squeegee and medium nap roller. All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
   d. Number of Coats: (1) one.
2. Grout Resurfacing Base:
   a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
   b. Application Method: colloidal mix pump, cam rake, spike roll.
      1) Thickness of Coats: Per architectural scope, 1” lifts.
      2) Number of Coats: More than one if needed.
   c. Aggregates: for applications greater than 1inch, require additional 3/8” aggregate to mix.

Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT(NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.

B. Compressive Strength: Minimum 4000 psi in 28 days

C. Trowel-applied underlayment shall not contain silica quartz (sand).

D. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

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 testing and not less than three days after testing.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.

C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

A. Existing concrete slabs with existing floor coverings:

1. Conduct visual observation of existing floor covering for adhesion, water damage, alkaline deposits, and other defects.
2. Remove existing floor covering and adhesives. Comply with local, state and federal regulations and the RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to the floor covering being removed.

B. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.

C. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.

D. Prepare concrete substrates per ASTM D4259 as follows:
   1. Dry abrasive blasting.
   2. Wet abrasive blasting.
   3. Vacuum-assisted abrasive blasting.
   4. Centrifugal-shot abrasive blasting.
   5. Comply with manufacturer's written instructions.

E. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.

F. Verify that concrete substrates are dry.

G. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.

H. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture’s formal and project specific written recommendation.

I. Provide a written report showing test placement and results.

J. Prepare joints in accordance with Section 07 92 00, JOINT SEALANTS and material manufacturer’s instructions.

K. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer’s technical representative.

L. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4” deviation in 10’. As required, install underlayment to achieve required tolerance.

M. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING:

A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.

B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.

C. Mix and apply moisture remediation coating in accordance with manufacturer’s instructions.

3.4 CEMENTITOUS UNDERLAYMENT:

A. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.

B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

- - - E N D - - -

SECTION 09 06 00
SCHEDULE FOR FINISHES

SECTION 09 06 00-SCHEDULE FOR FINISHES

VAMC:
Location:
Project no. and Name:
Submission
Date:

INSTRUCTIONS FOR PREPARATON OF
SECTION 09 06 00-SCHEDULE FOR FINISHES

GENERAL:

Use, SECTION 09 06 00, SCHEDULE FOR FINISHES as a master format for construction projects, to identify interior and exterior material finishes for type, texture, patterns, color and placement. Fully coordinate with other VA master construction specification sections for information, abbreviations and symbols contained in this Section to be consistent and fully coordinated with those in drawings, finish schedules and material boards.
Provide dimensions in metric followed by English equivalent in parenthesis, when applicable.
Slash symbol (//.. //) Edit information contained between these symbols for project or delete if not applicable. These are not always used.

Delete pages SECTION 09 06 00, SCHEDULE FOR FINISHES-i, ii, iii from final document. Submit complete master document that you received with edit marks during Design Development and Construction Document stage of project. Provide a re-typed version for final document.
Coordinate with VA handbook H-08-14, Room Finishes, Door and Hardware Schedule.

Explanation of Terms:
Material Abbreviations: Use in Room Finish Schedule to identify Finish Materials.
Example: GWB-W is Gypsum Wall Board- Vinyl coated fabric wallcovering finish surface.

Paint, Stain, or Coating Code and Finish Code: A number or abbreviation you assign for material color system texture and pattern in conjunction with a manufacturer's identification when applicable.

Instructions for Part I - General

Copy following paragraphs as stated: 1.1 DESCRIPTION, 1.2 MANUFACTURERS, 1.3 SUBMITTALS.

Paragraph 1.5 Digital Color Photos – Interior Views: Include a series of photographic slides, representing a sequential walk-through. Show typical public, patient, staff and all specialized areas. The photography is of architectural quality and are the property of the Department of Veterans Affairs, Office of Facility Management.

Instruction for Part II Products – Interior and Exterior

Edit outline to suit the project. The outline is divided by technical specification section and list items requiring finish selections. Locations are designated either in room finish schedule in this section or shown on drawings.

Some products are listed for which a VA guide specifications is not available; no technical Section number shown, Section will have to be written.

Identify locations for products not shown in Room Finish Schedule. Some items require identification of room number and name to establish location.

Identify color, texture, patterns as applicable with manufacturer's identification label with a product or abbreviations are identified throughout drawings and specification sections. Coordinate for uniformity and consistency. Do not duplicate abbreviations for different materials. Avoid conflicts with technical specification sections. Example; Vinyl Composition Tile (VCT).

Some Sections specify finish on product and are not included in Part II, i.e. 10350, FLAGPOLES.

Whenever possible minimize use of multiple manufacturer's for colors and ones which constitute large quantities such as paint, plastic, laminate and carpet.

Loose items are not permitted in construction contracts unless an integral component of a fixed item i.e. keys for locks, adjustable shelves in cabinets.

Give preference to products containing recovered materials when price performance and availability meets project requirements.

Give sizes in metric followed by English in parenthesis, i.e. 100 mm (4 inches).

Instructions for Part III - Execution

Paragraph 3.1 a: Finish Schedules and Miscellaneous Abbreviations-provide a complete list of product abbreviations used on project. Edit list to suit project.

Paragraph 3.1 b: Finish Schedule Symbols: Edit symbol list to suit project.

Paragraph 3.2: Room Finish Schedule- Finish schedule format is contained in architectural package or at end of this Section. Surface for walls "C" is for free standing columns.

Finish Plans: these plans are a part of architectural drawing set as an adjunct to the finish schedule. Use for showing wall, ceiling and floor patterns and identifying stopping and starting points for finishes exterior elevations may be used to show locations of various finishes identified by finish code and materials.

SECTION 09 06 00
SCHEDULE FOR FINISHES

PART I - GENERAL

1.1 DESCRIPTION

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

1.2 MANUFACTURERS

Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturer's equivalent to colors, finishes, textures and patterns of manufacturers listed that meet requirements of technical specifications will be acceptable upon approval in writing by contracting officer for finish requirements.

1.3 SUBMITALS

Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES—provide quadruplicate samples for color approval of materials and finishes specified in this section.

1. DIGITAL COLOR PHOTOS-INTERIOR VIEWS:

Room Number and Name	Item/View to be Photographed
1.	
2.	
3.	
4.	

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 DIGITAL COLOR PHOTOS

A. Size 24 x 35 mm.

B. Labeled for:

1. Building name and Number.

2. Room Name and Number.

2.2 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.
Coated			
Galvanized			
Painted (P)			

B. SECTION 32 14 16, BRICK UNIT PAVING.

Size	Pattern	Manufacturer	Mfg. Color Name/No.

C. SECTION 32 17 23, PAVEMENT MARKINGS.

Color	Manufacturer	MFG. Color Name/No.
Yellow		
White		

D. ASPHALTIC BLOCK PAVER

Size	Shape	Manufacturer	Mfg. Color Name/No.

E. CONCRETE PAVERS

Size	Shape	Manufacturer	Mfg. Color Name/No.

F. BOLLARDS (ORNAMENTAL)

Material	Finish	Style Name/ No.	Manufacturer	Mfg. Color Name/No.
Precast concrete				
Stone				

G. SITE AND STREET FURNISHINGS

Item	Style Name/No.	Finish	Manufacture	Mfg. Color Name/No.
Benches				

Game Tables				
Planters				
Tree Grates				
Trash Receptacles				
Ash Receptacles				

2.3 DIVISION 03 - CONCRETE

A. SECTION 03 30 00, CAST IN PLACE CONCRETE

Surface	Finish Description

B. SECTION 03 45 00, PRECAST ARCHITECTURAL CONCRETE

Finish Color	Texture	Finish	Manufacturer	Mfg. Color Name/No.

2.4 DIVISON 04 - MASONRY

A. Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING

Finish Code	Manufacturer	Mfg. Color Name

B. Section 04 20 00, UNIT MASONRY

1. FACE BRICK (FB)

Finish Code	Size	Pattern	Manufacturer	Mfg. Color Name/No.

2.CERAMIC GLAZED FACING BRICK (CGFB)

Finish Code	Size	Pattern	Manufacturer	Mfg. Color Name/No.

3.CONCRETE MASONRY UNIT (CMU)

Type	Size	Pattern	Finish	Mfg. Color Name/No.
CMU Standard				
Glazed Face				
Sound Absorbing				
Split Rib				
Ground Face				

4. CLAY TILE UNITS

Type	Pattern	Finish	Manufacturer	Mfg. Color/Finish
Glazed Structural Facing Tile (SFTU)				
Structural Clay Load				

Bearing Wall Tile (SFTU)				

C. UNIT MASONRY (04 20 00)

Stone Type	Color	Manufacturer	Mfg. Color & Texture No.

D. GLASS MASONRY UNITS

Size	Pattern	Manufacturer	Mfg. Color Name/No.

E. STONE MASONRY

Material	Size	Color, Texture, Finish, Grain	Pattern	Stone Source

F. STONE FACING

Name of Stone	Color, Texture, Finish	Stone Source

2.5 DIVISION 05 - METALS

A. SECTION 05 12 00, STRUCTURAL STEEL FRAMING

Component	Finish	Color

B. SECTION 05 21 00, STEEL JOIST FRAMING

Finish	Color

C. SECTION 05 31 00, STEEL DECKING, SECTION 05 36 00, COMPOSITE METAL DECKING

Finish	Color

D. SECTION 05 40 00, COLD-FORMED METAL FRAMING

Finish	Color

E. SECTION 05 50 00, METAL FABRICATION

Item	Finish
Modular Channel Units	
Channel Door Frames	
Frames for Lead Lined Doors	
Structural Steel Angle Corner Guards	
Guard Angles for Overhead Doors	
Edge Guards Angles for Opening in Slabs	
Wheel Guards	

Steel Covers and Frames for pits and trenches	
Cast Iron Covers and Frames for Pits and Trenches	
Steel Grating and Frames	
Aluminum Gratings and Frames	
Steel Plank Gratings	
Cast Iron Gratings	
Loose Lintels	
Steel Plate Door Sill	
Aluminum Plate Door Sill	
Cast Iron Safety Nosing	
Aluminum Safety Nosing	
Steel Ladders	
Aluminum Ladders	
Steel Ladder Rungs	
Steel Pipe Railings and Gates (not on Steel Stairs)	
Aluminum Railings	
Stainless Steel Railings	
Ornamental Railings	
Catwalks	
Floor Trap Door and Ceiling Hatch	
Sidewalk Door	
Screened Access Door and Frame	
Steel Counter or Bench Top Frame and Legs.	

F. SECTION 05 51 00, METAL STAIRS

Component	Finish	Color
Newel Posts		
Guard Rails		
Handrails		
Stringers		
Risers		
Underside		

G. SECTION 07 95 13, EXPANSION JOINT COVER ASSEMBLIES

	Material	Finish	Manufacturer	Mfg. Color Name/No.
Floor Component Cover Plate Frame Casket or Sealant (interior only)				
Wall Component Cover Plate Frame Casket or Sealant (interior only)				
Ceiling Component Cover Plate, Gasket or Sealant (interior only)				
Exterior Wall Cover Plate Frame Thermoplastic Joint				
Garage Floor Steel				

2.6 DIVISION 06 WOOD, PLASTICS, AND COMPOSITES

A. SECTION 06 10 00, ROUGH CARPENTRY

Item	Finish	Color

B. SECTION 06 20 00, FINISH CARPENTRY

1. STORAGE CABINETS

Room No. and Name	Component	Material	Species	Finish	Color
A64 OT TREATMENT/EXERCISE					
	Vertical Surface(s)	PL-1	Wilsonart	Matte finish	Shaker Cherry, 7935
A91 RECEIVING and A92 WORKROOM	Vertical Surface(s)	PL-2	Wilsonart	Matte finish	Skyline Walnut, 7964

2.7 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

A. SECTION 07 31 13, ASPHALT SHINGLES

Size	Shape	Manufacturer	Mfg. Color Name/No.

B. SECTION 07 31 29.13, WOOD SHINGLES

Size	Shape	Manufacturer	Mfg. Color Name/No.

C. SECTION 07 31 26, SLATE SHINGLES

Size	Shape	Manufacturer	Mfg. Color Name/No.

D. SECTION 07 32 13, CLAY ROOF TILES

Size	Shape	Manufacturer	Mfg. Color Name/No.

E. SECTION 07 40 00, ROOFING AND SIDING PANELS

Type	Shape	Ext. Finish	Int. Finish	Manufacturer	Mfg. Color Name/No.

F. SECTION 07 24 00, EXTERIOR INSULATION AND FINISH SYSTEMS

Finish Code	Finish	Manufacturer	Mfg. Color Name/No.

G. SECTION 07 54 19, POLYVINYL-CHLORIDE ROOFING

Color	Manufacturer	Mfg. Color Name/No.

H. SETION 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

Color	Manufacturer	Mfg. Color Name/No.

I. SECTION 07 57 13, SPRAYED POLYURETHANE FOAM ROOFING

Coating Material	Color	Manufacturer	Mfg. Color Name/No.
Silicone Rubber Top Coat			
Ceramic Granules			

J. SECTION 07 56 00, FLUID-APPLIED ROOFING

Material	Color	Manufacturer	Mfg. Color Name/No.

K. BUILT-UP BITUMINOUS ROOFING (07 51 00) / STYRENE-BUTADIENE-STYRENE MODIFIED BITUMINOUS MEMBRANE ROOFING (07 52 16) / POLYVINYL-CHLORIDE ROOFING (07 54 19) / ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (7 53 23)

Pavers	Size	Material	Color	Manufacturer	Mfg. Color Name/No.

L. SECTION 07 14 21, LATEX MASTIC DECK COVERING

Finish	Manufacturer	Mfg. Color Name/No.

M. SECTION 07 18 13, PEDESTRIAN TRAFFIC COATINGS

Finish	Manufacturer	Mfg. Color Name/No.

N. SECTION 07 60 00, FLASHING AND SHEET METAL

Item	Material	Finish
Copings	Copper	
	Stainless steel	
	Aluminum	
Hanging Gutters and Downspouts	Copper	
	Stainless steel	
	Aluminum	

Roof Insulated Expansion Joint Covers	Vinyl sheet	
Gravel Stops	Aluminum mill	
	Aluminum	
	Copper	
	Stainless steel	
Scuppers		

O. SECTION 07 61 16, BATTEN SEAM SHEET METAL ROOFING

Material	Finish/Color

P. STANDING SEAM ROOFING (NO VA GUIDE SECTION)

Material	Finish/Color

Q. SECTION 07 71 00 / 07 72 00, ROOF SPECIALITIES AND ACCESSORIES

Item	Material	Finish	Manufacturer	Manufacturer/Color Name/Number.
Roof Hatch	Aluminum	Mill		
Equipment Support	Galv. Steel	Paint		
Gravity Ventilators	Aluminum	Mill		
Grating Walkway	Galv Steel			
Copings	Extruded Aluminum			
Gravel Stops and Fascia System	Extruded Aluminum			
Fascia Systems	Extruded Aluminum			

Roof Expansion Joint Covers	Extruded Aluminum	Mill		

R. SECTION 07 92 00, JOINT SEALANTS

Location	Color	Manufacturer	Manufacturer Color
Masonry Expansion Joints			
CMU Control Joints			
Precast Concrete Panels			
New to Existing Walls			
Building Expansion Joints			
Masonry Sealed Joints			
Stone Sealed Joints			

2.8 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
Door	
Frame	
Window frame	

B. SECTION 08 14 00, WOOD DOORS

Component	Finish/Color
Doors	

Frames	

C. SECTION 08 31 13, ACCESS DOORS AND FRAMES

Material	Finish/Color
Steel	
Stainless steel	

D. SECTION 08 11 73, SLIDING METAL FIRE DOORS

Material	Finish/Color

E. SECTION 08 33 00, COILING DOORS AND GRILLES

Location	Item	Material	Finish	Manufacturer	Manufacturer Color Name/No.
	Door				
	Grille				

F. SECTION 08 33 13, COILING COUNTER DOORS

Location	Material	Finish	Manufacturer	Manufacturer Color Name/No.

G. SECTION Doors 08 35 13.13, Accordion Folding

Location	Component	Finish	Manufacturer	Manufacturer Color Name/No.

H. SECTION 08 38 16, FLEXIBLE TRAFFIC DOORS

Location	Frame	Finish
	Steel	

I. SECTION 08 36 13, SECTIONAL DOORS

Finish	Manufacturer	Manufacturer Color Name/No.

J. SECTION 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

Material	Finish	Manufacturer	Manufacturer Color Name/No.
Aluminum			
Glass			

K. SECTION 08 42 33, REVOLVING DOOR ENTRANCES

Material	Finish	Manufacturer	Mfg. Color Name/No.
Aluminum			
Glass			
Stainless Steel			

L. SECTION 08 51 23, STEEL WINDOW

Component	Finish	Manufacturer	Mfg. Color Name/No.
Window			
Trim			
Screens			
Sills			
Stools			

M. SECTION 08 51 13, ALUMINUM WINDOWS

Type	Finish	Glazing	Manufacturer	Mfg. Color Name/No.
Hung				
Casement				
Projected				
Dual Horizontal Sliding				
Single Horizontal Sliding				
Fixed				

N. SECTION 08 51 13.11, SIDE-HINGED ALUMINUM WINDOWS

Finish	Ext. Glazing	Blind color	Int. Glazing	Manufacturer	Mfg. Color Name/No.

O. SECTION 08 51 69.11, ALUMINUM STORM WINDOWS

Finish	Glazing	Manufacturer	Mfg. Color Name/No.

P. SECTION 08 63 00, METAL-FRAMED SKYLIGHTS

Finish	Glazing	Manufacturer	Mfg. Color Name/No.
Frame			

Q. SECTION 08 51 69.11, ALUMINUM STORM WINDOWS

Component	Finish	Manufacturer	Mfg. Color Name/No.
Frame	Mill		
Glazing	Tinted Clear		

R. SECTION 08 56 19, PASS WINDOWS

Room No. and Name	Finish	Glazing	Manufacturer	Mfg. Color Name/No.

S. WINDOW SILLS

Room No. and Name	Material	Finish
	Aluminum (With Windows)	
	SECTION 04 72 00,CAST STONE MASONRY	

T. WINDOW STOOLS

Room No. and Name	Material	Finish
	Marble (09310)	
	Ceramic Tiling (09 30 13)	
	Plastic Laminate	
	Finish Carpentry (06 20 00)	

U. SECTION 08 71 00, BUILDERS HARDWARE

Item	Material	Finish
Hinges		
Door Closers		
Floor Closers		
Floor Pivot Sets		
Closer/ Holder		
Floor Stops		
Door Holders		
Lock/ Latches		
Key Cabinet	Steel	
Armor Plates	Metal Plastic	
Kick Mop Plates	Metal Plastic	
Door Edging		
Exit Device		
Flush Bolts		
Door Pulls		
Push Plates		
Combination Push Pull Plate		
Coordinators		
Light Proof Seals		
Weather Strip		
Threshold		

V. SECTION 08 80 00, GLAZING

Glazing Type	Manufacturer	Mfg. Color Name/No.
G-6		
G-7		
G-8		
G-9		
G-10		
G-11		
G-12		
G-13		
G-14		
G-15		
G-16		
G-17		

W. SECTION 08 44 13, GLAZED ALUMINUM CURTAIN WALLS

Component	Material	Finish	Manufacturer	Mfg. Color Name/No.
Frame				
Glazing				
Standard Panel				

2.9 DIVISION 09 - FINISHES

A. SECTION 09 51 00, ACOUSTICAL CEILINGS

Finish Code	Component	Color Pattern	Manufacturer	Mfg Name/No.
ACT-2	Exposed Suspension System	Cortega - White	Armstrong	
ACT-1	Type III	Vinylrock - White	CertainTeed	

B. SECTION 09 65 19, RESILIENT TILE FLOORING

Finish Code	Size	Material/Component	Manufacturer	Mfg Name/No.
RFT-1	39.53” x 39.53” x 3.5 mm tile	RFT	Nora Systems, Inc.	Norament XP
RFT-2	39.53” x 39.53” x 3.5 mm tile	RFT	Nora Systems, Inc.	Norament XP
RFT-3	24” x 24” x 3 mm tile	RFT	Nora Systems, Inc.	Noraplan Environcare
RFT-4	24” x 24” x 3 mm tile	RFT	Nora Systems, Inc.	Noraplan Environcare
RFT-5	48” wide x 3 mm rolled goods	RFT	Nora Systems, Inc.	Noraplan Sentica

C. SECTION 09 65 16, VINYL SHEET FLOORING, HEAT WELDED SEAMS (WSF)

Finish Code	Pattern name	Manufacturer	Mfg. Color Name/No.
WSF-1	Forestscapes	TeknoFlor	Abacoa/52210

D. SECTION 09 65 13, RESILIENT BASE STAIR TREADS AND ACCESSORIES

Finish Code	Item	Height	Manufacturer	Mfg Name/No.
RB-1	Rubber Base	4”	Johnsonite	Traditional Wall Base / Pebble 32
RB-2	Rubber Base	4”	Johnsonite	Traditional Wall Base / Fawn 80

E. SECTION 09 91 00, PAINT AND COATINGS

1. MPI Gloss and Sheen Standards

		Gloss @60	Sheen @85
Gloss Level 1	a traditional matte finish-flat	max 5 units, and	max 10 units
Gloss Level 2	a high side sheen flat-"a velvet-like" finish	max 10 units, and	10-35 units
Gloss Level 3	a traditional "egg-shell like" finish	10-25 units, and	10-35 units
Gloss Level 4	a "satin-like" finish	20-35 units, and	min. 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	
Gloss level 7	a high gloss	more than 85 units	

2. Paint code	Gloss	Manufacturer	Mfg. Color Name/No.
PT-1		Diamond Vogel	Hidden Cove/210
PT-2		Diamond Vogel	Drifting Sand/218
PT-3		Diamond Vogel	October Harvest/266
PT-4		Diamond Vogel	Golden Weave/888
PT-5		Diamond Vogel	Fair Maiden/456
PT-6		Diamond Vogel	Thistle Gray/197
PT-7		Diamond Vogel	Corn Chowder/876

F. SECTION 09 72 16, VINYL COATED FABRIC WALLCOVERING (W)

Finish Code	Manufacturer	Mfg. Color Name/No.
VWC-1	D.L. Couch	Salt Water Taffy/R2-BK-09

G. SECTION 10 26 00, WALL GUARDS AND CORNER GUARDS

Item	Material	Manufacturer	Mfg. Color Name/No.
Corner Guards	CG-1	Inpro	160DBN / Chamois 234
Corner Guards	CG-2	Inpro	Stainless Steel 430
Wall Guards	WG-1	Inpro	1600 Series / Chamois 234
Handrail	HR-1	Inpro	1200 Series / Chamois 234
Rub Rail	RR-1	Inpro	700 Wall Guard / Slate 237
Wall Sheet Protection	WSP-1	Inpro	Slate 237
Wall Sheet Protection	WSP-2	Inpro	Chamois 234

H. SECTION 10 13 00 / 10 14 00, INTERIOR SIGNS

Sign Type	Component	Manufacturer	Mfg. Color Name/No.
Interior		2/90 Sign Systems	2/90 FAI/728 Earth

2.11 DIVISION II – EQUIPMENT

A. SECTION 11 12 00, PARKING CONTROL EQUIPMENT

Component Ticket Dispenser	Material	Manufacturer	Mfg. Color Name/No.
Gate and Arm			
Booth Exterior			
Booth Interior			
Booth Shelf			

B. SECTION 08 11 61 / 08 56 66, DETENTION AND PROTECTION SCREENS

Type	Material	Finish Color
Type A		
Type B		
Type C		
Door Screen		

C. SECTION 11 41 00, FOOD SERVICE SELF CONTAINED REFRIGERATION EQUIPMENT

Component	Material	Finish	Manufacturer	Mfg. Color Name/No.
Refrigerators, Mechanical, Food, Self Contained, Reach-in, Roll-in, Pass Through	Outer Shell			
	Doors			
	Loading Cart			
	Transfer Carriage			

D. SECTION 11 40 21, FOOD SERVICE EQUIPMENT-UTILITY DISTRIBUTION SYSTEMS

Plastic Laminate Slide Tray	Manufacturer	Mfg. Color Name/No.

E. SECTION 11 26 00, UNIT KITCHEN TYPE 22

Component	Manufacturer	Mfg. Color Name/No.
Cabinet		
Wall Splash		

F. SECTION 11 27 00, PHOTOGRAPHIC PROCESSING EQUIPMENT

Component	Item	Manufacturer	Mfg. Color Name/No.
Steel Cabinets			
Plastic Laminate			

G. SECTION 11 53 53, BIOLOGICAL SAFETY CABINETS

Type	Manufacturer	Mfg. Color Name/No.
H 12 A		
H 12 B1		
H 12 B 2		
H 12 B 3		
H 20		

H. SECTION 11 53 13, LAB FUME HOODS

Component	Manufacturer	Mfg. Color Name/No.
Molded Resin		
Steel		
Base Cabinet		

I. SECTION 13 21 29, LABORATORY CONTROLLED TEMPERATURE ROOMS AND REFRIGERATORS

Room No. & Location	Exterior Material	Manufacturer	Mfg. Color Name/No.
VL 52-24 R			
VL 52-24 F			
VL 52 E-24R			
VL 52 EF-24			
CTR			

2.12 DIVISION 12- FURNISHINGS

A. SECTION 12 31 00, METAL CASEWORK

Item/ Type	Finish	Manufacturer	Mfg. Color Name/No.
1. PHARMACY			
PH 61			
PH 71			
PH 77			
PH 77W			
PH 77U			
PH 77D			
2. SHELVES			
4			
4 A			
4 B			
5 C			
6			
6 A			
6 B			
6 C			
6 E			
7			
7 A			
7 B			
3. LOCKERS			
A			
B			

C			
S 3			
4. CABINETS			
1 A			
1 B			
1 G			
8 A			
8 B			
8 C			
13			
14			
14 A			
17			
5. COUNTERS			
1 F			
1 K			
1 L			
15			
15 A			
15 B			
15 D			
15 E			
15 F			
16			
16 A			
16 B			

B. SECTION 12 32 00, WOOD CASEWORK

Item Type	Location	Finish/Color
	Cabinet Dental Service	
	Countertop	
	Radiology Countertop	

C. SECTION 12 36 00, COUNTERTOPS AND ACCESSORIES

Type	Finish/Color
Stainless Steel	
Solid Surface	SS-1/ LG Hi Macs/ Relieve R530

D. SECTION 12 34 00, MOLDED PLASTIC CASEWORK

Component	Finish	Manufacturer	Mfg. Color Name
Component PL-1	Matte	Wilsonart	Shaker Cherry 7935
Component PL-2	Matte	Wilsonart	Skyline Walnut 7964

E. SECTION 13 34 19, PRE ENGINEERED METAL BUILDINGS

Component	Manufacturer	Mfg. Color Name/No.
Exterior Wall Panels		
Exterior Roof Panels		
Interior Wall Panels		
Interior Structural Framing		
Doors		

Windows		
Louvers		

F. SECTION 22 12 16, ELEVATED WATER TANK

Finish	Color

G. SECTION 13 17 23.11, THERAPEUTIC POOL ACCESSORIES

Item	Finish	Color

H. SECTION 14 21 00, ELECTRIC TRACTION ELEVATORS

Elevator	Component	Material	Finish	Color
Passenger Elevator No. P	Hoistway Entrance			
	Hoistway Doors			
	Corridor Position Indicator and Call Buttons			
	Car Canopy	Steel		
	Car Wainscot	Stainless Steel		
	Panels Above Wainscot	Plastic Laminate		
	Car Floor			
	Car Operating Panel			
Freight Elevator No. F	Car Enclosure	Steel		
	Car Floor	Steel		

	Car Gate	Wire Mesh		
	Rubbing Strip	Wood		
	Hoistway Entrances	Steel		
	Hoistway Doors	Steel		

I. SECTION 14 24 00, HYDRAULIC ELEVATORS

1. Passenger Elevator No. P	Component	Material	Color
	Hoistway Entrances		
	Hoistway Doors		
	Corridor Position Indicator		
	Car Canopy		
	Car Wainscot		
	Panels Above Wainscot		
	Car Floor		
	Corridor Call Buttons		
	Car Doors		
	Car Door Frame		
	Corridor Position Indicator		
	Car Operating Panel		
2. Service Elevator No. S			
	Hoistway Entrances		
	Hoistway Doors		
	Car Canopy Car Doors		
	Car Wainscot		

	Panels Above Wainscot		
	Car Floor		
	Car Operating Panel		
	Corridor Position Indicator		
	Corridor Call Button		
3. Freight Elevator No. F			
	Hoistway Entrance		
	Hoistway Doors		
	Car Canopy		
	Car Sides		
	Car Gate		
	Rubbing Strips		
	Car Floor		
Station Directories			

2.15 DIVISION 22 - PLUMBING

A. SECTION 22 40 00, PLUMBING FIXTURES AND TRIM

Item	Color
Water Closet	
Urinal	
Bathtubs	
Lavatories	
Service Sink Corner	
Service Sink	
Clinic Service Sink	

Plaster Sink	
Laundry Tub	

2.16 DIVISON 26 - ELECTRICAL

A. SECTION 26 51 00, BUILDING LIGHTING INTERIOR

Fixture Type	Exterior Finish	Color

B. SECTION 26 56 00, SITE LIGHTING

Type and Component	Exterior Finish	Manufacturer	Mfg. Name/No.

C. SECTION 10 25 13, PATIENT BED SERVICE WALLS

Component	Material	Finish	Manufacturer	Mfg. Color/Name
Cabinet Frame				
Face Panel				
Doors				

PART III EXECUTION

3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS

FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS	
Term	Abbreviation
Access Flooring	AF
Accordion Folding Partition	AFP
Acoustical Ceiling	AT
Acoustical Ceiling, Special Faced	AT (SP)
Acoustical Metal Pan Ceiling	AMP
Acoustical Wall Panel	AWP
Acoustical Wall Treatment	AWT
Acoustical Wallcovering	AWF
Anodized Aluminum Colored	AAC
Anodized Aluminum Natural Finish	AA
Baked On Enamel	BE
Brick Face	BR
Brick Flooring	BF
Brick Paving	BP
Carpet	CP
Carpet Athletic Flooring	CAF
Carpet Module Tile	CPT
Ceramic Glazed Facing Brick	CGFB
Ceramic Mosaic Tile	FTCT
Concrete	C
Concrete Masonry Unit	CMU
Divider Strips Marble	DS MB
Epoxy Coating	EC
Epoxy Resin Flooring	ERF
Existing	E
Exposed Divider Strips	EXP
Exterior	EXT
Exterior Finish System	EFS
Exterior Paint	EXT-P
Exterior Stain	EXT-ST
Fabric Wallcovering	WF
Facing Tile	SCT
Feature Strips	FS
Floor Mats & Frames	FM
Floor Tile, Mosaic	FT
Fluorocarbon	FC
Folding Panel Partition	FP
Foot Grille	FG
Glass Masonry Unit	GUMU
Glazed Face CMU	GCMU
Glazed Structural Facing Tile	SFTU
Granite	GT
Gypsum Wallboard	GWB
High Glazed Coating	SC
Latex Mastic Flooring	LM
Linear Metal Ceiling	LMC
Linear Wood Ceiling	LWC
Marble	MB
Material	MAT
Mortar	M
Multi-Color Coating	MC
Natural Finish	NF
Paint	P
Paver Tile	PVT
Perforated Metal Facing (Tile or Panels)	PMF
Plaster	PL
Plaster High Strength	HSPL
Plaster Keene Cement	KC
Plastic Laminate	HPDL
Polypropylene Fabric Wallcovering	PFW
Porcelain Paver Tile	PPT

Quarry Tile	QT
Radiant Ceiling Panel System	RCP
Resilient Stair Tread	RST
Rubber Base	RB
Rubber Tile Flooring	RT
Spandrel Glass	SLG
Stain	ST
Stone Flooring	SF
Structural Clay	SC
Suspension Decorative Grids Grids	SDG
Terrazzo Portland Cement	PCT
Terrazzo Tile	TT
Terrazzo, Thin Set	

Textured Gypsum Ceiling Panel	TGC
Textured Metal Ceiling Panel	TMC
Thin set Terrazzo	TST
Veneer Plaster	VP
Vinyl Base	VB
Vinyl Coated Fabric Wallcovering	W
Vinyl Composition Tile	VCT
Vinyl Sheet Flooring	VSF
Vinyl Sheet Flooring (Welded Seams)	WSF
Wall Border	WB
Wood	WD

3.2 FINSIH SCHEDULE SYMBOLS

Symbol	Definition
**	Same finish as adjoining walls
-	No color required
E	Existing
XX	To match existing
EFTR	Existing finish to remain
RM	Remove

3.3 ROOM FINISH SCHEDULE

A. Match adjoining or existing similar surfaces colors, textures or patterns where disturbed or damaged by alterations or new work when not scheduled.

B. ROOM FINISH SCHEDULE

Room No. and Name		FLOOR			BASE		WALL		WAINSCOT		CEILING		REMARKS
		MAT	FC		MAT	FCC	MAT	FCC	MAT	FC	MAT	FCC	
	EXIST			N									
				E									
				S									
				W									
				C									
	NEW			N									
				E									
				S									
				W									
				C									
	EXIST			N									
				E									
				S									
				W									
				C									
	NEW			N									
				E									
				S									
				W									

				C								
	EXIST			N								
				E								
				S								
				W								
				C								
	NEW			N								
				E								
				S								
				W								
				C								

- - - E N D - - -

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.

B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.

C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.

D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS// Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.

B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.

C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Studs, runners and accessories.
2. Hanger inserts.
3. Channels (Rolled steel).
4. Furring channels.
5. Screws, clips and other fasteners.

C. Shop Drawings:

1. Typical ceiling suspension system.

2. Typical metal stud and furring construction system including details around openings and corner details.
3. Typical shaft wall assembly
4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

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

B. American Society For Testing And Materials (ASTM)

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

Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

2.2 STEEL STUDS AND RUNNERS (TRACK)

A. ASTM C645, modified for thickness specified and sizes as shown.
   1. Use C 645 steel, 0.75 mm (0.0296-inch) minimum base-metal (30 mil).
   2. Runners same thickness as studs.
   3. Exception: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement. Use C 645 steel, 0.48mm (0.019 inch) minimum base-metal (19 mil).

B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.

C. Doubled studs for openings and studs for supporting concrete backer-board.

D. Studs 3600 mm (12 feet) or less in length shall be in one piece.

2.3 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.

B. Resilient furring channels:
   1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
   2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.

D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.

B. For fire rated construction: Type and size same as used in fire rating test.

C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:

1. ASTM A641, soft temper, Class 1 coating.

2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:

1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.

2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (OPTION)

A. Conform to ASTM C635, heavy duty, with not less than 35 mm (1-3/8 inch) wide knurled capped flange face designed for screw attachment of gypsum board.

B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.

B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than 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 and insulated exterior wall furring.
F. At existing plaster ceilings and where shown, studs may terminate at ceiling as shown.
G. Openings:
   1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
   2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
   3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.
H. Fastening Studs:
   1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
   2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.
I. Chase Wall Partitions:
   1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
   2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).
J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.
K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.
B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:
1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
   1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
   2. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.

B. New exposed concrete slabs:
   1. Use metal inserts required for attachment and support of hangers or hanger wires with tied wire loops for embedding in concrete.
   2. Furnish for installation under Division 3, CONCRETE.
   3. Suspended ceilings under concrete rib construction shall have runner channels at right angles to ribs and be supported from ribs with hangers at ends and at 1200 mm (48-inch) maximum intervals along channels. Stagger hangers at alternate channels.

C. Concrete slabs on steel decking composite construction:
   1. Use pull down tabs when available.
   2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.

D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.

E. Existing concrete construction exposed or concrete on steel decking:
   1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
   2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists. //

F. Steel decking without concrete topping:
   1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
   2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.

G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
   1. Install only for ceilings to receive screw attached gypsum board.
   2. Install in accordance with ASTM C636.
      a. Install main runners spaced 1200 mm (48 inches) on center.

b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
c. Install wall track channel at perimeter.

H. Installing Ceiling Bracing System:
1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.
2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

3.6 TOLERANCES

A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
B. Plumb and align vertical members within 3 mm (1/8-inch.)
C. Level or align ceilings within 3 mm (1/8-inch.)

- - - E N D - - -

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

B. Sound deadening board: Section 07 21 13, THERMAL INSULATION.

C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

D. 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 sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
3. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:

1. Cornerbead.
2. Edge trim.
3. Control joints.

E. Test Results:
1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.

F. Certificates: Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos material.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

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

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

C11-15	Terminology Relating to Gypsum and Related Building Materials and Systems
C475-15	Joint Compound and Joint Tape for Finishing Gypsum Board
C840-13	Application and Finishing of Gypsum Board
C919-12	Sealants in Acoustical Applications
C954-15	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
C1002-14	Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
C1047-14	Accessories for Gypsum Wallboard and Gypsum Veneer Base
C1177-13	Glass Mat Gypsum Substrate for Use as Sheathing
C1658-13	Glass Mat Gypsum Panels
C1396-14	Gypsum Board

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.

B. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick.

C. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.2 GYPSUM SHEATHING BOARD

A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.

B. ASTM C1177, Type X.

2.3 ACCESSORIES

A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.

B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

A. ASTM C1002 and ASTM C840, except as otherwise specified.

B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).

C. Select screws of size and type recommended by the manufacturer of the material being fastened.

D. For fire rated construction, type and size same as used in fire rating test.

E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:

1. Two sides of partitions:

a. Fire rated partitions.

b. Smoke partitions.

c. Sound rated partitions.
d. Full height partitions shown (FHP).
e. Corridor partitions.

2. One side of partitions or furring:
a. Inside of exterior wall furring or stud construction.
b. Room side of room without suspended ceilings.
c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.

3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.

B. In locations other than those specified, extend gypsum board from floor to heights as follows:
1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
2. At ceiling of suspended gypsum board ceilings.
3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

A. Coordinate installation of gypsum board with other trades and related work.

B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.

C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.

D. Use gypsum boards in maximum practical lengths to minimize number of end joints.

E. Bring gypsum board into contact, but do not force into place.

F. Ceilings:
1. For single-ply construction, use perpendicular application.
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.

G. Walls:

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
3. Stagger screws on abutting edges or ends.
4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.

6. Control Joints ASTM C840 and as follows:
   a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
   b. Not required for wall lengths less than 9000 mm (30 feet).
   c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:

1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.

I. Electrical and Telecommunications Boxes:

1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.

J. Accessories:

1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
2. Install in one piece, without the limits of the longest commercially available lengths.
3. Corner Beads:
   a. Install at all vertical and horizontal external corners and where shown.
   b. Use screws only. Do not use crimping tool.
4. Edge Trim (casings Beads):
   a. At both sides of expansion and control joints unless shown otherwise.
   b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
   c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
   d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

A. Install in accordance with ASTM C840, except as otherwise specified or shown.

B. Use screws of sufficient length to secure sheathing to framing.

C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.

D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.

E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

F. Gypsum Board:
   1. Two hour wall:
      a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
      b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.

c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

G. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

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 smoke barrier, fire rated and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated and sound rated construction/ Sanding is not required of non decorated surfaces.

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 fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

3.6 UNACCESSIBLE CEILINGS

At Mental Health and Behavioral Nursing Units, areas accessible to patients and not continuously observable by staff (e.g., patient bedrooms, day rooms), ceilings should be a solid material such as gypsum board. This will limit patient access. Access doors are needed to access electrical and mechanical equipment above the ceiling. These doors should be locked to prevent unauthorized access and secured to ceiling using tamper resistant fasteners.

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SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Acoustical units.
   2. Metal ceiling suspension system for acoustical ceilings.

1.2 RELATED REQUIREMENTS

A. Color, pattern, and location of each type of acoustical unit: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. ASTM International (ASTM):
   1. A641/A641M-09a(2014) - Zinc-coated (Galvanized) Carbon Steel Wire.
   2. A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
   3. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   4. C634-13 - Terminology Relating to Environmental Acoustics.
   5. C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6. C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   7. D1779-98(2011) - Adhesive for Acoustical Materials.
   8. E84-15b - Surface Burning Characteristics of Building Materials.
   9. E119-16 - Fire Tests of Building Construction and Materials.
   10. E413-16 - Classification for Rating Sound Insulation.
   11. E580/E580M-14 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
   12. E1264-14 - Classification for Acoustical Ceiling Products.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Submittal Drawings:
   1. Show size, configuration, and fabrication and installation details.
C. Manufacturer's Literature and Data:

1. Description of each product.
2. Ceiling suspension system indicating manufacturer recommendation for each application.
3. Installation instructions.
4. Warranty.

D. Samples:

1. Acoustical units, 150 mm (6 inches) in size, each type, including units specified to match existing.
2. Suspension system, trim and molding, 300 mm (12 inches) long.
3. Colored markers for access service.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.7 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Ceiling System: Acoustical ceilings units on exposed grid suspension systems.

2.2 SYSTEM PERFORMANCE

A. Design product complying with specified performance:
   1. Maximum Deflection: 1/360of span, maximum.
B. Fire Resistance: ASTM E119
C. Surface Burning Characteristics: When tested according to ASTM E84.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Provide acoustical units from one manufacturer.
   1. Provide each product exposed to view from one production run.
C. Provide suspension system from same manufacturer.

2.4 ACOUSTICAL UNITS

A. General:
   1. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements.
      a. Mineral Fiber: 3.6 kg/sq. m (3/4 psf) weight, minimum.
   2. Classification: Provide type and form as follows:
      a. NRC (Noise Reduction Coefficient): ASTM C423, minimum 0.55.
      b. CAC (Ceiling Attenuation Class): ASTM E413, 40-44 range.
      c. LR (Light Reflectance): Minimum 0.75.
   3. Lay-in panels: Sizes as indicated on Drawings, with square edges
      a. Sizes:
         1) Edge and Joint Detail: Square edges and joints as required to suit suspension and access system.

2.5 METAL SUSPENSION SYSTEM

A. General: ASTM C635, except as otherwise specified.
   1. Suspension System: Provide the following:
   2. Galvanized cold-rolled steel, bonderized. Main and Cross Runner: Use same construction Do not use lighter-duty sections for cross runners.
B. Exposed Grid Suspension System: Support of lay-in panels.
   1. Grid Width: 22 mm (7/8 inch) minimum with8 mm (5/16 inch) minimum panel bearing surface.
   2. Molding: Fabricate from the same material with same exposed width and finish.

C. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.

1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).

D. Wire: ASTM A641.

1. Size:

a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).

b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).

2.6 ACCESSORIES

A. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.

1. Thickness: As required to fill voids between back of wall molding and finish wall.

2. Size: Minimum 9 mm (3/8 inch) wide strip.

B. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.

1. Color Code: Provide the 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 ACOUSTICAL UNIT INSTALLATION

A. Layout acoustical unit symmetrically, with minimum number of joints.

B. Installation:

1. Install acoustic tiles after wet finishes have been installed and solvents have cured.

2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.

a. Install tile to lay level and in full contact with exposed grid.

b. Replace cracked, broken, stained, dirty, or tile.

3. Markers:

a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
b. Attach colored markers to exposed grid on opposite sides of the units providing access.
c. Attach marker on exposed ceiling surface of upward access acoustical unit.

C. Touch up damaged factory finishes.
1. Repair painted surfaces with touch up primer.

3.2 CEILING SUSPENSION SYSTEM INSTALLATION

A. General: Install according to ASTM C636.
1. Use direct or indirect hung suspension system or combination of both.
2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.
3. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
4. Provide additional hangers located at each corner of support components.

B. Direct Hung Suspension System: ASTM C635.
1. Support main runners by hanger wires attached directly to the structure overhead.
2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.

C. Anchorage to Structure:
1. Steel:
a. Install carrying channels for attachment of hanger wires.
1) Size and space carrying channels to support load within performance limit.
2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.
c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of

the bottom chord of the bar joists, and securely wire tie or clip to joist.

3.3 CEILING TREATMENT

A. 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.

B. 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.

C. Existing ceiling:
   1. Where extension of existing ceilings occurs, match existing.
   2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
   3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

3.4 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed surfaces. Remove contaminants and stains.

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SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base (RB) adhered to interior walls and partitions.

1.2 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. F1344-15 - Rubber Floor Tile.
2. F1859-14 - Rubber Sheet Floor Covering without Backing.
3. F1860-14 - Rubber Sheet Floor Covering with Backing.
4. F1861-08(2012)e1 - Resilient Wall Base.
5. D4259-88(2012) - Abrading Concrete.

C. International Concrete Repair Institute (ICRI):

1. 310.2R-13 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.3 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Adhesives and primers indicating manufacturer's recommendation for each application.
3. Installation instructions.

C. Samples:

1. Resilient Base: 150 mm (6 inches) long, each type and color.

D. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

1.4 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.5 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage when handling and during construction operations.

1.6 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.7 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide each product from one manufacturer and from one production run.

2.2 RESILIENT BASE

A. Resilient Base: 3 mm (1/8 inch) thick, 100 mm (4 inches) high.

1. Type: Rubber or vinyl; use one type throughout.
2. ASTM F1861, Type TP thermoplastic rubber or Type TV thermoplastic vinyl, Group 2 - layered.

B. Applications:

1. Other Locations: Style B - Cove.

PRIMER (FOR CONCRETE FLOORS)

C. Primer: Type recommended by adhesive manufacturer.

2.3 LEVELING COMPOUND (FOR CONCRETE FLOORS)

A. Leveling Compound: Provide products mixed with latex or polyvinyl acetate resins.

2.4 ADHESIVES

A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Remove existing base to permit new installation.

1. Dispose of removed materials.

D. Correct substrate deficiencies.

1. Fill cracks, pits, and depressions with leveling compound.
2. Remove protrusions; grind high spots.
3. Apply leveling compound to achieve 3 mm (1/8 inch) in 3 m (10 feet) maximum surface variation.

E. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

1. Mechanically clean concrete floor substrate according to ASTM D4259.
2. Surface Profile: ICRI Guideline No. 310.2R.

F. Allow substrate to dry and cure.

G. Perform flooring manufacturer’s recommended bond, substrate moisture content, and pH tests.

3.2 INSTALLATION GENERAL

A. Install products according to manufacturer's instructions.

1. When instructions deviate from specifications, submit proposed resolution for Contracting Officer consideration.

3.3 RESILIENT BASE INSTALLATION

A. Applications:

1. Install resilient base in rooms scheduled on Drawings.
2. Install resilient base on casework and locker toe spaces, and other curb supported fixed equipment.
3. Extend resilient base into closets, alcoves, and cabinet knee spaces, and around columns within scheduled room.

B. Lay out resilient base with minimum number of joints.

1. Length: 600 mm (24 inches) minimum, each piece.
2. Locate joints 150 mm (6 inches) minimum from corners and intersection of adjacent materials.

C. Installation:

1. Apply adhesive uniformly for full contact between resilient base and substrate.

2. Set resilient base with hairline butted joints aligned along top edge.

D. Field form corners and end stops.
   1. V-groove back of outside corner.
   2. V-groove face of inside corner and notch cove for miter joint.

E. Roll resilient base ensuring complete adhesion.
   1. Roll sheet rubber flooring ensuring complete adhesion.

3.4 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed resilient base. Remove contaminants and stains.
   1. Clean with mild detergent. Leave surfaces free of detergent residue.

3.5 PROTECTION

1. Maintain protection until directed by Contracting Officer's Representative.

B. Replace damaged products and re-clean.
   1. Damaged Products include cut, gouged, scraped, torn, and unbonded products.

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SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient sheet flooring (RSF) with chemically welded seams
   2. Welded seam sheet flooring (WSF) with heat welded seams

1.2 RELATED REQUIREMENTS

A. Color, Pattern and Texture: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Resilient Base over Base of Lockers, Equipment and Casework:

1.3 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
   1. Show size, configuration, and fabrication and installation details.
B. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Application Installation instructions.
   3. Warranty.
C. Samples:
   1. Sheet material, 38 mm by 300 mm (1-1/2 inch by 12 inch), of each color and pattern with welded seam using specified welding rod 300 mm (12 inches) square for each type, pattern and color.

1.4 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.5 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.
B. Protect products from damage during handling and construction operations.

1.6 FIELD CONDITIONS

A. Environment:

1. Work Area Ambient Temperature Range: Minimum 18 to 38 degrees C (65 to 100 degrees F) continuously, beginning 48 hours before installation. Maintain room temperature above 18 degrees C (65 degrees F) after installation.
2. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.7 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant resilient sheet flooring against material and manufacturing defects.

1. Warranty Period: 2 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Sheet Flooring:

1. Critical Radiant Flux: ASTM E648; 0.45 watts per sq.cm or more, Class I.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide vinyl sheet color and pattern from one production run.

2.3 RESILIENT SHEET FLOORING

A. Resilient Sheet Flooring (RSF): ASTM F1913; Vinyl, without backing.

1. Wear Surface: Smooth.
2. Thickness: 2 mm (0.080 inches).

B. Resilient Sheet Flooring (RSF): ASTM F1303; Type II, Grade 1, vinyl, with backing.

1. Wear Surface: Smooth.
2. Wear Layer Thickness: Minimum 0.51 mm (0.020 inches).
3. Total Thickness: 2 mm (0.080 inches).

C. Sheet Size: Provide maximum size sheet produced by manufacturer to minimize joints.

1. Minimum Width: 1200 mm (48 inches).

2.4 WELDED SEAM SHEET FLOORING

A. Welded Seam Sheet Flooring (WSF): ASTM F1860; Type I Type II rubber, with backing.

1. Wear Surface: Smooth.
2. Wear Layer Thickness: Minimum 1.0 mm (0.040 inches).
3. Total Thickness: 2 mm (0.080 inches).

B. Sheet Size: Provide maximum size sheet produced by manufacturer to minimize joints.
1. Minimum Width: 1200 mm (48 inches).

2.5 ACCESSORIES

A. Bonding Chemical: Flooring manufacturer's standard seam bonding chemical.
B. Welding Rod: Flooring manufacturer's standard, in color matching field color of sheet flooring.
C. Adhesives: Water resistant type recommended by flooring manufacturer to suit application.
D. Leveling Compound:
1. Provide cementitious type with latex or polyvinyl acetate resins additive.
E. Primer:
1. Type recommended by adhesive or flooring manufacturer.
F. Sealant:
1. As specified in Section 07 92 00, JOINT SEALANTS.
2. Compatible with flooring.
G. Polish: Type recommended by flooring manufacturer to suit application and anticipated traffic.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Ensure interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work is complete and dry before installation.
1. Complete mechanical, electrical, and other work above ceiling line.
2. Ensure heating, ventilating, and air conditioning systems are installed and operating in order to maintain temperature and humidity requirements.
D. Correct substrate deficiencies.
1. Fill cracks, pits, and dents with leveling compound.
2. Grind, sand, or cut away protrusions. Grind high spots.

3. Level flooring substrate to 3 mm (1/8 inch) maximum variation.

E. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
   1. Mechanically clean concrete floor substrate according to ASTM D4259.
   2. Surface Profile: ICRI 310.2R CSP 3 to CSP 4.

F. Perform flooring manufacturer’s recommended bond, substrate moisture content, and pH tests.

G. Broom or vacuum clean substrates immediately before flooring installation.

H. Primer: Apply primer according to manufacturer’s instructions.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 INSTALLATION OF FLOORING

A. Flooring Layout:
   1. Arrange pattern in one direction joints pattern matched.
   2. Extend flooring wall-to-wall, under cabinets, casework, laboratory and pharmacy furniture, and other equipment for seamless flooring installation.
   3. Arrange sheets to minimize seams.
   4. Locate seams in inconspicuous and low traffic areas, minimum 150 mm (6 inches) away from parallel joints in flooring substrates.

B. Match edges of flooring for color shading and pattern at seams.

C. Install flooring flush with adjacent floor finishes.

D. Extend flooring into toe spaces, door reveals, closets, and similar openings.

E. Install flooring fully adhered to substrate.
   1. Air pockets or loose edges are not acceptable.
   2. Trim sheet materials tight to flooring penetrations; seal joints at pipe with waterproof sealant specified in Section 07 92 00, JOINT SEALANTS.

F. Butt joints tight, without gaps and bulges.

G. Installation of Edge Strips:
   1. Install edge strips at flooring terminations and transitions to other floor finishes.

2. Locate edge strips under center lines of doors unless otherwise indicated.
3. Set edge strips in adhesive and mechanically fasten to substrate.

3.4 HEAT WELDING

A. Heat weld joints of flooring and base using welding rod.
B. Rout joint, insert welding rod into routed space, and fuse flooring and welding rods for seamless, watertight installation.
   1. Fuse joints for seamless weld.
C. Finish joints flush, free from voids, and recessed or raised areas.

3.5 CLEANING

A. Remove excess adhesive before adhesive sets.
B. Clean and polish materials.
C. Vacuum floor thoroughly.
D. Perform initial maintenance according to flooring manufacturer's instructions.
   1. Delay washing flooring until adhesive is fully set and welded joints can contain wash water.

3.6 PROTECTION

A. Protect flooring from traffic and construction operations.
B. Keep traffic off sheet flooring for minimum 24 hours after installation.
C. Cover flooring with reinforced kraft paper, and plywood or hardboard.
D. Remove protective materials immediately before acceptance.
E. Repair damage.
F. Buff flooring to uniform sheen.

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SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies the installation of rubber tile and accessories required for a complete installation.

1.2 RELATED WORK:

B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

C. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

E. Color, Pattern and Texture for Resilient Tile Flooring and Accessories: 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.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Resilient material manufacturer’s recommendations for adhesives, underlayment, primers, and polish.
3. Application, installation and maintenance instructions.

D. Samples:

1. Tile: Each type, color, thickness and finish.
2. Edge Strips: Each type, color, thickness and finish.
3. Feature Strips: Each type, color, thickness and finish.

E. Shop Drawings:

1. Layout of patterns as shown on the construction documents.
2. Edge strip locations showing types and detail cross sections.

F. Test Reports:

1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory. Tested per ASTM F510/F510M.
2. Moisture and pH test results as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

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 are not acceptable.

1.5 STORAGE:

A. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives, and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.6 QUALITY ASSURANCE:

A. Furnish product type materials from the same production run.

1.7 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

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. ASTM International (ASTM):

D2047-11 .....Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

D2240-05(R2010) .....Test Method for Rubber Property—Durometer Hardness

D4078-02(R2008) .....Water Emulsion Floor Finish

E648-14c .....Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

E662-14 .....Specific Optical Density of Smoke Generated by Solid Materials

E1155/E1155M-14 .....Determining Floor Flatness and Floor Levelness Numbers

F510/F510M-14 .....Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method

F710-11 .....Preparing Concrete Floors to Receive Resilient Flooring

F925-13 .....Test Method for Resistance to Chemicals of Resilient Flooring

F1066-04(R2014) .....Vinyl Composition Floor Tile
F1344-12(R2013) .....Rubber Floor Tile
F1700-13a .....Solid Vinyl Floor Tile
F1869-11 .....Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-11 .....Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes

C. Code of Federal Regulation (CFR):
40 CFR 59 .....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

D. International Standards and Training Alliance (INSTALL):

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

A. Provide adhesives, underlayment, primers, and polish recommended by resilient floor material manufacturer.

B. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.

C. Smoke Density: Less than 450 per ASTM E662.

D. Slip Resistance – Not less than 0.5 when tested with ASTM D2047.

2.2 RUBBER TILE:

A. Tile Standard: ASTM F1344, Class I-A, homogeneous rubber tile, solid color Class I-B, homogeneous rubber tile, through mottled Manufacturer’s standard hardness, measured using Shore, Type A durometer per ASTM D2240.

C. Wearing Surface: Smooth.

D. Thickness: 3.2 mm (0.125 inch)

E. Size: 39.53 x 39.5 inches and (24 x 24 inches).

2.7 ADHESIVES:

A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. VOC content to be less than the 50 grams/L when calculated according to 40 CFR 59 (EPA Method 24). Submit manufacturer’s descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.8 PRIMER FOR CONCRETE SUBFLOORS:

A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.9 LEVELING COMPOUND FOR CONCRETE FLOORS:

A. Provide cementitious products with latex or polyvinyl acetate resins in the mix in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.10 POLISH AND CLEANERS:

A. Cleaners: As recommended in writing by floor tile manufacturer.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS:

A. Maintain flooring materials and areas to receive resilient flooring at a temperature above 20 degrees C (68 degrees F) for three (3) days before application, during application and two (2) days after application, unless otherwise directly by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 13 degrees C (55 degrees F) thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

B. 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 TESTING AND PREPARATION:

A. Prepare and test surfaces to receive resilient tile and adhesive as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

B. Prepare concrete substrates in accordance with ASTM F710.

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 is not acceptable.

C. Tile Layout:

1. If layout is not shown on construction documents, lay tile symmetrically about center of room or space with joints aligned.
2. Vary edge width as necessary to maintain full size tiles in the field, no edge tile to be less than 1/2 the field tile size, except where irregular shaped rooms make it impossible.

3. Place tile pattern in the same direction; do not alternate tiles unless specifically indicated in the construction documents to the contrary.

D. Application:
1. Adhere floor tile to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
2. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
3. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
4. Roll tile floor with a minimum 45 kg (100 pound) roller.

E. Seal joints at pipes with sealants in accordance with Section 07 92 00, JOINT SEALANTS.

F. Installation of Edge Strips:
1. Locate edge strips under center line of doors unless otherwise shown on construction documents.
2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws.
3. Where tile edge is exposed, butt edge strip to touch along tile edge.

3.4 CLEANING AND PROTECTION:

A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.

B. Keep traffic off resilient material for a minimum 72 hours after installation.

C. Clean flooring as recommended in accordance with manufacturer’s printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer’s written instructions.

D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by COR. 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 COR.

E. When protective materials are removed and immediately prior to acceptance, replace damaged tile and mouldings, re-clean resilient materials.

3.5 LOCATION:

A. Unless otherwise indicated in construction documents, install tile flooring, under areas where casework, laboratory and pharmacy furniture and other equipment occur.

B. Extend tile flooring for room into adjacent closets and alcoves.

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SECTION 09 72 16
VINYL-COATED FABRIC WALL COVERINGS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Section specifies vinyl coated fabric wall covering and installation.

1.2 RELATED WORK:

A. Color, pattern, type, direction of hanging and areas to receive wall covering: 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. Each type and pattern as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

C. Manufacturer's Certificates:

12. Wall covering manufacturer's approval of adhesive.

D. Manufacturer's Literature and Data:

1. Wall covering primer and adhesive.
2. Installation instructions.
3. Maintenance instructions, including recommended materials and methods for maintaining wall covering with precautions in use of cleaning material.
4. Adhesive for edge guard and wainscot cap.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver in original unopened containers bearing the manufacturer's name, brand name, and product designation.

B. Store in accordance with manufacturer's instructions.

C. Handle to prevent damage to material.

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. ASTM International (ASTM):

E84-14 .....Surface Burning Characteristics of Building Materials

G21-13 .....Determining Resistance of Synthetic Polymeric Materials to Fungi

C. Code of Federal Regulation (CFR):

40 CFR 59 .....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

D. Wallcovering Association (WA):

W-101-13 .....Quality Standard Polymer Coated Fabric Wallcoverings

PART 2 - PRODUCTS

2.1 VINYL COATED FABRIC WALL COVERING:

A. Comply with WA W-101.

B. Fungi Resistance: ASTM G21, rating of zero (0).

C. Factory-applied clear delustered polyvinyl-fluoride (PVF) coating:

1. Minimum 0.0125 mm (1/2 mil) thickness.
2. Do not include PVF coating weight in minimum total weight.
3. Fire hazard classification with PVF coating: Class A unless specified otherwise.

E. Type II (Medium Duty).

F. Type III (Heavy Duty).

2.2 PRIMER AND ADHESIVE:

A. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

B. Vermin, mildew resistant and germicidal inhibiting type recommended by wall covering manufacturer for use on substrate to receive wall covering.

2.3 WALL LINER:

A. Provide a non-woven polyester cellulose blend where required by wall-covering manufacturer having a minimum weight of 0.125 Kg/square meter (3.7 ounces per square yard) and a total minimum thickness of 0.325 mm (0.013 inches). Wall liner is to have a flame spread rating of 0-20 and smoke development rating of 0-25 when tested in accordance with ASTM E84.

PART 3 - EXECUTION

3.1 JOB CONDITIONS:

A. Temperatures:

1. Do not perform work until surfaces and materials have been maintained at minimum of 16 degrees C (60 degrees F) for three (3) days before work begins.

2. Maintain minimum temperatures of 16 degrees C (60 degrees F) until adhesives are dried or cured.

B. Lighting:

1. Do not proceed unless a minimum lighting level of 15 candela per 0.09 square meter (15 candela per square foot) is provided.

C. Ventilation: Provide continuous ventilation as required to rid the spaces in which the wall coverings are being installed of volatile compounds given off by the wall coverings, sealers and adhesives and as recommended by the product manufacturer for full drying or curing.

D. Protect other surfaces from damage resulting from installation of wall coverings. Provide drop cloths, shields and protective equipment to prevent primers, adhesives or wall covering from fouling adjacent surfaces and in particular, storage and preparation areas.

E. Store flammable rubbish, waste, cloths and materials which may constitute a fire hazard, in closed metal containers. Daily remove and properly dispose of flammable wastes from the site.

3.2 SURFACE CONDITION AND PREPARATION:

A. Inspect surfaces to receive wall coverings to assure that:

1. Patches and repairs to substrates are completed.
2. Surfaces are clean, smooth and prime painted.
3. Masonry and concrete walls are to have flush joints. Coat these walls with cement plaster or wall/liner as substrate preparation.

B. Surfaces to receive wall covering are to be dry. Test moisture content of plaster, concrete, and masonry walls with an electric moisture meter. The moisture content is not permitted to be more than 5 percent. Submit test results.

C. Do not proceed until discovered defects have been corrected by other trades and surfaces are ready to receive wall covering.

D. Carefully remove electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings and fastenings, prior to starting work and store items for reinstallation.

3.3 APPLICATION OF ADHESIVE:

A. Mix and apply adhesives in accordance with manufacturer's directions.

B. Prevent adhesive from getting on face of wall covering.

C. Apply adhesive to wall covering back.

3.4 INSTALLATION:

A. Use wall covering of same batch or run in each area. Use fabric rolls in consecutive numerical sequence of manufacture.

B. Install material completely adhered, smooth, clean, without wrinkles, air pockets, gaps or overlaps.
C. Extend wall covering continuous behind non-built-in casework and other items which are not bolted to the walls.
D. Install wall covering before installation of resilient base. Extend wall covering not more than 6 mm (1/4 inch) below top of resilient base.
E. Install wall covering panels consecutively in order in which they are cut from the roll including filling spaces above or below windows, doors, or similar penetrations.
F. Do not install horizontal seams.
G. Except on match patterns, hang fabric by reversing alternate strips, except as recommended by the manufacturer.
H. Cutting:
    1. Cut on a work table with a straight edge.
    2. Joints or seams that are not cut clean are unacceptable.
    3. Trim additional selvage to achieve a color and pattern match at seams. Overlapped seams are not allowed.
    4. Do double cut seams on wall with a double cutter.
    5. When double cutting on the wall is necessary, place a three inch strip of Type I wall covering under pasted edge.
        a. Do not cut into wall surface.
        b. After cutting, remove strip and excess adhesive from seam before proceeding to next seam.
        c. Smooth down seam in adhesive for tight bond and joint.
I. Trim strip-matched patterns which are not factory pre-trimmed.
J. Inside Corners:
    1. Wrap wall covering around corners.
    2. Do not seam within 50 mm (2 inches) of inside corners.
    3. Double cut seams.
K. Outside Corners:
    1. Wrap wall covering around corners.
    2. Do not seam within 152 mm (6 inches) of outside corners.
    3. Double cut seams.

3.5 PATCHING:

A. Replace surface damaged wall covering in a space as specified for new work:
    1. Replace full height of surface.

2. Replace from break in plane to break in plane when same batch or run is not used.
3. Double cut seams.
4. Adjoining differential colors from separate batches or runs is not acceptable.

B. Correct loose or raised seams with adhesives to lay flat with tight bonded joint as specified for new work.

3.6 CLEANING AND INSTALLING TEMPORARY REMOVED ITEMS:

A. Remove adhesive from wall covering as work proceeds.
B. Remove adhesives where spilled, splashed or splattered on wall coverings or adjacent surfaces in a manner not to damage surface from which it is removed.
C. Upon completion of work, leave wall covering free of dirt or soil.
D. Remove all debris associated with wall covering installation.
E. Reinstall previously removed electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings and fastenings.

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SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the construction documents and/or specified herein, including, but not limited to, the following:

1. Prime painting unprimed surfaces to be painted under this Section.
2. Painting items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
3. Painting ferrous metal (except stainless steel) exposed to view.
4. Painting galvanized ferrous metals exposed to view.
5. Painting gypsum drywall exposed to view.
6. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
7. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
8. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
9. Painting of any surface not specifically mentioned to be painted herein or on construction documents, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, is to be included as though specified.

1.2 RELATED WORK:

A. Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.

B. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS:

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

1.4 DELIVERY AND STORAGE:

A. Deliver materials to site in manufacturer's sealed container marked to show following:
   1. Name of manufacturer.
   2. Product type.
   3. Batch number.
   4. Instructions for use.
   5. Safety precautions.

B. In addition to manufacturer's label, provide a label legibly printed as following:
   1. Federal Specification Number, where applicable, and name of material.
   2. Surface upon which material is to be applied.
   3. Specify Coat Types: Prime; body; finish; etc.

C. Maintain space for storage, and handling of painting materials and equipment in a ventilated, 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 7 and 30 degrees C (45 and 85 degrees F).

1.5 REGULATORY REQUIREMENTS:

A. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
   1. Volatile Organic Compounds (VOC) Emissions Requirements: Field-applied paints and coatings that are inside the waterproofing system to not exceed limits of authorities having jurisdiction.
   2. Lead-Base Paint:
      a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
      b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
      c. Do not use coatings having a lead content.
   3. Asbestos: Provide materials that do not contain asbestos.
   4. Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.

5. Human Carcinogens: Provide materials that do 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.

1.6 SAFETY AND HEALTH

A. Apply paint materials using safety methods and equipment in accordance with the following:

1. Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis (AHA) as specified in Section 01 35 26, SAFETY REQUIREMENTS. The AHA is to include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7 APPLICABLE PUBLICATIONS:

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

B. American Conference of Governmental Industrial Hygienists (ACGIH):

ACGIH TLV-BKLT-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. ASME International (ASME):

A13.1-07(R2013) .....Scheme for the Identification of Piping Systems

D. Commercial Item Description (CID):

A-A-1272A .....Plaster Gypsum (Spackling Compound)

E. Master Painters Institute (MPI):

2 .....Interior/ Exterior Latex Block Filler

3 .....Aluminum Paint, High Heat (up to 590% - 1100F)

4 .....Interior Satin Latex, MPI Gloss Level 4

5 .....Interior Low Sheen Latex, MPI Gloss Level 2

5 .....Interior Enamel Undercoat

7 .....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5

8 .....Interior Alkyd, Gloss, MPI Gloss Level 6

9 .....Interior Latex Primer Sealer

10 .....Interior Alkyd, Eggshell, MPI Gloss Level 3

11 .....Interior Latex, MPI Gloss Level 3

12 .....Interior Latex, Flat, MPI Gloss Level 1

13 .....Interior Latex, Semi-Gloss, MPI Gloss Level 5
14 .....Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss
15 .....Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved)
16 .....Interior Latex Fire Retardant, Top-Coat (ULC Approved)
17 .....Polyurethane, Moisture Cured, Clear, Flat
18 .....Epoxy Cold Cured, Gloss
19 .....Fast Drying Metal Primer
20 .....High Build Epoxy Coating
21 .....Epoxy Anti-Corrosive Metal Primer
22 .....High Build Epoxy Coating, Low Gloss
23 .....Interior Latex, Gloss
24 .....Interior High Performance Latex, MPI Gloss Level 2
25 .....Interior High Performance Latex (SG) MPI Gloss Level 5

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer’s technical data sheets for specified coatings.

2.2 PAINT PROPERTIES:

A. Use ready-mixed (including colors).
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.
C. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

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 day's 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 COR and the product manufacturer. Under no circumstances are application conditions to exceed manufacturer recommendations.
   c. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
2. Maintain interior temperatures until paint dries hard.
3. Do not paint in direct sunlight or on surfaces that the sun will warm.
4. 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 only when allowed by manufacturer's printed instructions.

3.2 INSPECTION:

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.3 GENERAL WORKMANSHIP REQUIREMENTS:

A. Application may be by brush or roller.

B. Protect work at all times. Protect all adjacent work and materials by suitable covering or other method during progress of work. Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and leave work in a clean condition.

C. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

D. When indicated to be painted, remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

E. Materials are to be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

F. Apply materials with a coverage to hide substrate completely. When color, stain, dirt or undercoats show through final coat of paint, the surface is to be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Government.

G. All coats are to be dry to manufacturer's recommendations before applying succeeding coats.

3.4 SURFACE PREPARATION:

A. General:

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished are to be completely dry, clean and smooth.
2. See other sections of specifications for specified surface conditions and prime coat.
3. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
4. Clean surfaces before applying paint or surface treatments 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. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
5. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   a. Concrete: 12 percent.
   b. Fiber-Cement Board: 12 percent.
   c. Masonry (Clay and CMU's): 12 percent.

B. Ferrous Metals:
   1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
   2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning).
   3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
      a. Fill 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.

C. Masonry, Concrete, Cement Board:
   1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
   2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
   3. Remove loose mortar in masonry work.
   4. 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 (3) days and brush thoroughly free of crystals.
   5. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in Division 03, CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

D. Gypsum Board:
   1. Remove efflorescence, 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 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 gypsum board.

3.5 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 (2) component and two (2) 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.

3.6 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 (3) coats; prime, body, and finish. When two (2) 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 COR.

E. Apply by brush or roller.

F. 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.

3.7 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. Metals except boilers, incinerator stacks, and engine exhaust pipes:
   1. Steel and iron: MPI 79 (Marine Alkyd Metal Primer)

E. Gypsum Board
   1. Surfaces scheduled to have MPI 11 (Exterior Latex, Semi-Gloss)
   2. Primer: MPI 50 (Interior Latex Primer Sealer) except MPI 46 (Interior Enamel Undercoat) in shower and bathrooms.
   3. Surfaces scheduled to receive vinyl coated fabric wall covering: Use MPI 45 (Interior Primer Sealer)

F. Concrete Masonry Units except glazed or integrally colored and decorative units:
   1. MPI 4 (Block Filler) on interior surfaces.
   2. Prime exterior surface as specified for exterior finishes.

G. Concrete Masonry Interior Surfaces of Ceilings and Walls:
   1. MPI 53 (Interior Latex, Flat, MPI Gloss Level 1)

3.8 INTERIOR FINISHES:

A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Metal Work:
   1. Apply to exposed surfaces.
   2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
   3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
      a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) unless specified otherwise.
      b. Two (2) coats of MPI 48 (Interior Alkyd Gloss) MPI 51 (Interior Alkyd, Eggshell).
      c. One (1) coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss) on exposed interior surfaces of alkyd-amine enamel prime finished windows.

C. Gypsum Board:
   1. One (1) coat of MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3).

D. Masonry and Concrete Walls:
   1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.

2. Two (2) coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2).

3.9 REFINISHING EXISTING PAINTED SURFACES:

A. Clean, patch and repair existing surfaces as specified under "Surface Preparation". No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, sand smooth and re-finish until surface meets with COR's approval.

B. Remove and reinstall items as specified under "General Workmanship Requirements".

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. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.10 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.

3.11 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 below.

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 exposed sprinkler lines red to match existing.

E. Paint after tests have been completed.

F. Omit prime coat from factory prime-coated items.

G. 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. 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.

b. Federal Safety Red: Exposed fire protection piping electrical conducts containing fire alarm control wiring, and fire alarm equipment.

H. Apply paint systems on properly prepared and primed surface as follows:

1. Interior Locations:

a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:

1) Metal under 94 degrees C (201 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, electric conduits and panel boards.

3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.

3. Other exposed locations:

a. Metal surfaces, except aluminum, including connected pipes: Two (2) coats of MPI 1 (Aluminum Paint).

b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 10 (Exterior Latex, Flat) MPI 11 (Exterior Latex Semi-Gloss MPI 119 (Exterior Latex, High Gloss (acrylic)).

3.12 IDENTITY PAINTING SCHEDULE:

A. Identify designated service in new buildings or projects with extensive remodeling in accordance with ASME A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels. For existing spaces where work is minor match existing.

1. Legend may be identified using snap-on coil plastic markers or by paint 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 12.2 M (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 using black stencil paint.
5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on construction documents 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		Green	White	Blow-off
Boiler Feedwater		Green	White	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		Blue	White	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain

Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Green	White	H.P. _____*
High Pressure Condensate Return		Green	White	H.P. Ret ____*
Medium Pressure Steam		Green	White	M. P. Stm ____*
Medium Pressure Condensate Return		Green	White	M.P. Ret _____*
Low Pressure Steam		Green	White	L.P. Stm _____*
Low Pressure Condensate Return		Green	White	L.P. Ret _____*
High Temperature Water Supply		Green	White	H. Temp Wtr Sup
High Temperature Water Return		Green	White	H. Temp Wtr Ret
Hot Water Heating Supply		Green	White	H. W. Htg Sup
Hot Water Heating Return		Green	White	H. W. Htg Ret
Gravity Condensate Return		Green	White	Gravity Cond Ret
Pumped Condensate Return		Green	White	Pumped Cond Ret
Vacuum Condensate Return		Green	White	Vac Cond Ret
Fuel Oil - Grade	Brown	White	Fuel Oil-Grade	
(Diesel Fuel included under Fuel Oil)				
Boiler Water Sampling		Green	White	Sample
Chemical Feed		Green	White	Chem Feed
Continuous Blow-Down		Green	White	Cont. B D
Pumped Condensate		Green	White	Pump Cond
Pump Recirculating		Green	White	Pump-Recirc.
Vent Line		Green	White	Vent
Alkali		Orange	Black	Alk
Bleach		Orange	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		Orange	Black	Acid Waste
Vent		Orange	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	Red	White	Auto Spr
Standpipe	Red	Red	White	Stand
Sprinkler	Red	Red	White	Drain

Hot Water Supply Dom./ Solar Water	Green	White	H.W. Sup Dom/SW
Hot Water Return Dom./ Solar Water	Green	White	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6096 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000 15000 2500.
8. See Sections for methods of identification, legends, and abbreviations of the following:
   a. Regular compressed air lines: Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS.

B. Fire and Smoke Partitions:
1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
3. Locate not more than 6096 mm (20 feet) on center on corridor sides of partitions, and with a least one (1) message per room on room side of partition.
4. Use semi-gloss paint of color that contrasts with color of substrate.

3.13 PROTECTION CLEAN UP, AND TOUCH-UP:

A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.

B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.

C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

- - - E N D - - -

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies interior signage for room numbers, directional signs exterior signage, code required signs and temporary signs.

1.2 RELATED WORK:

A. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.

1.3 QUALITY ASSURANCE:

A. Manufacturer’s Qualifications: Provide signage that is the product of one manufacturer, who has provided signage as specified for a minimum of three (3) years. Submit manufacturer’s qualifications.

B. Installer’s Qualifications: Minimum three (3) years’ experience in the installation of signage of the type as specified in this Section. Submit installer’s qualifications.

1.4 SUBMITTALS:

A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
compounds per volume as specified in PART 2 - PRODUCTS.

B. Interior Sign Samples: Sign panels and frames, with letters and symbols, for each sign type.
1. Sign Panel, 203 x 254 mm (8 x 10 inches), with letters.
2. Color samples of each color, 152 x 152 mm (6 x 6 inches. Show anticipated range of color and texture.
3. Sample of typeface, arrow and symbols in a typical full size layout.

C. Exterior Sign Samples: 152 x 152 mm (6 x 6 inches) samples of each color and material.

D. Manufacturer's Literature:
1. Showing the methods and procedures proposed for the anchorage of the signage system to each surface type.
2. Manufacturer’s printed specifications and maintenance instructions.

E. Sign Location Plan, showing location, type and total number of signs required.

F. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.

G. Full size layout patterns for dimensional letters.

H. Manufacturer’s qualifications.

I. Installer’s qualifications.

1.5 DELIVERY AND STORAGE:

A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.

B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.

C. Deliver signs only when the site and mounting services are ready for installation work to proceed.

D. Store products in dry condition inside enclosed facilities.

1.6 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21, “Warranty of Construction”.

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 Architectural Manufacturers Association (AAMA):

611-14 .....Anodized Architectural Aluminum

2603-13 .....Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

C. American National Standards Institute (ANSI):

A117.1-09 .....Accessible and Usable Buildings and Facilities

D. ASTM International (ASTM):

A36/A36M-14 .....Carbon Structural Steel

A240/A240M-15 .....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A666-10 .....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

A1011/A1011M-14 .....Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

B36/B36M-13 .....Brass Plate, Sheet, Strip, and Rolled Bar
B152/B152M-13 .....Copper Sheet, Strip, Plate, and Rolled Bar
B209-14 .....Aluminum and Aluminum-Alloy Sheet and Plate
B209M-14 .....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
B221-14 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
B221M-13 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
C1036-11(R2012) .....Flat Glass
C1048-12 .....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass
C1349-10 .....Architectural Flat Glass Clad Polycarbonate
D1003-13 .....Test Method for Haze and Luminous Transmittance of Transparent Plastics
D4802-10 .....Poly(Methyl Methacrylate) Acrylic Plastic Sheet

D. Code of Federal Regulation (CFR):
40 CFR 59 .....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

E. Federal Specifications (Fed Spec):
MIL-PRF-8184F .....Plastic Sheet, Acrylic, Modified.
MIL-P-46144C .....Plastic Sheet, Polycarbonate

F. National Fire Protection Association (NFPA):
70-14 .....National Electrical Code

PART 2 - PRODUCTS

2.1 SIGNAGE GENERAL:

A. Provide signs of type, size and design shown on the construction documents.

B. Provide signs complete with lettering, framing and related components for a complete installation.

C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

D. Do not scale construction documents for dimensions. Verify dimensions and coordinate with field conditions. Notify Contracting Officer Representative (COR) of discrepancies or changes needed to satisfy the requirements of the construction documents.

2.3 INTERIOR SIGN MATERIALS:

A. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.

B. Polycarbonate: MIL-P-46144C; Type I, class 1.

C. Vinyl: Premium grade 0.1 mm (0.004 inch) thick machine cut, having a pressure sensitive adhesive and integral colors.

D. Adhesives:

1. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by signage manufacturer.
2. Adhesives to have VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

E. Typography: Comply with VA Signage Design Guide.

1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps, as indicated in Sign Message Schedule.
2. Arrow: Comply with graphic standards in construction documents.
3. Letter spacing: Comply with graphic standards in construction documents.
4. Letter spacing: Comply with graphic standards in construction documents.
5. Provide text, arrows, and symbols in size, colors, typefaces and letter spacing shown in construction documents. Text shall be a true, clean, accurate reproduction of typeface(s). Text shown in construction documents is for layout purposes only; final text for signs is listed in Sign Message Schedule.

2.5 INTERIOR SIGN TYPES:

A. Conform to the VA Signage Design Guide.

B. Provide frame insert and frame component system.

C. Component System Signs:

1. Provide interior sign system as follows:
   a. Interchangeable system that allows for changes of graphic components of the installed sign, without changing sign in its entirety.
   b. Provide sign system comprised of following primary components:

1) Rail Back: Horizontal rails, spaced to allow for uniform, modular sizing of sign types.
2) Rail Insert: Mount to back of Copy Panels to allow for attachment to Rail Back.
3) Copy Panels: Fabricate of ABS phopolymer acrylic aluminum stainless steel match existing materials to allow for different graphic needs.
4) End Caps: Interlock to Rail Back to enclose and secure changeable Copy Panels.
5) Joiners and Accent Joiners: To connect separate Rail Backs together.
6) Top Accent Bars: To provide decorative trim cap that encloses the top of sign.

c. Provide rail back, rail insert and end caps in anodized extruded aluminum.
d. Provide signs in system that are convertible in the field to allow for enlargement from one (1) size to another in height and width through use of joiners or accent joiners, which connect rail back panels together blindly, providing a butt joint between copy panels. Connect accent joiners to rail backs with a visible 3 mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.
e. Provide sign configurations as indicated on construction documents that vary in width from 228 mm (9 inches) to 2032 mm (80 inches), and have height dimensions of 50 mm (2 inches), 76 mm (3 inches), 152 mm (6 inches), 228 mm (9 inches) and 305 mm (12 inches). Height that can be increased beyond 305 mm (12 inches), by repeating height module in full or in part.

2. Provide rail back functions as internal structural member of sign. Fabricate of 6063T5-extruded aluminum, anodized black.
a. Fabricate to accept an extruded aluminum or plastic insert on either side, depending upon sign type.
b. Provide components that are convertible in field to allow for connection to other rail back panels.
c. Provide mounting devices including wall mounting for screw-on applications, wall mounting with pressure sensitive tape, freestanding mount, ceiling mount and match existing mounting devices.

3. Provide rail insert functions as mounting device for copy panels on to the rail back. The rail insert mounts to the back of the copy panel with adhesive suitable for attaching particular copy insert material.
   a. Provide copy panels that slide or snap into the horizontal rail back.
4. Provide copy panels that accept various forms of copy and graphics, and attach to the rail back with the rail insert. Provide copy panels fabricated of ABS plastic with integral color or an acrylic lacquer finish, photopolymer or acrylic.
   a. Provide copy panels that are interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
   b. Provide materials that are cleanable without use of special chemicals or cleaning solutions.
   c. Copy Panel Materials.
      1) ABS Inserts: 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process.
         a) Pressure bonded to extruded rail insert with adhesive.
         b) Background Color: Integral or painted in acrylic lacquer.
         c) Finished: Texture pattern.
5. End Caps: Extruded using 6063T5 aluminum with a black anodized finish. End caps interlock with rail back with clips to form an integral unit, enclosing and securing the changeable copy panels, without requiring tools for assembly.
   a. Interchangeable to each end of sign and to other signs in signage system of equal height.
   b. Provide mechanical fasteners that can be added to the end caps that will secure it to rail back to make sign tamper resistant.
6. Typography:
   a. Vinyl First Surface Copy (non-tactile): Applied vinyl copy.
   b. Subsurface Copy Inserts: Textured 1 mm (.030 inches) clear polycarbonate face with subsurface applied vinyl copy.
      1) Spray face back with paint and laminated to extruded aluminum carrier insert.
   c. Integral Tactile Copy Inserts: Phenolic photopolymer etched with 2.3 mm (.0937 inches) raised copy.

d. Silk-screened First Surface Copy (non-tactile): Injection molded or extruded ABS plastic Aluminum insert with first surface applied enamel silk-screened copy.

D. Tactile Sign:
1. Tactile sign made from a material that provides for letters, numbers and Braille to be integral with sign. Photopolymer etched metal, sandblasted phenolic or embossed material. Do not apply letters, numbers and Braille with adhesive.
2. Numbers, letters and Braille to be raised 0.8 mm (1/32 inches) from the background surface. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
3. Braille Dots: Conform with ANSI A117.1 for Braille position and layout; (a) Dot base diameter: 1.5 mm (.059 inches) (b) Inter-dot spacing: 2.3 mm (.090 inches) (c) Horizontal separation between cells: 6.0 mm (.241 inches) (d) Vertical separation between cells: 10.0 mm (.395 inches)
4. Paint assembly specified color. After painting, apply white or other specified color to surface of the numbers and letters. Apply protective clear coat sealant to entire sign.
5. Finish: Eggshell, 11 to 19 degree on a 60 degree glossmeter.

E. Provide cork or felt on bottom or mounting bracket when sign is mounted on counter or desk.

F. For ceiling mounted signs, provide mounting hardware on the sign that allows for sign disconnection, removal, reinstallation, and reconnection.

G. Dimensional Letters:
1. Provide dimensional letters that are mill or laser cut acrylic in size and thickness indicated in construction documents.
2. Provide draft of letters perpendicular to letters face.
3. Fabricate letters with square corners, such as where a letter stem and bar intersect.
4. Paint letters with acrylic polyurethane.

H. Specialty Signs:
1. Small Freestanding Stanchion Sign: 57 mm (2.25 inches) polished aluminum tube mounted to weighted 356 mm (14 inches) diameter polished aluminum base. Sign bracket to hold a 6 mm (.25 inches)copy panel.

2. Freestanding Informational Sign: 57 mm (2.25 inches) polished aluminum tube vertical support mounted to a weighted 356 mm (14 inches) diameter 57 mm (2.25 inches) polished aluminum base. Provide rail back mechanically connected to vertical supports with copy panel attached to front and back.
3. Freestanding Informational Signs for Changeable Messages: 57 mm (2.25 inches) polished aluminum tube vertical support mounted to a weighted 365 mm (14 inches) 57 mm (2.25 inches) polished aluminum base. Provide rail back mechanically connected to vertical supports with hinged locking glass door. Provide interior surface with grooved felt covered changeable letter board or vinyl impregnated tackboard.

2.7 FABRICATION:

A. Design interior signage components to allow for expansion and contraction for a minimum material temperature range of 38 degrees C (100 degrees F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.

B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Provide concealed fasteners wherever possible.

C. Shop fabricate so far as practicable. Fasten joints flush to conceal reinforcement, or weld joints, where thickness or section permits.

D. Level and assemble contract surfaces of connected members so joints will be tight and practically unnoticeable, without applying filling compound.

E. Signs: Fabricate with fine, even texture to be flat and sound.
   1. Maintain lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern.
   2. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
   3. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.

F. Finish extruded members to be free from extrusion marks. Fabricate square turns, sharp corners, and true curves.

G. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Mitere edge joints to give appearance of solid material.

H. Do not manufacture signs until final sign message schedule and location review has been completed by the COR and forwarded to contractor.

I. Drill holes for bolts and screws. Mill smooth exposed ends and edges with corners slightly rounded.

J. Form joints exposed to weather to exclude water.

K. Movable Parts, Including Hardware: Cleaned and adjusted to operate as designed without binding or deformation of members. Center doors and covers in opening or frame.

1. Align contact surfaces fit tight and even without forcing or warping components.

L. Pre-assemble items in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

M. Prime painted surfaces as required. Apply finish coating of paint for complete coverage with no light or thin applications allowing substrate or primer to show.

1. Finish surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Locate signs as shown on the construction documents and or Sign Location Plans.

B. Conform to the VA Signage Design Guide for installation requirements.

C. At each sign location there are no utility lines behind each sign location that will be affected by installation of signs.

1. Correct and repair damage done to utilities during installation of signs at no additional cost to Government.

D. Provide inserts and anchoring devices which must be set in concrete or other material for installation of signs. Submit setting drawings, templates, instructions and directions for installation of anchorage devices, which may involve other trades.

E. Refer to Sign Message Schedule for mounting method. Mount signs in proper alignment, level and plumb according to the Sign Location Plan and the dimensions given on elevation and Sign Location Plans. When exact position, angle, height or location is not clear, contact COR for resolution.

F. When signs are installed on glass, provide blank glass back up to be placed on opposite side of glass exactly behind sign being installed. Provide blank glass back that is the same size as sign being installed.

G. Touch up exposed fasteners and connecting hardware to match color and finish of surrounding surface.

H. At completion of sign installation, clean exposed sign surfaces. Clean and repair adjoining or adjacent surfaces that became soiled or damaged as a result of installation of signs.

2/90 FAI

Sign Type 99.3

Specifications:

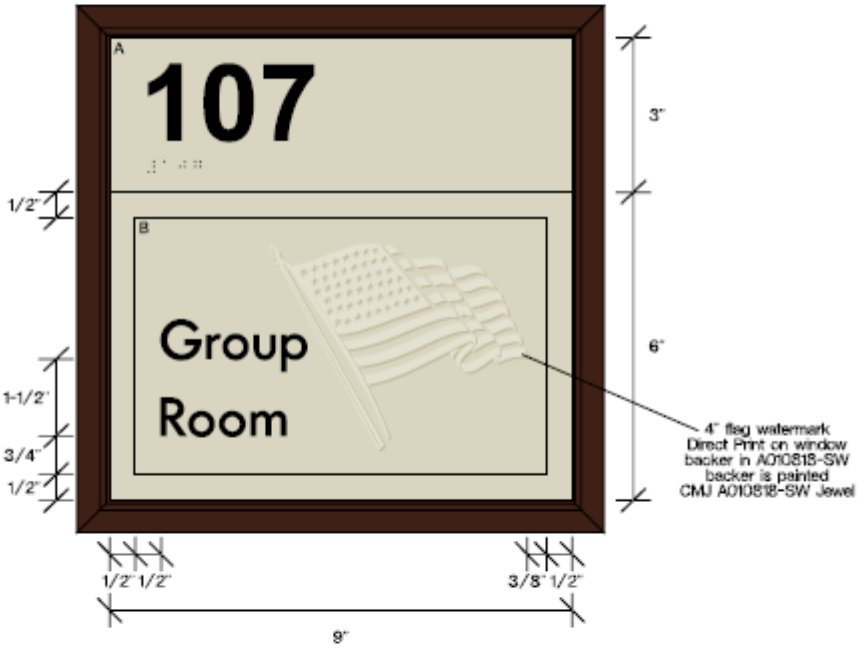
Sign Size:	9x9
Mount Option:	D-Screw
Frame Style:	AB, Angleback
Frame Color:	728 Earth

Project:	Signage Updates
Cust. Name:	VA Sioux Falls
Date:	03/01/18
Revision Date:	00/00/00
Approved by:	
	Name
	Date

Insert A		**Insert B**		**Insert C**	
Insert Size:	3x9	Insert Size:	6x9w Magnetic	Insert Size:	*
Insert Color:	CMJ A010818-SW Jewel	Insert Color:	CMJ A010818-SW Jewel, Clear Acetate	Insert Color:	*
Copy Option:	Tactile/Braille	Copy Option:	Laser Print	Copy Option:	*
Copy Style:	Arial Bold	Copy Style:	FMC Futura Medium	Copy Style:	*
Copy Size:	1-1/2	Copy Size:	3/4	Copy Size:	*
Copy Color:	704 Black	Copy Color:	704 Black	Copy Color:	*
Copy Position:	3/4 Left	Copy Position:	See Drawing	Copy Position:	*

ADA/ANSI Standards for signage disclaimer*: ☒ ADA/ANSI Applies ☐ Doesn't Apply ☐ Compliant ☒ Non-Compliant

Illustration:



Notes:

Frames are oversized 1/8" from inserts.
Insert B to have full magnetic backing.
Window backer is painted CMJ A010818-SW Jewel.

*Guideline per 2/90's interpretation of ADA/ANSI A117.1-200.3. Due to the ADA/ANSI's wide interpretation and other factors that may exist, 2/90 cannot affirm compliance in all situations and is hereby removed from responsibility regarding these issues.

Order:

Complete this order form and Fax to 2/90 at: 616.656.4300
Indicate quantity in boxes below.
Print desired copy above or attach copy schedule.
Designate Mount Option if ordering a full sign.

Full Sign		**Replacement Inserts**					
Qty.	Mount Option:	A Qty.	B Qty.	C Qty.	D Qty.	E Qty.	F Qty.

Name:
Phone:
Fax:
Date:

2/90 Sign Systems
Grand Rapids, MI 49512
800-777-4616 www.290sign.com

ka - vasiouxfalls-fai-99-3

- - - END - - -

SECTION 10 21 23
CUBICLE CURTAIN TRACKS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies cubicle curtain track (C.C.T.).

1.2 RELATED WORK:

A. Acoustical ceiling tile and suspension systems Section 09 51 00, ACOUSTICAL CEILINGS.

1.3 SUBMITTALS:

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

B. Samples:

1. 305 mm (12 inch) long piece of cubicle curtain track with carrier access and end stop.

C. Shop Drawings: Showing layout of tracks and method of anchorage.

D. Manufacturer's Literature and Data:

1. Cubicle curtain track.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver material in original package marked to identify the contents, brand name, and the name of the manufacturer or supplier.

B. Store in dry and protected location. Store so as to not bend or warp the tracks.

C. Do not open packages until contents are needed for installation, unless verification inspection is required.

1.5 WARRANTY:

A. Construction Warranty: Cubicle curtain tracks are subject to the terms of the Article “Warranty of Construction,” FAR clause 52.246-21.

1.6 APPLICABLE PUBLICATIONS:

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

B. ASTM International (ASTM):

B221-14 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-13 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

B456-11 .....Electrodeposited Coatings for Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

C. Aluminum Association (AA):

DAF 45-09 .....Designation System for Aluminum Finishes

D. American Architectural Manufacturers Association (AAMA):

2603-13 .....Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

E. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series .....Metal Finishes Manual

PART 2 - PRODUCTS

2.1 CUBICLE CURTAIN TRACKS:

A. Channel Tracks (Surface Mounted Type): Extruded aluminum, ASTM B221M (B221), alloy 6063, temper T5 or T6, channel shaped, with smooth inside raceway for curtain carriers.

B. End Stop Connectors, Ceiling Flanges and Other Accessories: Fabricate from the same material with the same finish as the tracks or from nylon.

C. Hangers and Fittings: Fabricate from the same material with the same finish as the tracks. Hangers may be round or square for channel tracks and round for tubular tracks. Design fittings to be compatible with design of tracks and to safely transmit the track load to the hangers.

D. At end of each section of track, make provision for insertion and removal of carriers. Design to prevent accidental removal of carrier. Provide operating mechanism shall be removable with common tools.

2.2 FASTENERS:

A. Exposed Fasteners, Screws and Bolts: Stainless steel or chromium/nickel plated brass.

B. Concealed Fasteners, Screws and Bolts: Hot-dip galvanized.

C. Metal Clips: Anchor curtain tracks to exposed grid of lay-in acoustical tile ceilings, with concealed metal (butterfly) type or two-piece snap locking type ceiling clip of high strength spring steel.

1. When it is not possible to install the metal ceiling clip, the cubicle curtain track may be screwed to the ceiling grid.

2.3 FINISHES:

A. Aluminum: Finish numbers for aluminum specified are in accordance with AA DAF 45. AA-C22A31 finish, chemically etched medium matte with clear anodic coating, Class II Architectural, .01 mm (0.4 mils) thick.

B. Chrome/Nickel Plating: Satin or polished finish, ASTM B546, minimum thickness of chromium plate as follows:
   1. 0.005 mm (0.2 mil) on copper alloys.
   2. 0.01 mm (0.4 mil) on steel.

C. Stainless Steel: No. 4 in accordance with NAAMM AMP 500.

D. Baked Enamel or Powder Coat Finish: AAMA 2603.

2.4 FABRICATION:

A. Weld and grind smooth joints of fabricated components.

B. Form tracks and bends of lengths that will produce the minimum number of joints. Make track sections up to 4877 mm (16 feet) without joints. Form corner bend on a 305 mm (12 inch) radius.

C. Provide steel anchor plates, supports, and anchors for securing components to building construction.

D. Form flat surface without distortion.

E. Shop assemble components and package complete with anchors and fittings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install tracks after finish painting and ceiling finishing operations are complete.

B. Install track level and hangers plumb and securely anchor to the ceiling to form a rigid installation.

C. Anchor surface mounted curtain tracks directly to exposed grid of lay-in acoustical tile ceilings with suitable fasteners, spaced approximately 610 mm (24 inches) on center.

D. Anchor surface mounted curtain tracks to concrete, plaster and gypsum board ceilings with a minimum of 3 mm (1/8-inch) diameter fastenings or concealed clips spaced not more than 914 mm (3 feet) on center.

E. Install suspended track 2210 mm (87 inches) above the finished floor, with hangers spaced no more than 1219 mm (4 feet) on center. At ceiling line, provide flange fittings secured to hangers with set screws. Secure track to walls with flanged fittings and to hangers with special fittings.

F. Fasten end stop caps to prevent them from being forced out by the striking weight of carriers.
G. Remove damaged or defective components and replace with new components or repair to the original condition.
H. Install track rigid, plumb, level and true, and securely anchored to the overhead construction.
I. Verify that carrier units operate smoothly and easily over the full range of travel.

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SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies wall guards, handrail/wall guard combinations, corner guards and high impact wall covering.

1.2 RELATED WORK:

B. Color and texture of aluminum and resilient material: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS:

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

B. Shop Drawings: Show design and installation details.

C. Manufacturer's Literature and Data:

1. Handrail/Wall Guard Combinations.
2. Wall Guards.
3. Corner Guards.
4. High Impact Wall covering.

D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

E. Manufacturer’s warranty.

1.5 DELIVERY AND STORAGE:

A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.

B. Protect from damage from handling and construction operations before, during and after installation.

C. Store in a dry environment of approximately 21 degrees C (70 degrees F) for at least 48 hours prior to installation.

1.6 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 “Warranty of Construction”.

B. Manufacturer Warranty: Manufacturer shall warranty their wall and door protection for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.7 APPLICABLE PUBLICATIONS:

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

B. ASTM International (ASTM):

A240/A240M-14 .....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications

B221-14 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-13 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

D256-10 .....Impact Resistance of Plastics

D635-10 .....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

E84-14 .....Surface Burning Characteristics of Building Materials

C. Aluminum Association (AA):

DAF 45-09 .....Designation System for Aluminum Finishes

D. American Architectural Manufacturers Association (AAMA):

611-14 .....Anodized Architectural Aluminum

E. Code of Federal Regulation (CFR):

40 CFR 59 .....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

F. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06 .....Metal Finishes Manual

G. National Fire Protection Association (NFPA):

80-13 .....Standard for Fire Doors and Windows

H. SAE International (SAE):

J 1545-05(R2014) .....Instrumental Color Difference Measurement for Exterior Finishes.

I. Underwriters Laboratories Inc. (UL):

Annual Issue .....Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Stainless Steel: A240/A240M, Type 304.

C. Resilient Material:

1. Provide resilient material consisting of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic conforming to the following:
   a. Minimum impact resistance of 960.8 N-m/m (18 ft.-lbs./sq. inch) when tested in accordance with ASTM D256 (Izod impact, ft.-lbs. per inch notched).
   b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
   c. Rated self-extinguishing when tested in accordance with ASTM D635.
   d. Provide material labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
   e. Provide resilient material for protection on fire rated doors and frames assemblies that is listed by the testing laboratory performing the tests.
   f. Provide resilient material installed on fire rated wood/steel door and frame assemblies that have been tested on similar type assemblies. Test results of material tested on any other combination of door and frame assembly are not acceptable.
   g. Provide integral color with colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.2 CORNER GUARDS:

A. Resilient, Shock-Absorbing Corner Guards: Surface mounted type. Match existing.

1. Snap-on corner guard formed from resilient material, minimum 1.98 mm (0.078-inch) thick, free floating on a continuous 1.52 mm (0.060-inch) thick extruded aluminum retainer. Provide appropriate mounting hardware, cushions and base plates as required.
2. Profile: Minimum 50 mm (2 inch) long leg and 6 mm (1/4 inch) corner radius
3. Height: 1.22 m (4 feet).
4. Retainer Clips: Provide manufacturer’s standard impact-absorbing clips.

5. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.

B. Fabricate stainless steel corner guards of 1.27 mm (.05 inch) thick material conforming to ASTM A240/A240M, install corner guards as indicated on construction documents. Form corner guard to dimensions from floor to ceiling.

2.3 WALL GUARDS AND HANDRAILS:

A. Resilient Wall Guards and Handrails:

1. Handrail/Wall Guard Combination:
   a. Snap-on covers of resilient material, minimum 2 mm (0.078-inch) thick.
   b. Free-floating on a continuous, extruded aluminum retainer, minimum 1.82 mm (0.072-inch) thick.
   c. Anchor to wall at maximum 762 mm (30 inches) on center.
2. Wall Guards:
   a. Snap-on covers of resilient material, minimum 2.54 mm (0.100-inch) thick. Free-floating over 51 mm (2 inch) wide aluminum retainer clips, minimum 2.28 mm (0.090-inch) thick, anchored to wall at maximum 610 mm (24 inches) on center, supporting a continuous aluminum retainer, minimum 1.57 mm (0.062-inch) thick free-floated over a continuous extruded aluminum retainer, minimum 2.03 mm (0.080-inch) thick anchored to wall at maximum 610 mm (24 inches) on center .
3. Provide handrails and wall guards with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners to be field adjustable to assure close alignment with handrails and wall guards. Screw or bolt closure caps to aluminum retainer in a concealed manner.

2.4 DOOR

2.5 HIGH IMPACT WALL COVERING:

A. Provide wall covering/panels consisting of high impact rigid acrylic vinyl or polyvinyl chloride resilient material.

B. Panel sizes to be 0.61 x 1.21 m (2 x 4 ft.)

C. Submit statements attesting that the items comply with specified fire and safety code requirements.

D. High Impact Wall Panels: Wall panel face and edge thickness to be 0.56 mm (0.022 inch) Panel face to be factory banded to a 9.53 mm (0.375

inch) thick fiberboard core. The backside of the panel is to be laminated with a moisture resistant vapor barrier.

E. Provide adhesive as recommended by the wall covering manufacturer. Provide adhesive with VOC content of 250 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

2.6 FASTENERS AND ANCHORS:

A. Provide fasteners and anchors as required for each specific type of installation.

2.7 FINISH:

A. Stainless Steel: In accordance with NAAMM AMP 500 finish Number 4.

B. Resilient Material: Embossed textures and color in accordance with SAE J1545.

PART 3 - INSTALLATION

3.1 RESILIENT CORNER GUARDS:

A. Install corner guards on walls in accordance with manufacturer's instructions.

3.2 STAINLESS STEEL CORNER GUARDS:

A. Mount guards on external corners of interior walls, partitions and columns as shown on construction documents.

B. Where corner guards are installed on gypsum board, clean surface and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from around edge of guard and allow curing undisturbed for 24 hours.

3.3 RESILIENT WALL GUARDS, HANDRAILS

A. Secure guards to walls with mounting cushions brackets and fasteners in accordance with manufacturer's details and instructions.

3.6 DOOR, DOOR FRAME PROTECTION AND HIGH IMPACT WALL COVERING

A. Surfaces to receive protection to be clean, smooth and free of obstructions.

B. Install protectors after frames are in place but preceding installation of doors in accordance with approved shop drawings and manufacturer’s specific instructions.

C. Apply with adhesive in controlled environment according to manufacturer’s recommendations.

D. Protection installed on fire rated doors and frames to be installed according to NFPA 80 and installation procedures listed in UL Building

Materials Directory; or, equal listing by other approved independent testing laboratory establishing the procedures.

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SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers recessed fire extinguisher cabinets.

1.2 RELATED WORK

A. Acrylic glazing: Section 08 80 00, GLAZING.

B. Field Painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

1.4 APPLICATION PUBLICATIONS

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

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

D4802-15 .....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

Recessed type with flat trim of size and design shown.

2.2 FABRICATION

A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.

B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth.

1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish 1.
2. Design doors to open 180 degrees.
3. Provide continuous hinge, pull handle, and adjustable roller catch.

2.3 FINISH

A. Finish interior of cabinet body with baked-on semigloss white enamel.

B. Finish door, frame with manufacturer's standard baked-on prime coat suitable for field painting.

PART 3 - EXECUTION

A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.

B. Install cabinet so that the extinguisher height within meets the requirements of NFPA 10

- - - E N D - - -

SECTION 12 34 00
MANUFACTURED PLASTIC CASEWORK

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This section specifies interchangeable modular plastic casework system.

B. System includes support components, storage units, accessories, electrical wiring chases, for wall hung, and island arrangements.

1.2 RELATED WORK:

A. Sealants: Section 07 92 00, JOINT SEALANTS.

B. Color of Casework Finish: Section 09 06 00, SCHEDULE OF FINISHES.

C. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

D. Backing Plates for Wall Mounted Casework: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

E. Countertop Construction and Materials and Items Installed in Countertops: Section 12 36 00, COUNTERTOPS.

F. Plumbing Requirements Related to Casework: Division 22, PLUMBING.

G. Electrical Lighting and Power Requirements Related to Casework: Division 26, ELECTRICAL.

1.3 QUALITY ASSURANCE:

A. Approval by Architect/Engineer and Contracting Officer Representative (COR) is required of manufacturer and installer based upon certification of qualifications specified.

1.4 SUBMITTALS:

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

B. Product data:

1. Manufacturer’s literature and other data showing compliance with the specification for materials.

C. Certification:

1. Manufacturer’s qualifications specified.

D. Shop drawings:

1. Drawings complete, accurate and to scale.
2. Show:
   a. Location of each component.
   b. Dimensions and clearance as required.
   c. Identify each component with both drawing identification and manufacturer’s product number.

d. Details including cuts, holes, scribes, attachments and specialized construction requirements.

3. Installation procedures: Show dimensions, methods of assembly, anchorage, installation and conditions relating to adjoining work.
4. Placement Listing: Itemized listing by room number of components provided.
5. Complete listing of each component used.
6. Include the weight of each component.

E. Operational and Maintenance Manual.

F. Manufacturer's warranty.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store and handle to prevent damage and deterioration until final acceptance of project.

B. Deliver and store materials in manufacturer's original, labeled containers after building is enclosed and wet work is complete and dry.

C. Store materials in a secure, locked area.

D. Repair or replace damaged items due to storage or handling.

1.6 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their plastic casework for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty. Submit manufacturer warranty.

1.7 APPLICABLE PUBLICATIONS:

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

B. American Hardwood Association:
A135.4-12 .....Basic Hardwood

C. American National Standards Institute (ANSI):
A208.1-09 .....Particleboard

D. ASTM International (ASTM):
A36/A36M-14 .....Carbon Structural Steel
A240/A240M-14 .....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A283/A283M-13 .....Low and Intermediate Tensile Strength Carbon Steel Plates
A1008/A1008M-11 .....Steel Sheet, Carbon Cold-Rolled, Commercial Quality
A423/A423M-09(R2014) ...Seamless and Electric-Welded Low-Alloy Steel Tubes
A568/A568M-14 .....Steel, Sheet, Carbon, Structural and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled, General Requirements
B221-14 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods Wire, Profiles and Tubes
B221M-13 .....Aluminum and Aluminum-Alloy Extruded Bars, Rods Wire, Profiles and Tubes (Metric)
B456-11 .....Electrodeposited Coatings of Copper Plus, Nickel Plus Chromium and Nickel Plus Chromium
D1201-13 .....Polyester Thermosetting Molding Compound
D4673-02(R2008) .....Acrylonitrile-Butadiene-Styrene (ABS) Molding and Extrusion Materials
E84-11 .....Surface Burning Characteristics of Plastics and Alloys Building Materials

E. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500 Series .....Metal Finishes Manual

F. National Electrical Manufacturers Association (NEMA):
LD 3-05 .....High Pressure Decorative Laminates

G. American Welding Society (AWS):
D1.1/D1.1M-10 .....Structural Welding Code Steel
D9.1/D9.1M-06(R2012) ...Sheet Metal Welding Code

H. National Fire Protection Association (NFPA):
70-11 .....National Electric Code (NEC)

I. U.S. Department of Commerce, Product Standard (PS):
PS1-95 .....Construction and Industrial Plywood

J. Underwriters Laboratories (UL):
Annual Fire Resistance Directories

PART 2 - PRODUCT

2.1 DESIGN REQUIREMENTS:

A. Provide components which are alike by one (1) manufacturer with specified flexibility and interchangeability requirements.

B. Components interchangeable to form flexible system which will accommodate change:
   1. Dimensions of products are nominal and shown on construction documents and schedules.
   2. Hanging components modular on same increments.
   3. Selectively removable and replaceable without disturbing adjacent components.

C. Combustibility: Maximum flame spread rating of 25 and smoke development of 450 when tested in accordance with ASTM E84.

D. Basic Support Components:
   1. Service Modules:
      a. Steel support frames designed to support storage assemblies and work surfaces, enclosed plumbing and electrical lines and hold fixtures.
      b. Used to form work area configurations that are easily rearranged.
      c. Modules maybe installed as wall-attached structures or in freestanding configurations.
      d. Adjacent modules capable of being joined together.
      e. Equip module with adjustable floor guides to compensate for uneven floors.
      f. Modules equipped with stability accessories such as floor anchors and wall attachments brackets as required. Show details on shop drawings.
      g. Provide access panels for easy access to interior of pipe chase areas. Access panels supported individually and not tied into each other.
      h. Modules contain method to secure piping for fixtures, electrical outlets and sinks. Detail on shop drawing.
      i. Enclose modules to floor with a removable panel.
      j. Modules have end panels where noted. End panels capable of supporting storage assemblies.
      k. Modules shipped completely finished preassembled, ready for installation.
   2. Vertical Wall Strips:
      a. Fabricated of steel or aluminum.
      b. Wall-mounted designed to suspend selected components that require vertical height adjustments.
      c. Vertical adjustment 25 mm (1 inch) maximum.

d. Only one (1) wall strip is required between side by side suspended components.
e. Attach wall strips to walls or service modules by mechanical fasteners. Wall strips may be an integral part of service modules.

3. Horizontal Support Rail:
a. Fabricated of steel or aluminum.
b. Designed to suspend selected components in one place, allowing them to be removed and replaced in same or different location.
c. Rail designed to be supported from vertical rails or service modules.
d. Rail configuration able to receive each hanging component.
e. Rail able to be cut to any length using simple hand tool or applied to form continuous runs.
f. System designed to eliminate area of potential dust accumulation or bacteriological growth.
g. Attach rail to walls or service modules with mechanical fasteners to provide a permanent installation.

G. Shelves:
1. Continuous molded lip around perimeter designed to retain liquid spillage and retain container dividers.
2. Self-stacking for storage.
3. Capability to easily accept snap-on labels.
4. Provide container dividers, as indicated in construction documents.

H. Shelf units-Open and Closed Type:
1. Rounded exposed surfaces free from sharp edges.
2. Attach and interchangeable on wall strips and service module.
3. Doors designed to allow maximum use of interior cubic space.
4. Provide for shelf adjustment on 25 mm (1 inch).
5. Readily installed, removed and relocated without disturbing adjacent units.

I. Miscellaneous Components:
1. Mobile Storage Carts:
a. Capable of supporting six (6) full-loaded storage units.
b. Equipped with minimum 127 mm (5 inch) diameter hard-rubber tire casters, with grease fittings for lubrication. Equip two (2) casters with brakes.

c. Exposed and non-exposed surfaces capable of easily being cleaned and sanitized.

3. Included in casework features that are part of the manufacturer's standards commercial product.
4. Transportation:
   a. Single unit capable of lifting large storage modules on and off storage rails providing a stable platform for transporting large storage modules to other locations without tipping over.
   b. Equipped with hard rubber tires wheels not less than 127 mm (5 inches) in diameter with grease fitting for lubrication to accommodate washing and cleaning.
   c. Design to be moved to insure safety to operator.

J. Assembly and Disassembly:
1. Mechanical interlock system that does not require tools. Positive locking system that prevents potential of accidental dislodged.
2. Use of standard hand tools where fasteners used, no special designed tools permitted.
3. Components of such size and weight that can easily be lifted or moved by one (1) person or with transportation designed for such purpose.

K. Live Load Capacity:
1. Loads in addition to weight of components supported.
2. Panel types; minimum of 130 kg (300 lbs.) maximum of 500 kg (1100 lbs.) per panel per sides.
3. Roller Rails: 136 kg (300 lbs.) per linear foot.
4. Vertical wall strips: Minimum 272 Kg (600 lbs.).
5. Service modules: frames: 998 kg (2200 lbs.).
6. Undercounter storage units: 91 kg (200 lbs.).
7. Overhead Storage Units:
   a. 762 mm (30 inches) wide by 381 mm (15 inch) deep by 533 mm (21 inches) high, maximum of 32 kg (70 lbs.).
   b. 1200 mm (48 inches) wide by 381 mm (15 inches) deep by 533 mm (21 inches) high maximum of 64 kg (140 lbs.)
   c. Manufactures standard modular sizes acceptable.
8. Special Storage Units:
   a. 558 mm (22 inches) wide by 610 mm (24 inches) deep by 635 mm (25 inches) high maximum of 91 kg (200 lbs.).

b. 558 mm (22 inches) wide by 762 mm (30 inches) deep by 635 mm (25 inches) high: maximum of 91 kg (200 lbs.).
c. Pullout shelves or fixed shelves. Maximum of 23 kg (50 lbs.) each.
d. Manufacturers standard modular sizes acceptable

9. Drawers: 181 kg (400 lbs.) for drawers 101 mm (4 inches) deep.

L. Finish:
1. Selected from manufactures standard colors, specification Section 09 06 00, SCHEDULE FOR FINISHES.
2. More than one (1) color may be selected for units.
3. Steel components finished with chemical resistant paint.

M. Locks:
1. Manufactures standard design.
2. Drawers capable of locking into cabinets or lockable lids.
3. Cabinets shall be locking to match 7 pin system.

2.2 MATERIALS:

A. Carbon Structural Steel: ASTM A36/A36M.
B. Stainless Steel: ASTM A240/A240M Type 302B with number 4 finish minimum.
C. Steel plates: ASTM A283/A283M.
D. Sheet Steel: ASTM A1008/A1008M or ASTM A568/A568M.
E. Steel Tubes: ASTM A423/A423M.
F. Aluminum: ASTM B221M (B221).
G. ABS compounds: ASTM D4673.
H. Plastic Laminate: NEMA LD-3.
I. Hardboard: AHA A135.4, Class 1, tempered.
J. Particleboard: ANSI A208.1; no added urea formaldehyde.
K. Plywood, Softwood: Prod. Std. PS1, five (5) ply construction from 13 mm to 28 mm (1/2 inch to 1-1/8 inch) thickness, and seven (7) ply for 31 mm (1-1/4 inch) thickness.
L. Adhesive: Provide adhesive with VOC content of 250 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

2.3 FABRICATION:

A. Manufacturer’s standard design of modular casework system meeting design requirements.
1. Casework requirements specified are intended to establish minimum requirements.

2. Dimensions of components shown on construction documents are nominal to represent module requirements.
3. Provide components compatible with each other as to color, finish and hardware.

B. Components of acrylonitrile butadiene styrene (ABS) compounds, ASTM D4673, with integral color throughout and molded to manufacturer's standard system design.

C. Components stain and rust-resistant capable of withstanding washing temperatures up to 85 degrees C (185 degrees F) without distortion or physical imperfections.

D. Storage modules, plastic laminate exposed surfaces including interiors conforming to and fabricated in accordance with LD3, over plywood conforming to PS1 or not less than 641 Kg/cubic meter (45 lbs. per cubic foot) particleboard conforming to ANSI A208.1.

E. Storage modules of molded plastic:
1. Fire-retardant thermoplastic or sheet-molding compound ASTM D1201, injection-molding, compression-molding or vacuum-forming technique.
2. Constructed to achieve structural strength, durability and resistance to acids, stains, corrosion and heat.
3. Color integral throughout plastic.

F. Fabricate frames and rails of steel or aluminum as standard with modular casework manufacturer’s system.

G. Finish metals in accordance with NAAMM AMP 500-505 and plated steel in accordance with ASTM B456 as standard with modular casework manufacturer’s system.

H. Fabricate steel components of ASTM A36/A36M, ASTM A283/A283M, ASTM A1008/A1008M or ASTM A568/A568M as standard with casework system manufacturer.

I. Weld in accordance with AWS D1.1/D1.1M or AWS D9.1/D9.1M. Finish welds smooth and free of sharp edges where exposed.

J. Plated Metal: Finish in accordance with ASTM B456 for steel products and NAAMM AMP 500-505.

K. Painted Steel: Finish in accordance with NAAMM AMP 500-505

L. Anodized Aluminum: Finish as standard with modular cabinet manufacturers system.

2.4 PRODUCTS OF OTHER COMPONENTS DIRECTLY RELATED TO CASEWORK:

A. Refer to Section 07 92 00, JOINT SEALANTS for work related to sealants used in conjunction with joints of countertops, casework systems, and adjacent materials.

B. Refer to Section 09 65 13, RESILIENT BASE AND ACCESSORIES for work related to rubber base adhered to casework systems.

C. Refer to Section 09 22 16, NON-STRUCTURAL METAL FRAMING for backing plates used in conjunction with wall assemblies for the attachment of casework systems.

D. Refer to Division 22, PLUMBING for the following work related to casework systems:

1. Sinks, faucets and other plumbing service fixtures, venting, and piping systems.
2. Compressed air, gas, vacuum and piping systems.

E. Refer to Division 26, ELECTRICAL for the following work related to casework systems:

1. Connections and wiring devices.
2. Connections and lighting fixtures except when factory installed by the manufacturer.

PART 3 – EXECUTION

3.1 COORDINATION:

A. Begin only after work of other trades in complete, i.e. wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected and area is free of trash and debris.

B. Verify location and size of mechanical and electrical services as required and perform cutting of components of work installed by other trades.

C. Verify reinforcement of walls and partitions for support and anchorage of casework.

D. Coordinate with other Divisions and Sections of the specification for work related to installation of casework systems to avoid interference and completion of service connections.

3.2 INSTALLATION:

A. Install casework in accordance with manufacturer’s written instructions and per SEFA 2.3 recommendations.

1. Install in available space; arranged for safe and convenient operation and maintenance.

2. Align cabinets for flush joints except where shown otherwise on construction documents.
3. Install with bottom of wall cabinets in alignment and tops of base cabinets aligned level, plumb, true, and straight to a tolerance of 3.2 mm in 2438 mm (1/8 inch in 96 inches).
4. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.

B. Support Rails:
1. Install true to horizontal at heights shown on construction documents; maximum tolerance for uneven floors is plus or minus 13 mm (1/2 inch).
2. Shim as necessary to accommodate variations in wall surface not exceeding 5 mm (3/16 inch) at fastener.

C. Wall Strips:
1. Install true to vertical and spaced as shown and spaced as shown on construction documents.
2. Align slots to assure that hanging units will be level.

E. Seal junctures of casework systems with mildew-resistant silicone sealants as specified in Section 07 92 00, JOINT SEALANTS.

3.3 CLOSURES AND FILLER PLATES:

A. Close openings larger than 6 mm (1/4 inch) wide between cabinets and adjacent walls with flat, steel closure strips, scribed to required contours, or machined formed steel fillers with returns, secure with sheet metal screws to tubular or channel members of units, or bolts where exposed on inside.

B. Where ceilings interfere with installation of sloping tops, omit sloping tops and provide flat steel filler plates.

C. Secure filler plates to casework top members, unless shown otherwise on construction documents.

D. Secure filler plates more than 152 mm (6 inches) in width top edge to a continuous 25 x 25 mm (1 x 1 inch) 0.889 mm (1/16 inch) thick steel formed steel angle with screws.

E. Anchor angle to ceiling with toggle bolts.

F. Install closure strips at exposed ends of pipe space and offset opening into concealed space.

G. Finish closure strips and fillers with same finishes as cabinets.

3.4 FASTENINGS AND ANCHORAGE:

A. Do not anchor to wood ground strips.

B. Provide hat shape metal spacers where fasteners span gaps or spaces.
C. Use 6 mm (1/4 inch) diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.
D. Use 6 mm (1/4 inch) diameter hex bolts for securing cabinets together.
E. Use 6 mm (1/4 inch) by minimum 38 mm (1-1/2 inch) length lag bolt anchorage to wood blocking for concealed fasteners.
F. Use not less than No. 12 or 14 wood screws with not less than 38 mm (1 1/2 inch) penetration into wood blocking.
G. Space fastening devices 305 mm (12 inches) on center with minimum of three (3) fasteners in 915 or 1220 mm (3 or 4 foot) unit width.
H. Anchor floor mounted cabinets with a minimum of four (4) bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.
I. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.
J. Where units abut end to end, anchor together at top and bottom of sides at front and back. Where units are back to back, anchor backs together at corners with hex bolts placed inconspicuously inside casework.
K. Where type, size, or spacing of fastenings is not shown or specified on construction documents, show proposed fastenings and method of installation on shop drawings.

3.5 ADJUSTMENTS:

A. Adjust equipment to insure proper alignment and operation.
B. Replace or repair damaged or improperly operating materials, components or equipment.

3.6 CLEANING:

A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter resulting from work of this section.
B. Remove from job site trash, debris and packing materials resulting from work of this section.
C. Leave installed areas clean of dust and debris resulting from work of this section.

3.7 INSTRUCTIONS:

A. Provide operational and cleaning manuals and verbal instructions in accordance with Article INSTRUCTIONS, SECTION 01 00 00, GENERAL REQUIREMENTS.

B. Provide in service training both prior to and after facility opening. Coordinate in service activities with COR.

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SECTION 12 36 00
COUNTERTOPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies casework countertops with integral accessories.

1.2 RELATED WORK

A. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

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

B. Shop Drawings

1. Show dimensions of section and method of assembly.
2. Show details of construction at a scale of ½ inch to a foot.

C. Samples:

1. 150 mm (6 inch) square samples each top.

1.4 APPLICABLE PUBLICATIONS

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

B. American Hardboard Association (AHA):

A135.4-95 .....Basic Hardboard

C. Composite Panel Association (CPA):

A208.1-09 .....Particleboard

D. American Society of Mechanical Engineers (ASME):

A112.18.1-12 .....Plumbing Supply Fittings
A112.1.2-12 .....Air Gaps in Plumbing System
A112.19.3-08(R2004) ....Stainless Steel Plumbing Fixtures (Designed for Residential Use)

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

A167-99 (R2009) .....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
A1008-10 .....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy
D256-10 .....Pendulum Impact Resistance of Plastic
D570-98(R2005) .....Water Absorption of Plastics
D638-10 .....Tensile Properties of Plastics

D785-08 .....Rockwell Hardness of Plastics and Electrical Insulating Materials

D790-10 .....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D4690-99(2005) .....Urea-Formaldehyde Resin Adhesives

F. Federal Specifications (FS):

A-A-1936 .....Adhesive, Contact, Neoprene Rubber

G. U.S. Department of Commerce, Product Standards (PS):

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

H. National Electrical Manufacturers Association (NEMA):

LD 3-05 .....High Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 MATERIALS

1) No change in color, surface texture, and original protectability remaining from test results of following reagents:

98% Acetic Acid	Butyl Alcohol	Acetone
90% Formic Acid--	Benzine	Chloroform
28% Ammonium Hydroxide	Xylene	Carbon Tetrachloride
Zinc Chloride (Sat.)	Toluene	Cresol
Sodium Carbonate (Sat.)	Gasoline	Ether
Calcium Hypochlorite (Sat.)	Kerosene	Cottonseed Oil
Sodium Chloride (Sat.)	Mineral Oil	40% Formaldehyde
Methyl Alcohol	Ethyl Acetate	Trichlorethylene
Ethyl Alcohol	Amyl Acetate	Monochlorobenzine

2) Superficial effects only: Slight color change, spot, or residue only with original protectability remaining from test results of following reagents:

77% Sulfuric Acid	37% Hydrochloric Acid	85% Phenol
33% Sulfuric Acid	20% Nitric Acid	Furfural
85% Phosphoric Acid	30% Nitric Acid	Dioxane

3) Minimum height of impact resistance: 300 mm (12 inches).

B. Molded Resin:

1. Non-glare epoxy resin or furan resin compounded and cured for minimum physical properties specified:

Flexural strength	70 MPa (10,000 psi)	ASTM D790
Rockwell hardness	105	ASTM D785
Water absorption, 14 hours (weight)	.01%	ASTM D570

2. Material of uniform mixture throughout.

C. Stainless Steel: ASTM A167, Type 304.

D. Adhesive

3. For Field Joints:

a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.

b. Fungi resistant: ASTM G-21, rating of 0.

E. Fasteners:

1. Metals used for welding same metal as materials joined.

2. Use studs, bolts, spaces, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

2.2 SINKS

B. Stainless Steel:

1. ANSI/ASME A112.19.3, Type 304.

2. Self rim for plastic laminate or similar tops with concealed fasteners.

3. Flat rim for welded into stainless steel tops.

4. Ledge back or ledge sides with holes to receive required fixtures when mounted on countertop.

5. Apply fire resistant sound deadening material to underside.

2.3 TRAPS AND FITTINGS

A. Material as specified in DIVISION 22, PLUMBING.

B. For Stainless Steel Sinks:

1. Either cast or wrought brass or stainless steel P-traps and drain fittings; ASME A112.18.1

2. Flat strainer, except where cup strainer or overflow standpipe specified.

a. Provide cup strainer in cabinet type 1B.

b. Provide stainless steel overflow stand pipe to within 38 mm (1-1/2 inches) of sink rim.

3. Exposed surface chromium plated finish.

2.10 COUNTERTOPS

A. Fabricate in largest sections practicable.

B. Fabricate with joints flush on top surface.

C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.

D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).

E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.

F. Fabricate with end splashes where against walls or cabinets.

G. Splash Backs and End Splashes:

1. Not less than 19 mm (3/4 inch) thick.
2. Height 100 mm (4 inches) unless noted otherwise.
3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 150 mm (6 inches) unless noted otherwise.
4. Fabricate epoxy splash back in maximum lengths practical of the same material.

H. Drill or cutout for sinks, and penetrations.

1. Accurately cut for size of penetration.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.

B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.

1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
2. Use round head bolts or screws.
3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.
4. Use wood or sheet metal screws for wood or plastic laminate tops; minimum penetration into top 16 mm (5/8 inch), screw size No 8, or 10.

C. Rubber Moldings:
   1. Where shown install molding with butt joints in horizontal runs and mitered joints at corners where ceramic tile occurs omit molding.
   2. Fasten molding to wall and to splashbacks and splashends with adhesive.

D. Sinks
   1. Install stainless steel sink in plastic laminate tops with epoxy compound to form watertight seal under shelf rim.
      a. In laboratory and pharmacy fit stainless steel sink with overflow standpipe.
      b. Install faucets and fittings on sink ledges with watertight seals where shown.
      c. Design support for a twice the full sink weight.
      d. Install with overflow standpipes.

E. Faucets, Fixtures, and Outlets:
   1. Seal opening between fixture and top.
   2. Secure to top with manufacturers standard fittings.

3.2 PROTECTION AND CLEANING

A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.

B. Clean at completion of work.

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SECTION 13 37 00
CLEAN ROOM PASS-THROUGH CHAMBERS

GENERAL

1.1 SECTION INCLUDES

A. Clean Room Pass-Through Chambers.

1.2 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealers.

B. Section 08 71 00 - Door Hardware.

C. Division 15 - HVAC; mechanical services and connections.

D. Division 16 - Electrical; electrical power service and wiring connections.

1.3 REFERENCES

A. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ANSI/UL 10B - Standard for Fire Tests of Door Assemblies.

F. CAN/ULC-S104-10 - Standard Method for Fire Tests of Door Assemblies

G. FS 209E - Cleanroom and Workstation Requirements, Controlled Environments.

H. ISO 146744-1 - Cleanrooms and associated controlled environments Part 1: Classification of air cleanliness

I. UL (Underwriters Laboratories, Inc.) - Electrical Appliance and Utilization Equipment Directory.

J. FDA/cGMP Requirements - 21 CFR Section 211 and Proposed Guidelines 21 CFR Section 212.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Cleanroom Pass Through shall be capable of maintaining the following cleanroom performance requirements when installed as follows.

1. Capable of maintaining Class 100 to 10,000 (ISO 5 to ISO 8) conditions in accordance with FS 209E and ISO 146744-1.

2. Capable of meeting validation requirements of FDA/cGMP and the following requirements.

a. Nonviability Particle Count: Maximum of 10,000 per cf, 0.5

micron or larger measured 6 inches above work surface (Class 10,000/ISO 7). Other permissible counts accord with nominal cleanliness rating (1000 per cf. for ISO 6, 100 per cf. for ISO 5).

b. Viable Count: Less than 1.5 colony forming units per 10 cubic feet. Other permissible counts in accord with nominal cleanliness rating.

3. Capable of maintaining a passive pressure differential of:
   a. Area outside room: balance condition
   b. Air lock: 0.05 inch w.g.
   c. Cleanroom: 0.1 inch w.g.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 23.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and finish.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment of cable tension and periodic cleaning and maintenance of all railing and infill components.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of products specified in this section with minimum 10 years documented experience.

B. Installer Qualifications: Company specializing in performing work of this section with minimum 5 years documented experience.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

D. Preinstallation Meetings: Conduct meeting to verify project requirements, substrate conditions, utility connections, manufacturer's installation instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Do not deliver materials or assemblies to site until installation spaces are ready to receive units.

1.8 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN:

A. Model # #1991-73D (or equal) by Terra Universal, Inc., which is located at: 800 S. Raymond Ave.; Fullerton, CA 92381-5234; Tel: 714-578-6017; Fax: 714-578-6020; Email: request info (info@TerraUniversal.com); Web:www.TerraUniversal.com

1. Electropolished 304 Stainless Steel with Stainless Steel Doors/Dissipative PVC Windows.
   a. Wall Mount:
      Outside Dimensions: 18 inches by 18 inches by 18 inches (457 mm by 457 mm by 457 mm)

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings and substrates have been properly prepared.

B. Verify exact location of clean room pass-throughs for installation.

C. Verify that rough openings and surfaces are ready to receive work.

D. If opening and substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install pass-throughs, plumb and level. Seal the perimeter of both sides of the opening as required.

C. Upon completion of installation operate unit and make necessary adjustments.

D. Connect mechanical services as specified under Division 15.

E. Connect electrical services as specified in Division 16.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

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