

Construction Documents
Volume 1 of 2-Architectural
Project Specifications

**EDWARD HINES, JR. VA HOSPITAL
CANOPY/AMBULANCE BAY /
DECONTAMINATION AREA BLDG. 200
PROJECT #578-315**



Submitted by the Team of:

**PFB ARCHITECTS, INC. / MELVIN COHEN AND
ASSOCIATES, INC**

9461 Kenwood Road, Cincinnati, OH 45242

Original Drawing Issue Date 10.26.10
Architectural Drawing Revision Date 02.11.11
MEP Drawing Revision Date 01.14.11
Date of Project Re-Issue 06.08.12

DEPARTMENT OF VETERANS AFFAIRS
CANOPY/AMBULANCE BAY/DECONTAMINATION AREA BLDG. 200

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The "M" after the date denotes that the document is now in dual Metric/English.

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**Section 00200
GENERAL SCOPE**

A. GENERAL SCOPE

A-1 GENERAL INTENT

Contractor shall furnish all necessary labor, material, equipment, components supplies, tools and supervision required to construct the ED Canopy/Ambulance Bay and Decontamination Area VA, Building #200, VA project number 578-315.

The existing Canopy at the ED of building 200 shall be demolished and a new Canopy/Ambulance Bay/Decontamination Area constructed. The following paragraphs outline only the major portions of work on this contract, and are not intended to limit the contractor's responsibility.

Demolish, remove and dispose of at the contractor's cost, all Architectural, Asbestos, Mechanical, Electrical and Plumbing, and Structural identified in the specifications and/or on the drawings for the new work shown on the construction documents. Prepare all existing items, surfaces and components to remain for new finishes and work. The demolition clears the area adjacent to the ED for new construction.

Provide all new architectural, mechanical, electrical, and plumbing work as specified and/or shown on the construction documents. Provide, install and connect (as applicable) equipment noted as contractor furnished in the specifications and/or shown on the construction documents. Contractor shall be responsible for work shown only on the construction documents that is not specified.

Contractor shall also refer to section "Work at the Hospital" for additional requirements.

BID ITEMS:

Bid Item No. 1 (Base Bid):

GENERAL CONSTRUCTION: Work includes general construction, alterations, roads, walks, grading, drainage, mechanical, electrical, decontamination items, and necessary removal of existing structures as defined in the Drawings and Specifications.

BID ITEM NO. 1 (BASE BID): _____

Bid Item No. 2:

Contractor shall perform all work included in Bid Item No. 1 except delete the following items associated with the decontamination items including:

1. Automatic privacy screens and associated electric.
2. Radiant Heaters at privacy screened compartments and associated electric.
3. Exterior underground sanitary piping and holding tank.
4. Plumbing fixtures including shower heads, shower wands, cabinet enclosures, etc. including all associated piping.
5. Lighting and associated electric to illuminate the privacy screen compartments.

BID ITEM NO. 2: _____

A-2 (Not Used)

A-3 SITE VISIT

All bidders are required to visit the construction site with the project coordinator, contracting officer and the Architect on the date of the scheduled pre-construction meeting / site visit to determine and verify conditions that will be experienced when the work is accomplished. The project coordinator will assist and answer any questions regarding this project. All requests for information must be made to the contracting officer in writing. All requests for information shall be responded to in writing and be provided to all bidders. Do not contact the architect or engineering consultants directly without permission of the contracting officer.

A-4 PHASING

The project will be completed in one phase.

All shop drawings and submittals shall be processed at the beginning of the first phase. No work item permitted to be installed without approved Shop drawing. The contractor shall furnish the project coordinator with a schedule of approximate dates on which the contractor intends to accomplish the work in specific areas of the site; this shall include the time for shop drawings preparation, review and approval.

A-5 ACCIDENT PREVENTION

Work will be accomplished in a safe manner in accordance with hospital safety, traffic, and parking regulations.

A-6 CLEAN UP

All debris will be removed daily from the work area at the close of each workday. All debris will be promptly removed from VA premises.

A-7 WORK PERIOD

All work shall be performed during the normal workday, which is 7:00 a.m. to 3:30 p.m., Monday through Friday, except for national holidays when the building is closed. Should it become necessary for the contractor, because of the nature of the work involved, to work hours in addition to and over and beyond the hours indicated for a normal work day, the contractor will absorb all additional premium pay at no cost to the Government. In addition, the contractor will request approval from the Contracting Officer to work over and beyond the normal work days indicated above at least 72 hours in advance of when such is requested.

All work in the Surgery area, in the basement, will be performed after hours. Protection for dust containment in the Basement Surgery work areas is specified in General Requirements Section 01010 paragraph 1.7-D (Protection) and in the Infection Control

Risk Assessment Form.

A-8 **WORKMANSHIP**

All work shall be in strict accordance with the installation specifications and recommendations of manufacturer, and the latest standard professional practices for work of this nature.

A-9 **RESTORATION**

Upon completion of the contract, deliver the work complete and undamaged. Damage that may be caused by the contractor or his workmen to the existing structures, grounds, and utilities, or work done by others shall be repaired by him and left in as good a condition as that which existed prior to damaging at no extra cost to the Government

A-10 **TIME FOR COMPLETION**

The contractor shall complete all work under these specifications and / or construction documents after receipt of Notice to Proceed as follows:

Total duration of project = 180 days in 1 phase.

CONSTRUCTION DRAWING INDEX

The drawings listed below will accompany the specifications and will form part of this contract:

Drawings dated 07/01/04

ARCHITECTURAL DRAWINGS

G1100	Cover Sheet and Drawing Index
ASC01	Existing Canopy Grading Plan
ASC101	New Canopy Grading Plan
ASD01	Canopy Demolition Plan
AS101	Canopy Architectural Floor Plan
AS101A	Decontamination Schematic Plan
AS102	Canopy reflected Ceiling Plan
AS103	Canopy Roof Plan
AS201	Exterior Elevations
AS301	Building Sections
AS302	Wall Sections
AS303	Wall Sections
AS304	Wall Sections
AS305	Wall Sections

AS306	Wall Sections
AS401	Architectural Details
AS701	Window Elevations and Details

STRUCTURAL DRAWINGS SS101 Structural Notes

SS201	Foundation Plan
SS202	Roof Framing Plan
SS301	Foundation Details
SS302	Masonry details
SS303	Structural Details

MECHANICAL DRAWINGS

M101	HVAC Plan
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ELECTRICAL DRAWINGS

E101	Electrical, Power and Lighting Partial Ground Floor Plan
E102	Electrical Notes, Schedules, Symbol List

PLUMBING DRAWINGS

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P102	Canopy Plumbing Water Piping Plan
P200	Canopy Plumbing Water Piping Diagram, Notes and Abbreviations
P300	Canopy Plumbing Notes - Symbols and Specifications

FIRE PROTECTION DRAWINGS

FP101	Canopy Fire Protection Plan
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Date:

578/1 38A

Construction Co.:

Address:

Phone No.:

**Re: Project No.578–315;
CANOPY/AMBULANCE BAY/DECONTAMINATION AREA BLDG. 200**

Engineering Service Project Guidelines and Requirements:

a. Address & Phone:

COTR Name: Azad Sunkavalli

COTR Address: Edward Hines, Jr., VA Hospital
Building 2, Room 121 (138A)
Hines, IL 60141-5138

COTR Mail Routing: (1 38A)

COTR Phone Number: (708) 202-8387, Ext. 21152

COTR Fax Number: (708) 202-2167

- b. Submittals:** One courtesy copy shall be sent to the VA while five copies are simultaneously sent to the A/E. The submittal log shall be submitted to the VA with a list of submittals required per the specifications within ten calendar days of this Pre-construction meeting.
- c. Schedule of Values/Progress Chart:** Progress Chart must be submitted to the VA within ten calendar days of this Pre-construction Meeting. Prior to commencing work, the contractor shall submit a detailed schedule of work (including phasing, if any) from the starting day to the day of completion prior to commencing work.
- d. Subcontractor List:** Within ten calendar days of this Pre-construction meeting, submit to the VA a list of all subcontractors including the company name, address, phone number and contact person.
- e. On/Off Jobsite:** The Superintendent on the job should be on the job site during the work. The Superintendent on the job should sign the Log book in Engineering Office at the beginning of each workday. The VA must be made aware of when the contractor is on or off the Jobsite.

- f. **Daily Logs:** All contractors shall submit to the VA a completed Daily Log to the COTR at the end of working day. The daily log shall be on the form provided by the COTR at the Pre-construction Meeting. *Payment applications will not be processed until the Daily Logs are up to date for that month.*
- g. **Work Hours:** The tour of duty for the COTR on this project is 7:00 AM to 3:30 PM. If the contractor would like to work hours other than that, he/she shall request permission to do so from the COTR as per specifications. The contractor can not work on national holidays, when the hospital is closed for the business.
- h. **Emergency Number:** In case of emergency contact of the contractor's personnel.

Person Name :
Phone/Pager# :
- i. **Payrolls:** *Payments will not be processed until all payrolls are into the VA.*
- j. **Storage/Field Office:** No on-site storage or a field office will be provided. If a trailer will be brought on site, request a location for it and get approvals as early as possible.
- k. **Dumpster:** Will a dumpster be required? If so, notify the COTR of such and request a location for it. The contractor shall secure the dumpster and empty promptly.
- l. **Clean up:** All debris will be removed daily from the work area at the close of each workday. Contain debris before transport in tightly covered containers. Place dust mat at entrance and exit of work area.
- m. **Keys:** The COTR will need two copies of keys for any locks in temporary partitions or construction entrances. One key for COTR use and one key for fire department.
- n. **Barricades:** All construction areas are to be barricaded off from non-construction personnel. This is especially critical near all patient care buildings.
- o. **Infection Control:** Isolate HVAC system in the area, where work is being done to prevent contamination of duct system. Maintain negative air pressure within work site utilizing HEPA-equipped air filtration units. Wet

mop and/or vacuum with HEPA filtered vacuum before leaving work areas.

- p. **VA Equipment:** The use of VA equipment (ie: carts, towels, etc.) is strictly forbidden unless approved by the VA.
- q. **No Smoking:** No smoking is allowed in the Hospital including construction area. Violation of this rule will result in work stoppage by COTR and Contracting Officer.
- r. **Hard-hats:** Hard-hats shall be worn by all personnel on a construction Jobsite.
- s. **Badges:** Badges shall be worn at all times by construction personnel while on VA property.
- t. **Burn Permits:** A burn permit shall be obtained from Safety Department (extension 25613/25658/21952) for all cutting with a torch, welding and soldering operations.
- u. **Asbestos Abatement:** All asbestos abatement shall be done according to VA regulations. The contractor shall obtain the permission of Project Engineer prior to commencing the abatement. No abatement work shall be started without approved asbestos submittals.
- v. **Fire Stopping:** Any penetrations through all new and existing walls shall be sealed promptly with a fire-rated sealant before leaving that area of work.
- w. **Life Safety:** All interim life safety measures shall be discussed with the Project Engineer prior to the start of construction.
- x. **Bi-monthly meeting:** The Project Manager of the job should attend bi-monthly construction review meeting on second and fourth Wednesdays of the month at 1:30pm in Room 126, Bldg. 2.

Contractor Signature:

COTR's Signature:

**SECTION 01 00 00
GENERAL REQUIREMENTS**

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SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for Project # 578-315-Canopy/Ambulance Bay /Decontamination Area Addition Building 200 as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the COTR
- C. Offices of _PFB Architects Inc., as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.

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

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

G. Training:

1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other

relevant competency training, as determined by VA CP with input from the ICRA team.

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

1.2 STATEMENT OF BID ITEM(S)

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

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, 15 sets of specifications and drawings will be furnished. These drawings and specifications will consist of those returned by prospective bidders.
- B. Additional sets of drawings may be made by the Contractor, at Contractor's expense, from reproducible sepia prints furnished by Issuing Office. Such sepia prints shall be returned to the Issuing Office immediately after printing is completed.

1.4 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

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

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.

2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

D. Key Control:

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

E. Document Control:

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

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

F. Motor Vehicle Restrictions

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

1.5 FIRE SAFETY

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

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

E84-2009 Surface Burning Characteristics of Building Materials

2. National Fire Protection Association (NFPA):

- 10-2010Standard for Portable Fire Extinguishers
- 30-2008..... Flammable and Combustible Liquids Code
- 51B-2009..... Standard for Fire Prevention During Welding,
Cutting and Other Hot Work
- 70-2011..... National Electrical Code
- 241-2009..... Standard for Safeguarding Construction,
Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA): 29 CFR

- 1926Safety and Health Regulations for Construction

- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COTR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the COTR that individuals have undergone contractor's safety briefing.
- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions to provide smoke-tight separations between 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, 3/4 hour fire/smoke rated doors with self-closing devices.
 3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.
- F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with COTR/.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COTR/.
- 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.
- L. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.
- M. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request

- interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COTR. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the COTR.
- N. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COTR .
- O. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COTR. Obtain permits from facility Safety Officer at least 24 hours in advance . Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- P. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COTR.
- Q. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- R. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- S. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

COTR1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the

Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

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

COTR

- D. Working space and space available for storing materials shall be as determined by the COTR.
- E. Workmen are subject to rules of Medical Center / applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COTR where required by limited working space.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of

Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.

3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.

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 COTR. All such actions shall be coordinated with the Utility Company involved:

1. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

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

H. Building No.200 will be occupied during performance of work

Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction

areas which serve as routes of access to such affected areas and equipment. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.

- 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 indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by COTR.
- J. When a building is turned over to Contractor, Contractor shall accept entire responsibility therefore.
1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.
- K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COTR.
1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COTR. Electrical work shall be

accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.

2. Contractor shall submit a request to interrupt any such services to COTR, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
 3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center / . Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
 4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COTR.
 5. In case of a contract construction emergency, service will be interrupted on approval of COTR. Such approval will be confirmed in writing as soon as practical.
 6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- L. 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.

- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times.
 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COTR.
- N. Coordinate the work for this contract with other construction operations as directed by COTR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

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1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COTR // and a representative of VA Supply Service, of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:
1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of building.
 2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.

3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and COTR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COTR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COTR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
 2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.

3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

construction on a regular basis. (VHA

1.8 INFECTION PREVENTION MEASURES

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to COTR and Facility ICRA team for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- C. Medical center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition:
 1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.

2. In case of any problem, the medical center, along with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.
- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by COTR. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
 2. Do not perform dust producing tasks within occupied areas without the approval of the COTR. For construction in any areas that will remain jointly occupied by the medical Center and Contractor's workers, the Contractor shall:
 - a. Provide dust proof o temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and an agreement is reached with the COTR and Medical Center.
 - b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be

heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.

- c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (2 4" x 36"), shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
- d. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.
- e. The contractor shall not haul debris through patient-care areas without prior approval of the COTR and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
- f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
- g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
- h. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

E. Final Cleanup:

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

1.9 DISPOSAL AND RETENTION

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

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

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

A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the

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

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

(FAR 52.236-9)

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

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1.11 RESTORATION

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

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

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

1.12 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.
- B. Subsurface conditions have not been developed. The Foundation design assumes 1500 PSF bearing capacity at footings. Contractor shall engage a geotechnical engineer to confirm allowable bearing capacity exceeds or meets the minimum specified.

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1.14 LAYOUT OF WORK

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

(FAR 52.236-17)

- B. Establish and plainly mark center lines for each building and/or addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, / are in accordance with lines and elevations shown on contract drawings.
- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the COTR before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.

- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to COTR.
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.15 AS-BUILT DRAWINGS

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

1.16 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COTR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.
- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads

leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

1.17 COTR'S FIELD OFFICE

- A. The Contractor shall, within fifteen (15) days after receipt of Notice to Proceed, provide where approved by COTR a temporary field office, furniture, and two inch deep gravel surfaced area for use of the COTR. Office and furniture shall be new.
- B. The field office shall provide not less than 67 square meters (720 gross square feet) of floor area in one unit. Installation of the office shall meet all local codes.
- C. Provide office with two, 900 mm (three foot) wide exterior doors, including hardware and OSHA approved platform and stairs leading to grade.
- D. Enclose the entire perimeter of the office from the floor to the ground and finish to match exterior. Provide R7 insulation and seal tight to ground with a painted 19 mm (3/4 inch) exterior grade plywood skirt.
- E. Exterior finishes shall be manufacturer's standards.
- F. Provide floor, wall, and roof with not less than R5 insulation.
- G. Interior finishes shall consist of resilient flooring, plywood paneling or painted wallboard on walls, and acoustical tile ceilings. Interior doors may be either painted or stained.
- H. Interior shall be subdivided with full height partitions to provide one office, and one meeting area/ . Provide each space with 900 mm (three foot) wide door with master keyed locks.
- I. Provide 750 mm (2-1/2 feet) wide by 900 mm (3 feet) high operable windows; two in each room (none required in sample room), except provide only one 600 mm (2 foot) high window in toilet room(s). Window openings shall be fitted with security bars to prevent any forced entry. The door of field office shall have a hasp and padlock and also deadbolts keyed from both sides.

- J. Provide sufficient fluorescent lighting in each room to deliver 750 lux (70 foot-candles) of light at desk top height without the aid of daylight. Provide one light switch in each room.
- K. Provide one duplex receptacle in each wall of each room. If a wall is 3.0 m (10 feet) long or more, provide two receptacles for each 3.0 m (10 feet), or portion thereof, of wall. Provide two duplex receptacles in low partition at secretary's desk.
- L. The Contractor shall provide the following:
1. Electricity, hot and cold water, and necessary utility services (except telephone).
 2. All necessary piping, power circuits network cabling, cat 5e or better cabling for phones and computers, electrical fixtures, lighting, and other items necessary to provide a habitable structure for the purpose intended. The number of network and electrical receptacles will be as per attached drawing of the field office.
 3. Thermostatically controlled, centralized heating and air conditioning system designed to maintain the temperature between 21 and 27 degrees C (70 and 80 degrees F) with 50 percent relative humidity maintained during the air conditioning season.
 5. The contractor to install a suitable alarm system for the field office .
- M. Contractor shall, for the duration of the COTR's occupancy, provide the following:
1. Satisfactory conditions in and around the field office and parking area.
 2. Maintenance of gravel surfaced area, including the area for parking, in an acceptable condition for vehicle and foot traffic at all times.
 3. Maintenance of utility services.

N. The Contractor shall provide the following items:

QUANTITY REQUIRED

1 Printer stand 663 mm H x 1.5 m W x 750 mm D (size 26-1/2" H x 60" W x 30" D)

3 Office desks, double pedestal

1 Conference table 900 mm x 1.8 m (size 3' x 6')

1 Plan table 1.2 m x 2.1 m (4' x 7')

3 Work tables 750 mm x 1.8 m (folding 30" x 72")

1 Secretary chair

4 Swivel chairs with arms

6 Conference chairs (armless & folding)

2 Arm Chairs

4 Lockable 5 drawer file cabinets, letter size

1 Drawing rack, with 12-750 mm (12-30 inch) "Plan Hold" drawing holders, freestanding

1 Shelves for sample room, 7 adjustable Shelves, 305 mm W x 900 mm L (12" W x 3' L)

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r) 1 Plan table 1200 mm x 6 meters (4' x

20')

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- O. COTR's field office and facilities shall be relocated once after its initial installation at the Contractor's expense. Relocation consists of moving the field office and facilities to a location within the VA site designated by the COTR together with providing and maintaining utilities, parking area, sanitary facilities and janitorial service in new location until completion and final acceptance of project.

- P. At the completion of all work, including the punch list, the COTR's field office and facilities shall become the property of the Contractor and Contractor shall remove same, including utility connections, from the Medical Center . The site shall be restored to original condition and finished in accordance with contract requirements.

- Q. The Contractor shall furnish floor plans for approval by the COTR prior to furnishing the field office.

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 COTR. If the equipment is not installed and maintained in accordance with the following provisions, the COTR will withdraw permission for use of the equipment.

 - 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.

3. Units shall be properly lubricated, balanced, and aligned.
Vibrations must be eliminated.
 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
 5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
 6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government. Boilers, pumps, feedwater heaters and auxiliary equipment must be operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

1.19 TEMPORARY USE OF EXISTING ELEVATORS

- A. Contractor will not be allowed the use of existing elevators. Outside type hoist shall be used by Contractor for transporting materials and equipment.

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1.21 TEMPORARY TOILETS

- A. Provide where directed, (for use of all Contractor's workmen) ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by COTR, 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.
- A'. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center . Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.22 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.
- C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
- D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:

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

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

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

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

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at COTR's discretion) of use of water from // Medical Center's // Cemetery's // system.

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1.24 TESTS

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.

- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a complex which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- D. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.25 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the COTR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment,

component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

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

1.26 GOVERNMENT-FURNISHED PROPERTY

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings .
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center . //

- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the Medical Center /
- D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.
1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
 2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.
- E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.
- F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
- G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

SPEC WRITER NOTE: Check with Equipment Specification Writer concerning what equipment is scheduled to be relocated before using or omitting this article.

1.27 RELOCATED ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COTR.
- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

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1.30 SAFETY SIGN

- A. Provide a Safety Sign where directed by COTR. Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.
- B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.
- C. Maintain sign and remove it when directed by COTR.

- D. Standard Detail Drawing Number SD10000-02 (Found on VA TIL) of safety sign showing required legend and other characteristics of sign is attached hereto and is made a part of this specification. E. Post the number of accident free days on a daily basis.

Estimated Cost		Nb. of Photographs
Up to	\$250,000	50 to 100
" "	\$500,000	100 to 150
" "	\$1,000,000	150 to 200
" "	\$2,000,000	200 to 250
" "	\$5,000,000	250 to 300
" "	\$10,000,000	300 to 400
More than	\$10,000,000	400 to 500

1.32 FINAL ELEVATION DIGITAL IMAGES

- A. A minimum of four (4) images of each elevation shall be taken with a minimum 6 MP camera, by a professional photographer with different settings to allow the COTR to select the image to be printed. All images are provided to the RE on a CD.
- B. Photographs shall be taken upon completion, including landscaping. They shall be taken on a clear sunny day to obtain sufficient detail to show depth and to provide clear, sharp pictures. Pictures shall be 400 mm x 500 mm (16 by 20 inches), printed on regular weight paper, matte finish archival grade photographic paper and produced by a RA4 process from the digital image with a minimum 300 PPI. Identifying data shall be carried on label affixed to back of photograph without damage to photograph and shall be similar to that provided for final construction photographs.
- C. Furnish six (6) 400 mm x 500 mm (16 by 20 inch) color prints of the following buildings constructed under this project (elevations as selected by the RE from the images taken above). Photographs shall be

artistically composed showing full front elevations. All images shall become property of the Government. Each of the selected six prints shall be place in a frame with a minimum of 2 inches of appropriate matting as a border. Provide a selection of a minimum of 3 different frames from which the SRE will select one style to frame all six prints. Photographs with frames shall be delivered to the COTR in boxes suitable for shipping.

1. Hospital Building No. ____.

- - - E N D - - -

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
- | | |
|-----------------------|---|
| T27-99 | Standard Specification for Sieve Analysis of Fine and Coarse Aggregates |
| T96-02 | Standard Specification for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine |
| T99-01 | Standard Specification for the Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop |
| T104-99 | Standard Specification for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate |
| T180-01 | Standard Specification for Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop |
| T191-02 | Standard Specification for Density of Soil In-Place by the Sand-Cone Method |
| T205-86(R1996) | Standard Specification for Density of Soil In-Place by the Rubber-Balloon Method |
| T230-68 (R2000) | Standard Specification for Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures |
| T238-97 | Standard Specification for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
- C. American Concrete Institute (ACI):
- | | |
|-----------------|---------------------------------------|
| 506.4R-94 | Guide for the Evaluation of Shotcrete |
|-----------------|---------------------------------------|

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

A325-2002	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
A370-2003.....	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
A416/A416M-2002	Standard Specification Uncoated Seven-Wire for Prestressed Concrete
A490-2002	Standard Specification for Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
A880-95.....	Standard Practice for Criteria for Use in Evaluation of Testing Laboratories and Organizations for Examination and Inspection of Steel, Stainless Steel, and Related Alloys
C31/C31M(REV. A)-2003	Standard Test Method Test Specimens in the Field
C33-2003.....	Standard Specification for Concrete Aggregates
C39/C39M-2001.....	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens C109/C109M-2002Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C138(REV. A)-2001	Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C140 (REV. A)-2002.....	Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-2003..	Standard Test Method for Slump of Hydraulic Cement Concrete
C172-99.....	Standard Practice for Sampling Freshly Mixed Concrete
C173-2001.....	Standard Test Method for Air Content of freshly Mixed Concrete by the Volumetric Method
C330-2003	Standard Specification Aggregates for Structural Concrete
C567-2000.....	Standard Test Method for Density Structural Lightweight Concrete
C780-2002	Standard Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

C1019-2003	Standard Test Method for Sampling and Testing Grout
C1064/C1064M-2001	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
C1077-2002	Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314(REV. A)-2003	Standard Test Method for Compressive Strength of Masonry Prisms
D698 (REV. A)-2000	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143-81 (E1994) (R1994) . .	Standard Test Method for Piles Under Static Axial Compressive Load
D1188-96(R2002)	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556-00	Standard Test Method for of Soil in Place by the Sand-Cone Method
D1557-2002	Standard Test Method for Characteristics of Soil Using Modified Effort
D2166-2000	Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
D2167-94 (R2001)	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-98	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2922- (2001)	Standard Test Methods for Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D2974- (2000)	Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666- (2002)	Standard Specification for Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740- (2001)	Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

- E94- (2000)Standard Guide for Radiographic Testing
- E164-97Standard Practice for Ultrasonic Contact
Examination of Weldments
- E329- (2002)Standard Specification for Agencies Engaged in
the Testing and/or Inspection of Materials Used
on Construction
- E543- (2002)Standard Practice for Agencies Performing Non-
Destructive Testing
- E605-93 (R2000)Standard Test Methods for Thickness and Density
of Sprayed Fire-Resistive Material (SFRM)
Applied to Structural Members
- E709- (2001)Standard Guide for Magnetic Particle Examination
- E1155-96(R2001)Standard Test Method for Determining FF
- E. American Welding Society (AWS):
- D1.1-02Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Testing Laboratory retained and paid for by Contractor, must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the geographic region for the project. Furnish to the Contracting Officer a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has started, and submit to the Contracting Officer for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to the testing field.
1. Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E329.
 2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
 3. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D3666.
 4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D3740.

5. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880.
 6. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543.
 7. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.
- 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, and Local Building Authority within 24 hours after each test is completed unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
 2. Provide part time observation of fill placement and compaction and field density testing in building areas and provide part time observation of fill placement and compaction and field density

testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.

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

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with AASHTO T99/T180 Method A or ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556, or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (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 m² (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 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
 - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

- C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

3.2 FOUNDATION PILES:

SPEC WRITER NOTE: Verify that test piles are required and location is shown.

- A. Witness load test procedure for conformance with ASTM D1143 and interpret test data to verify geotechnical recommendations for pile capacity. Submit load test report in accordance with ASTM D1143.
- B. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to Resident Engineer.

3.4 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.

3.5 ASPHALT CONCRETE PAVING:

- A. Aggregate Base Course:
 - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with AASHTO T180, Method D
 - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with AASHTO T191 /.
 - 3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:
 - 1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).

2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.6 SITE WORK CONCRETE:

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

3.7 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 m³ (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. // After good concrete quality control has been established and maintained as determined by Resident Engineer make three cylinders for each 80 m³ (100 cubic yards) or less of each concrete type, and at least three cylinders from any one day's pour for each concrete type.
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 m³ (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m³ (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.

SPEC WRITER NOTE: Testing of reinforcement bars is required for all major projects in the State of California. Check with structural engineer for testing in other locations.

3.9 REINFORCEMENT:

- 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

3.10 STRUCTURAL STEEL:

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:

1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
3. Approve welder qualifications by certification or retesting.
4. Approve procedure for control of distortion and shrinkage stresses.
5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.

C. Fabrication and Erection:

1. Weld Inspection:

- a. Inspect welding equipment for capacity, maintenance and working condition.
- b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
- c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
- d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.

e. Measure 25 percent of fillet welds.

f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:

- 1) 20 percent of all shear plate fillet welds at random, final pass only.
- 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
- 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
- 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
- 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.

g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.

- h. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.
- i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
- j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.

2. Bolt Inspection:

- a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
- b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
- c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
- d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
- e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
- f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.

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

3.11 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.

3.12 SHEAR CONNECTOR STUDS:

- A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.
- B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.
- C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.13 SPRAYED-ON FIREPROOFING:

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from Resident Engineer.
- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605.
 - 1. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.
- E. Location of test areas for field tests as follows:
 - 1. Thickness: Select one bay per floor, or one bay for each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
 - 2. Density: Take density determinations from each floor, or one test from each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.
- F. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. This section specifies the requirements for furnishing all equipment, materials, labor, tools, and techniques for earthwork including, but not limited to, the following:

1. Site preparation.
2. Excavation.
3. Underpinning.
4. Filling and backfilling.
5. Grading.
6. Soil Disposal.
7. Clean Up.

1.2 DEFINITIONS:

A. Unsuitable Materials:

1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 75 mm (3 inches); organic material, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable.
2. Existing Subgrade (Except Footings): Same materials as above paragraph, that are not capable of direct support of slabs, pavement, and similar items with possible exception of improvement by compaction, proofrolling, or similar methods.
3. Existing Subgrade (Footings Only): Same as paragraph 1, but no fill or backfill. If materials differ from reference borings and design requirements, excavate to acceptable strata subject to Resident Engineer's approval.

B. Building Earthwork: Earthwork operations required in area enclosed by a line located 1500 mm (5 feet) outside of principal building perimeter. It also includes earthwork required for auxiliary structures and buildings.

C. Trench Earthwork: Trenchwork required for utility lines.

D. Site Earthwork: Earthwork operations required in area outside of a line located 1500 mm (5 feet) outside of principal building perimeter and within new construction area with exceptions noted above.

E. Degree of compaction: Degree of compaction is expressed as a percentage of maximum density obtained by laboratory test procedure. This

percentage of maximum density is obtained through use of data provided from results of field test procedures presented in ASTM D1556, ASTM D2167, and ASTM D2922.

- F. Fill: Soil materials used to raise existing grades. In the Construction Documents, the term "fill" means fill or backfill as appropriate.
- G. Backfill: Soil materials used to fill an excavation.
- H. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or dimensions without written authorization by the Resident Engineer. No payment will be made for unauthorized excavation or remedial work required to correct unauthorized excavation.
- I. Authorized additional excavation: Removal of additional material authorized by the Resident Engineer based on the determination by the Government's soils testing agency that unsuitable bearing materials are encountered at required sub-grade elevations. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- J. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- K. Structure: Buildings, foundations, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- L. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- M. Drainage course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- N. Bedding course: Layer placed over the excavated sub-grade in a trench before laying pipe.
- O. Sub-base Course: Layer placed between the sub-grade and base course for asphalt paving or layer placed between the sub-grade and a concrete pavement or walk.
- P. Utilities include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- Q. Debris: Debris includes all materials located within the designated work area not covered in the other definitions and shall include but not be limited to items like vehicles, equipment, appliances, building materials or remains thereof, tires, any solid or liquid chemicals or products stored or found in containers or spilled on the ground.

1.3 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01410, TESTING LABORATORY SERVICES.

- B. Safety requirements // and blasting operations //: Section 01001, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.
- C. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01010, GENERAL REQUIREMENTS.
- D. Subsurface Investigation: Section 01010, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- H. Paving sub-grade requirements: Section 02513, ASPHALTIC CONCRETE PAVING.

1.4 CLASSIFICATION OF EXCAVATION:

- A. Unclassified Excavation: Removal and disposal of pavements and other man-made obstructions visible on surface; utilities, and other items including underground structures indicated to be demolished and removed; together with any type of materials regardless of character of material and obstructions encountered.

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 Association of State Highway and Transportation Officials (AASHTO):
 - T99-97.....Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop
 - T180-97.....Moisture-Density Relations of Soils using a 4.54 kg (10 lb) Rammer and a 457 mm (18 inch) Drop
 - T191-93 (R96)Density of Soil In-Place by the Sand-Cone Method
 - T205-86 (R96)Density of Soil In-Place by the Rubber-Balloon Method
 - T238-97Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- C. American Society for Testing and Materials (ASTM): D448-98.....Sizes of Aggregate for Road and Bridge Construction
 - D698-00Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft. lbf/ft³ (600 kN m/m³))
 - D1556-00Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - D1557-00 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2700 kN m/m³))

- D2167-94 (R01)Standard Test Method for Density and Unit Weight
of Soil in Place by the Rubber Balloon Method
- D2922-01Standard Test Methods for Density of Soil and
Soil-Aggregate in Place by Nuclear Methods
(Shallow Depth)
- D2940-98Graded Aggregate Material for Bases or Subbases
for Highways or Airports
- D. Society of Automotive Engineers (SAE):
 - J732-92Specification Definitions Loaders
 - J1179-90Hydraulic Excavator and Backhoe Digging Forces

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Fills: Material approved from on site or off site sources having a minimum dry density of 1760 kg/m³ (110 pcf), a maximum Plasticity Index of 6, and a maximum Liquid Limit of 30.
- B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90 percent passing a 37.5-mm (1 1/2-inch) sieve and not more than 12 percent passing a 75-µm (No. 200) sieve.
- C. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 25 mm (1 inch) sieve and not more than 8 percent passing a 75-µm (No. 200) sieve.
- D. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 37.5 mm (1 1/2-inch) sieve and 0 to 5 percent passing a 2.36 mm (No. 8) sieve.
- E. Granular Fill:
 - 1. Under concrete slab, crushed stone or gravel graded from 25 mm (1 inch) to 4.75 mm (No. 4).
 - 2. Bedding for sanitary and storm sewer pipe, crushed stone or gravel graded from 13 mm (1/2 inch) to 4.75 mm (No 4).

PART 3 - EXECUTION

3.1 SITE PREPARATION:

- A. Clearing: Clear within limits of earthwork operations as shown. Work includes removal of trees, shrubs, fences, foundations, incidental

structures, paving, debris, trash, and other obstructions. Remove materials from Medical Center.

- B. Grubbing: Remove stumps and roots 75 mm (3 inch) and larger diameter. Undisturbed sound stumps, roots up to 75 mm (3 inch) diameter, and nonperishable solid objects a minimum of 900 mm (3 feet) below subgrade or finished embankment may be left.
- C. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 4500 mm (15 feet) of new construction and 2250 mm (7.5 feet) of utility lines when removal is approved in advance by Resident Engineer. Remove materials from Medical Center. Trees and shrubs, shown to be transplanted, shall be dug with a ball of earth and burlapped in accordance with latest issue of, "American Standard for Nursery Stock" of the American Association of Nurserymen, Inc. Transplant trees and shrubs to a permanent or temporary position within two hours after digging. Maintain trees and shrubs held in temporary locations by watering as necessary and feeding semiannually with liquid fertilizer with a minimum analysis of 5 percent nitrogen, 10 percent phosphorus, and 5 percent potash. Maintain plants moved to permanent positions as specified for plants in temporary locations until conclusion of contract. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in construction area. Immediately repair damage to existing trees and shrubs by trimming, cleaning and painting damaged areas, including roots, in accordance with standard industry horticultural practice for the geographic area and plant species. Do not store building materials closer to trees and shrubs, that are to remain, than farthest extension of their limbs.
- D. Stripping Topsoil: Strip topsoil from within limits of earthwork operations as specified. Topsoil shall be a fertile, friable, natural topsoil of loamy character and characteristic of locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile topsoil and protect as directed by Resident Engineer. Eliminate foreign materials, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials larger than 0.014 m³ (1/2 cubic foot) in volume, from soil as it is stockpiled. Retain topsoil on station. Remove foreign materials larger than 50 mm (2 inches) in any dimension from topsoil used in final grading. Topsoil work, such as stripping, stockpiling, and similar topsoil work shall not, under any circumstances, be carried out when soil is wet so that tilth of soil will be destroyed.

E. Concrete Slabs and Paving: Score deeply or saw cut to insure a neat, straight cut, sections of existing concrete slabs and paving to be removed where excavation or trenching occurs. Extend pavement section to be removed a minimum of 300 mm (12 inches) on each side of widest part of trench excavation and insure final score lines are approximately parallel unless otherwise indicated. Remove material from Medical Center

F. Lines and Grades: Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01010, GENERAL REQUIREMENTS, shall establish lines and grades.

1. Grades shall conform to elevations indicated on plans within the tolerances herein specified. Generally grades shall be established to provide a smooth surface, free from irregular surface changes. Grading shall comply with compaction requirements and grade cross sections, lines, and elevations indicated. Where spot grades are indicated the grade shall be established based on interpolation of the elevations between the spot grades while maintaining appropriate transition at structures and paving and uninterrupted drainage flow into inlets.

2. Proposed spot elevations have been developed utilizing the existing site plan and may be approximate. Contractor is responsible to notify Resident Engineer of any differences between existing elevations shown on plans and those encountered on site by Surveyor/Engineer described above. Notify Resident Engineer of any differences between existing or constructed grades, as compared to those shown on the plans.

3. Subsequent to establishment of lines and grades, Contractor will be responsible for any additional cut and/or fill required to ensure that site is graded to conform to elevations indicated on plans.

4. Finish grading is specified in Section 02480, LANDSCAPING.

G. Disposal: All materials removed from the property shall be disposed of at a legally approved site, for the specific materials, and all removals shall be in accordance with all applicable Federal, State and local regulations. No burning of materials is permitted onsite.

3.2 EXCAVATION:

A. Shoring, Sheet piling and Bracing: Shore, brace, or slope, to its angle of repose, banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities.

1. Extend shoring and bracing to bottom of excavation. Shore excavations that are carried below elevations of adjacent existing foundations.

2. If bearing of any foundation is disturbed by excavating, improper shoring or removal of shoring, placing of backfill, and similar operations, provide a concrete fill support, under disturbed foundations, as directed by Resident Engineer, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by Resident Engineer.
- B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required to keep excavation free of water and subgrade dry, firm, and undisturbed until approval of permanent work has been received from Resident Engineer. Approval by the Resident Engineer is also required before placement of the permanent work on all subgrades. When subgrade for foundations has been disturbed by water, remove disturbed material to firm undisturbed material after water is brought under control. Replace disturbed subgrade in trenches with mechanically tamped sand or gravel. When removed disturbed material is located where it is not possible to install and properly compact disturbed subgrade material with mechanically compacted sand or gravel, the Resident Engineer should be contacted to consider the use of flowable fill.
- C. Proofrolling:
1. After rough grade has been established in cut areas and prior to placement of fill in fill areas under building and pavements, proofroll exposed subgrade with a fully loaded dump truck to check for pockets of soft material.
 2. Proofrolling shall consist of at least two complete passes with one pass being in a direction perpendicular to preceding one. Remove any areas that deflect, rut, or pump excessively during proofrolling, or that fail to consolidate after successive passes to suitable soils and replaced with compacted fill. Maintain subgrade until succeeding operation has been accomplished.
- E. Building Earthwork:
1. Excavation shall be accomplished as required by drawings and specifications.
 2. Excavate foundation excavations to solid undisturbed subgrade.
 3. Remove loose or soft materials to a solid bottom.
 4. Fill excess cut under footings or foundations with 25 MPa (3000 psi) concrete poured separately from the footings.
 5. Do not tamp earth for backfilling in footing bottoms, except as specified.

F. Trench Earthwork:

1. Utility trenches (except sanitary and storm sewer):
 - a. Excavate to a width as necessary for sheeting and bracing and proper performance of the work.
 - b. Grade bottom of trenches with bell holes scooped out to provide a uniform bearing.
 - c. Support piping on undisturbed earth unless a mechanical support is shown.
 - d. Length of open trench in advance of piping laying shall not be greater than is authorized by Resident Engineer.
2. Sanitary and storm sewer trenches:
 - a. Trench width below a point 150 mm (6 inches) above top of pipe shall be 600 mm (24 inches) maximum for pipe up to and including 300 mm (12 inches) diameter, and four-thirds diameter of pipe plus 200 mm (8 inches) for pipe larger than 300 mm (12 inches). Width of trench above that level shall be as necessary for sheeting and bracing and proper performance of the work.
 - b. Bed bottom quadrant of pipe on undisturbed soil or granular fill.
 - 1) Undisturbed: Bell holes shall be no larger than necessary for jointing. Backfill up to a point 300 mm (12 inches) above top of pipe shall be clean earth placed and tamped by hand.
 - 2) Granular Fill: Depth of fill shall be a minimum of 75 mm (3 inches) plus one sixth of pipe diameter below pipe to 300 mm (12 inches) above top of pipe. Place and tamp fill material by hand.
 - c. Place and compact as specified remainder of backfill using acceptable excavated materials. Do not use unsuitable materials.
 - d. Use granular fill for bedding where rock or rocky materials are excavated.

G. Site Earthwork: Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation. Excavation shall be accomplished as required by drawings and specifications. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 25 mm (1 inch). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, complying with OSHA requirements, and for inspections. Remove subgrade materials that

are determined by Resident Engineer as unsuitable, and replace with acceptable material. If there is a question as to whether material is unsuitable or not, the contractor shall obtain samples of the material, under the direction of the Resident Engineer, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. When unsuitable material is encountered and removed, contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL CONDITIONS as applicable. Adjustments to be based on volume in cut section only.

1. Site Grading:

- a. Provide a smooth transition between adjacent existing grades and new grades.
- b. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- c. Slope grades to direct water away from buildings and to prevent ponds from forming where not designed. Finish subgrades to required elevations within the following tolerances:
 - 1) Lawn or Unpaved Areas: Plus or minus 25 mm (1 inch).
 - 2) Walks: Plus or minus 25 mm (1 inch).
 - 3) Pavements: Plus or minus 13 mm (1/2 inch).
- d. Grading Inside Building Lines: Finish subgrade to a tolerance of 13 mm (1/2 inch) when tested with a 3000 mm (10 foot) straightedge.

3.3 FILLING AND BACKFILLING:

- A. General: Do not fill or backfill until all debris, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation. For fill and backfill use excavated materials and borrow meeting the criteria specified herein, as applicable. Borrow will be supplied at no additional cost to the Government. Do not use unsuitable excavated materials. Do not backfill until foundation walls have been completed above grade and adequately braced, waterproofing or dampproofing applied, foundation drainage, and pipes coming in contact with backfill have been installed and work inspected and approved by Resident Engineer.
- B. Placing: Place materials in horizontal layers not exceeding 200 mm (8 inches) in loose depth for material compacted by heavy compaction equipment, and not more than 100 mm (4 inches) in loose depth for material compacted by hand-operated tampers and then compacted. Place

backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. Place no material on surfaces that are muddy, frozen, or contain frost.

- C. Compaction: Compact with approved tamping rollers, sheepsfoot rollers, pneumatic tired rollers, steel wheeled rollers, vibrator compactors, or other approved equipment (hand or mechanized) well suited to soil being compacted. Do not operate mechanized vibratory compaction equipment within 3000 mm (10 feet) of new or existing building walls without prior approval of Resident Engineer. Moisten or aerate material as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact soil to not less than the following percentages of maximum dry density, according to ASTM D698 or ASTM D1557 as specified below:

1. Fills, Embankments, and Backfill

- a. Under proposed structures, building slabs, steps, and paved areas, scarify and recompact top 300 mm (12 inches) of existing subgrade and each layer of backfill or fill material in accordance with ASTM D698 95 percent.
- b. Curbs, curbs and gutters, ASTM D698 95 percent.
- c. Under Sidewalks, scarify and recompact top 150 mm (6 inches) below subgrade and compact each layer of backfill or fill material in accordance with ASTM D698 95 percent.
- d. Landscaped areas, top 400 mm (16 inches), D698 85 percent.
- e. Landscaped areas, below 400 mm (16 inches) of finished grade, ASTM D698 90 percent.

2. Natural Ground (Cut or Existing)

- a. Under building slabs, steps and paved areas, top 150 mm (6 inches), ASTM D698 95 percent.
- b. Curbs, curbs and gutters, top 150 mm (6 inches), ASTM D698 95 percent.
- c. Under sidewalks, top 150 mm (6 inches), ASTM D698 95 percent.

3.5 GRADING:

- A. General: Uniformly grade the areas within the limits of this section, including adjacent transition areas. Smooth the finished surface within specified tolerance. Provide uniform levels or slopes between points where elevations are indicated, or between such points and existing finished grades. Provide a smooth transition between abrupt changes in slope.

- B. Cut rough or sloping rock to level beds for foundations. In pipe spaces or other unfinished areas, fill low spots and level off with coarse sand or fine gravel.
- C. Slope backfill outside building away from building walls for a minimum distance of 1800 mm (6 feet).
- D. Finish grade earth floors in pipe basements as shown to a level, uniform slope and leave clean.
- E. Finished grade shall be at least 150 mm (6 inches) below bottom line of window or other building wall openings unless greater depth is shown.
- F. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled. Thickness of fill shall be 150 mm (6 inches) unless otherwise shown.
- G. Finish subgrade in a condition acceptable to Resident Engineer at least one day in advance of paving operations. Maintain finished subgrade in a smooth and compacted condition until succeeding operation has been accomplished. Scarify, compact, and grade subgrade prior to further construction when approved compacted subgrade is disturbed by Contractor's subsequent operations or adverse weather.
- H. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 6 mm (0.25 inches) of indicated grades.

3.6 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL:

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Medical Center property.
- C. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- D. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- E. Segregate all excavated contaminated soil designated by the Resident Engineer from all other excavated soils, and stockpile on site on two 0.15 mm (6 mil) polyethylene sheets with a polyethylene cover. A designated area shall be selected for this purpose. Dispose of excavated contaminated material in accordance with State and Local requirements.

3.7 CLEAN UP:

Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove all debris, rubbish, and excess material from // Medical Center // Cemetery Property //.

E N D

**SECTION 02410
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:
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01010, GENERAL REQUIREMENTS.
- H. Infectious Control: Section 01007, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01010, GENERAL REQUIREMENTS, Article 1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.

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

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

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

1.4 UTILITY SERVICES:

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
 1. As required for installation of new utility service lines.
 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him

daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. 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 off the Medical Center. disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

- - - E N D - - -

SECTION 02513
ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

This work shall cover the composition, mixing, construction upon the prepared subgrade, and the protection of hot asphalt concrete pavement.

The hot asphalt concrete pavement shall consist of an aggregate or asphalt base course and asphalt surface course constructed in conformity with the lines, grades, thickness, and cross sections as shown.

1.2 RELATED WORK

- A. Laboratory and field testing requirements: Section 01410, TESTING LABORATORY SERVICES.
- B. Subgrade Preparation: Paragraph 3.3 and Section 02200, EARTHWORK.
- C. Pavement Markings: Section 02577, PAVEMENT MARKING.

1.3 INSPECTION OF PLANT AND EQUIPMENT

The Resident Engineer shall have access at all times to all parts of the material producing plants for checking the mixing operations and materials and the adequacy of the equipment in use.

1.4 ALIGNMENT AND GRADE CONTROL

The Contractor's Registered Professional Land Surveyor specified in Section 01001, GENERAL CONDITIONS shall establish and control the pavement (aggregate or asphalt base course and asphalt surface course), alignments, grades, elevations, and cross sections as shown on the Drawings.

1.5 SUBMITTALS

- A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS, furnish the following:
- B. Data and Test Reports:
 - 1. Aggregate Base Course: Sources, gradation, liquid limit, plasticity index, percentage of wear, and other tests required by State Highway Department.
 - 2. Asphalt Base/Surface Course: Aggregate source, gradation, soundness loss, percentage of wear, and other tests required by State Highway Department.
 - 3. Job-mix formula.
- C. Certifications:
 - 1. Asphalt prime and tack coat material certificate of conformance to State Highway Department requirements.

2. Asphalt cement certificate of conformance to State Highway Department requirements.
3. Job-mix certification - Submit plant mix certification that mix equals or exceeds the State Highway Specification.

D. One copy of State Highway Department Specifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Aggregate base and asphalt concrete materials shall conform to the requirements of the following and other appropriate sections of the latest version of the State Highway Material Specifications, including amendments, addenda and errata. Where the term "Engineer" or "Commission" is referenced in the State Highway Specifications, it shall mean the VA Resident Engineer or VA Contracting Officer.

2.2 AGGREGATES

- A. Provide aggregates consisting of crushed stone, gravel, sand, or other sound, durable mineral materials processed and blended, and naturally combined.
- B. Subbase aggregate (where required) maximum size: 1-1/2".
- C. Base aggregate maximum size:
1. Base course over 6" thick: 1-1/2";
 2. Other base courses: 3/4".
- D. Asphaltic base course:
1. Maximum particle size not to exceed 1"
 2. Where conflicts arise between this specification and the requirements in the latest version of the State Highway Specifications, the State Specifications shall control.
- E. Aggregates for asphaltic concrete paving: Provide a mixture of sand, mineral aggregate, and liquid asphalt mixed in such proportions that the percentage by weight will be within:

Sieve Sizes	Percentage Passing
3/4"	100
3/8"	67 to 85
1/4"	50 to 65
No. 8 mesh	37 to 50
No. 30 mesh	15 to 25
No. 200 mesh	3 to 8

plus 50/60 penetration liquid asphalt at 5 percent to 6-1/2 percent of the combined dry aggregates.

2.3 ASPHALTS

A. Comply with provisions of Asphalt Institute Specification SS2:

1. Asphalt cement: Penetration grade 50/60
2. Prime coat: Cut-back type, grade MC-250
3. Track coat: Uniformly emulsified, grade SS-1H

2.4 SEALER

- A. Provide a sealer consisting of suitable fibrated chemical type asphalt base binders and fillers having a container consistency suitable for troweling after thorough stirring, and containing no clay or other deleterious substance.
- B. Where conflicts arise between this specification and the requirements in the latest version of the State Highway Specifications, the State Specifications shall control.

PART 3 - EXECUTION

3.1 GENERAL

The Asphalt Concrete Paving equipment, weather limitations, job-mix formula, mixing, construction methods, compaction, finishing, tolerance, and protection shall conform to the requirements of the appropriate sections of the State Highway Specifications for the type of material specified.

3.2 MIXING ASPHALTIC CONCRETE MATERIALS

- A. Provide hot plant-mixed asphaltic concrete paving materials.
1. Temperature leaving the plant: 290 degrees F minimum, 320 degrees F maximum.
 2. Temperature at time of placing: 280 degrees F minimum.

3.3 SUBGRADE

- A. Shape to line and grade and compact with self-propelled rollers.
- B. All depressions that develop under rolling shall be filled with acceptable material and the area re-rolled.
- C. Soft areas shall be removed and filled with acceptable materials and the area re-rolled.
- D. Should the subgrade become rutted or displaced prior to the placing of the subbase, it shall be reworked to bring to line and grade.

3.4 BASE COURSES

- A. Subbase (when required)
1. Spread and compact to the thickness shown on the drawings.

2. Rolling shall begin at the sides and continue toward the center and shall continue until there is no movement ahead of the roller.
3. After completion of the subbase rolling there shall be no hauling over the subbase other than the delivery of material for the top course.

B. Base

1. Spread and compact to the thickness shown on the Drawings.
2. Rolling shall begin at the sides and continue toward the center and shall continue until there is no movement ahead of the roller.
3. After completion of the base rolling there shall be no hauling over the base other than the delivery of material for the top course.

C. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 0.0" to plus 0.5".

D. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 3/16 inch in ten feet.

E. Moisture content: Use only the amount of moisture needed to achieve the specified compaction.

3.5 PLACEMENT OF ASPHALTIC CONCRETE PAVING

A. Remove all loose materials from the compacted base.

B. Apply the specified prime coat, and tack coat where required, and allow to dry in accordance with the manufacturer's recommendations as approved by the engineer.

C. Receipt of asphaltic concrete materials:

1. Do not accept material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 280 degrees F.
2. Do not commence placement of asphaltic concrete materials when the atmospheric temperature is below 50 degrees F, not during fog, rain, or other unsuitable conditions.

D. Spreading:

1. Spread material in a manner which requires the least handling.
2. Where thickness of finished paving will be 3" or less, spread in one layer.

E. Rolling:

1. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the drawings.
2. Roll in at least two directions until no roller marks are visible.
3. Finished paving smoothness tolerance:
 - a. No depressions which will retain standing water.

b. No deviation greater than 1/8" in six feet.

3.6 APPLICATION OF SEAL COAT

A. Prepare the surfaces, mix the seal coat material, and apply in accordance with the manufacturer's recommendations as approved by the Architect.

B. Apply one coat of the specified sealer.

C. Achieve a finished surface seal which, when dry and thoroughly set, is smooth, tough, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities.

3.7 PROTECTION

Protect the asphaltic concrete paved areas from traffic until the sealer is set and cured and does not pick up under foot or wheeled traffic.

3.8 FINAL CLEAN-UP

Remove all debris, rubbish, and excess material from the work area.

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SECTION 02514
SITE WORK CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work shall cover site work concrete constructed upon the prepared subgrade and in conformance with the lines, grades, thickness, and cross sections as shown. Construction shall include the following:
- B. Pedestrian Pavement: Walks

1.2 TOLERANCES

- A. ACI 117
- B. Slab Finishes: ACI 117, F - number method in accordance with ASTM E1155

1.3 SELECT SUBBASE MATERIAL JOB-MIX

The Contractor shall select subbase material mixture and submit a job-mix formula to the Resident Engineer in writing for approval. The formula shall include the source of materials, and gradation.

1.4 SUBMITTALS

- A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS, furnish the following:
- B. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified.
 - 1. Expansion joint filler
 - 2. Reinforcement
 - 3. Curing materials
- C. Data and Test Reports: Select subbase material.
 - 1. Source and gradation.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - M55M/55M-92 Welded Steel Wire Fabric for Concrete Reinforcement (ASTM A185-97)
 - M147-96 ~~Materials for Aggregates~~
Subbase, Base and Surface Courses (R 1996)
 - M148-94 ~~Test Methods for Concrete~~
Concrete (ASTM C309A-99)
 - M171-2000 ~~Standard Specification for~~
97a (1997))

- M182-91 (96R) Burlap Cloth Made from Jute or Kenaf
- M213-99 Preformed Expansion Joint Fillers for Concrete
Paving and Structural Construction (Non-
extruding and Resilient Bituminous Type)
- 305R-91..... Hot Weather Concreting
- 306R-88 Cold Weather Concreting
- 347R-94..... Guide to Formwork for Concrete
- C. American Society for Testing and Materials (ASTM):
- C94/C94M-00 Ready-Mixed Concrete
- C143/C143M-00 Slump of Hydraulic Cement Concrete
- A185-97 Steel Welded Wire, Fabric, Plain for Concrete
Reinforcement
- C31/C31M-98 Making and Curing Concrete Test Specimens in the
Field
- C33-99 Concrete Aggregates
- C39/C39M-99 Compressive Strength of Cylindrical Concrete
Specimens
- C143/C143M-98 Slump of Portland Cement Concrete
- C150-99 Portland Cement
- C171-97 Sheet Material for Curing Concrete
- C172-99 Sampling Freshly Mixed Concrete
- C173-94 (E1-95) .Air Content of Freshly Mixed Concrete by the Volumetric
Method
- C192/C192M-98 Making and Curing Concrete Test Specimens in the
Laboratory
- C231-97..... Air Content of Freshly Mixed Concrete by the
Pressure Method
- C260-98..... Air-Entraining Admixtures for Concrete
- D1751-99. Preformed Expansion Joint Fillers for Concrete Paving and
Structural Construction (Non-extruding and
Resilient Bituminous Types)

PART 2 - PRODUCTS

2.1 FORMS:

Wood, plywood, metal, or other materials, approved by Resident Engineer,
of grade or type suitable to obtain type of finish specified.

2.2 MATERIALS:

- A. Portland Cement: ASTM C150, Type I or II.
- B. Coarse Aggregate: ASTM C33, Size 67.
- C. Fine Aggregate: ASTM C33.
- D. Mixing Water: Fresh, clean, and potable.

- E. Air-Entraining Admixture: ASTM C260.
- F. Welded Wire Fabric: ASTM A185.
- G. Expansion Joint Filler: ASTM D1751.
- H. Sheet Materials for Curing Concrete: ASTM C171.
- I. Liquid Membrane Curing Compound: ASTM C309, Type I.

2.3 MIXES:

- A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.
- B. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.
- C. Compressive strength at 28 days shall be not less than 5000 psi.
- D. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.
- E. Maximum slump for concrete is 75 mm (3 inches) tested in accordance with ASTM C143.
- F. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete: Strength		Non-Air-Entrained		Air-Entrained	
Min. 28 Day Comp. Str.		Min. Cement	Max. Water	Min. Cement	Max. Water
MPa (psi)		kg/m ³ (lbs/c. yd)	Cement Ratio	kg/m ³ (lbs/c. yd)	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)	*

- F. Air-entrainment is required for all exterior concrete. Air content shall conform with the following table:

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

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

2.4 SELECT BASE

- A. Base material shall consist of selected granular material composed of sand, sand-gravel, crushed stone, crushed or granulated slag, with or without soil binder, or combinations of these materials conforming to AASHTO M147, Grading E or F.
- B. Materials meeting other gradations than that noted, will be acceptable whenever the gradations are within a tolerance of three to five percent, plus or minus, of the single gradation established by the job-mix formula.

2.5 FORMS

- A. Use metal or wood forms that are straight and suitable for the work involved in cross-section, depth, and strength to resist springing during depositing and consolidating the concrete.
- B. Do not use forms if they vary from a straight line more than 3 mm (1/8 inch) in any 3000 mm (ten foot) long section in either a horizontal or vertical direction.
- C. Wood forms should be at least 50 mm (2 inches) thick (nominal). Wood forms shall also be free from warp, twist, loose knots, splits, or other defects. Use approved flexible or curved forms for radius forming.

PART 3 - EXECUTION

3.1 SUBGRADE PENETRATION

- A. Maintain the subgrade in a smooth, compacted condition, in conformance with the required section and established grade until the succeeding operation has been accomplished.

3.2 SELECT AGGREGATE BASE

- A. Mixing: Proportion the select subbase by weight or by volume in quantities so that the final approved job-mixed formula will be met after base course has been placed.

- B. Placing: Place the mixed material on the prepared subgrade in a uniform layer to the required contour and grades, and to a loose depth not to exceed 200 mm (4 inches). Remove unsatisfactory areas and replace with satisfactory mixture, or mix the material in the area.
- C. Smoothness Test and Thickness Control: Test the completed base for grade and cross section with a straight edge. The surface of each layer shall not show any deviations in excess of 10 mm (3/8 inch). The completed thickness shall be within 13 mm (1/2 inch) of the thickness as shown.
- D. Protection: Maintain the finished base in a smooth and compacted condition until the concrete has been placed. When Contractor's subsequent operations or adverse weather disturbs the approved compacted base, reconstruct it with new material meeting the requirements herein specified, at no additional cost to the VA.

3.3 SETTING FORMS

- A. Form Setting: Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines. Set forms to true line and grade and use stakes, clamps, spreaders, and braces to hold them rigidly in place so that the forms and joints are free from play or movement in any direction. Forms shall conform to line and grade with an allowable tolerance of 3 mm (1/8 inch) when checked with a straightedge and shall not deviate from true line by more than 6 mm (1/4 inch) at any point. Do not remove forms until removal will not result in damaged concrete or at such time to facilitate finishing. Clean and oil forms each time they are used.

3.4 EQUIPMENT

- A. The Resident Engineer shall approve equipment and tools necessary for handling materials and performing all parts of the work prior to commencement of work.
- B. Maintain equipment and tools in satisfactory working condition at all times.

3.5 PLACING REINFORCEMENT

- A. Reinforcement shall be free from dirt, oil, rust, scale or other substances that prevent the bonding of the concrete to the reinforcement.
- B. Before the concrete is placed, the Resident Engineer shall approve the reinforcement which shall be accurately and securely fastened in place with suitable supports and ties. The type, amount, and position of the reinforcement shall be as shown.

3.6 PLACING CONCRETE - GENERAL

- A. Obtain approval of the Resident Engineer before placing concrete.
- B. Remove debris and other foreign material from between the forms before placing concrete. Obtain approval of the Resident Engineer before placing concrete.
- C. Before the concrete is placed, uniformly moisten the subgrade, base or subbase appropriate , avoiding puddles of water.
- D. Convey concrete from mixer to final place of deposit by a method which will prevent segregation or loss of ingredients. Deposit concrete so that it requires as little handling as possible.
- E. While being placed, spade or vibrate and compact the concrete with suitable tools to prevent the formation of voids or honeycomb pockets. Vibrate concrete well against forms and along joints. Over-vibration or manipulation causing segregation will not be permitted. Place concrete continuously between joints without bulkheads.
- F. Install a construction joint whenever the placing of concrete is suspended for more than 30 minutes and at the end of each day's work.
- G. Workmen or construction equipment coated with foreign material shall not be permitted to walk or operate in the concrete during placement and finishing operations.

3.7 PLACING CONCRETE FOR PEDESTRIAN PAVEMENT

- A. Place concrete in the forms in one layer of such thickness that, when compacted and finished, it will conform to the cross section as shown.
- B. Deposit concrete as near to joints as possible without disturbing them but do not dump onto a joint assembly.
- C. After the concrete has been placed in the forms, use a strike-off guided by the side forms to bring the surface to the proper section to be compacted.
- D. Consolidate the concrete thoroughly by tamping and spading, or with approved mechanical finishing equipment.
- E. Finish the surface to grade with a wood or metal float.

3.8 CONCRETE FINISHING - GENERAL

- A. The sequence of operations, unless otherwise indicated, shall be as follows:
 - 1. Consolidating, floating, straight-edging, troweling, texturing, and edging of joints.
 - 2. Maintain finishing equipment and tools in a clean and approved condition.

3.9 CONCRETE FINISHING PEDESTRIAN PAVEMENT

- A. Walks:

1. Finish the surfaces to grade and cross section with a metal float, trowled smooth and finished with a broom moistened with clear water.
2. Brooming shall be transverse to the line of traffic.
3. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.
4. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface face of the edger. Execute the brooming so that the corrugation, thus produced, will be uniform in appearance and not more than 2 mm (1/16 inch) in depth.
5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the pavement shall not vary more than 5 mm (3/16 inch) when tested with a 3000 mm (10 foot) straightedge.
6. The thickness of the pavement shall not vary more than 6 mm (1/4 inch).
7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

3.10 JOINTS - GENERAL

- A. Place joints, where shown, conforming to the details as shown, and perpendicular to the finished grade of the concrete surface.
- B. Joints shall be straight and continuous from edge to edge of the pavement.

3.11 CONTRACTION JOINTS

- A. Finish edges of all joints with an edging tool having the radius as shown.
- B. Score pedestrian pavement with a standard grooving tool or jointer.

3.12 EXPANSION JOINTS

- A. Use a preformed expansion joint filler material of the thickness as shown to form expansion joints.
- B. Material shall be full depth of concrete, cut and shaped to the cross section as shown, except that top edges of joint filler shall be below the finished concrete surface where shown to allow for sealing.
- C. Anchor with approved devices to prevent displacing during placing and finishing operations.
- D. Round the edges of joints with an edging tool.
- E. Form expansion joints without dowels about structures and features that project through, into, or against any site work concrete construction, using joint filler of the type, thickness, and width as shown, and

installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

3.13 CONSTRUCTION JOINTS

- A. Locate transverse construction joints between slabs of vehicular pavement as shown.
- B. Place transverse construction joints of the type shown, where indicated and whenever the placing of concrete is suspended for more than 30 minutes.
- C. In forming construction joints, carefully form a definite groove at the top, to the depth and width shown, to provide a recess for joint sealing material and to prevent any overhang onto concrete already in place. Install keyed joints and reinforcement as shown.

3.14 FORM REMOVAL

- A. Forms shall remain in place at least 12 hours after the concrete has been placed. Remove forms without injuring the concrete.
- B. Do not use bars or heavy tools against the concrete in removing the forms. Promptly repair any concrete found defective after form removal.

3.15 SEALING JOINTS

- A. At the end of the curing, carefully clean and fill joints with joint sealer as shown.
- B. The concrete at the joint shall be surface dry and the ambient temperature shall be above 10°C (50°F) at the time of application. The joint sealer shall not spill over the joint onto adjacent surface.
- C. Refill joints where necessary before final acceptance. Do not seal joints of pedestrian pavement.

3.16 CURING OF CONCRETE

- A. Cure concrete by one of the following methods appropriate to the weather conditions and local construction practices, against loss of moisture, and rapid temperature changes for at least seven days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. Provide protection as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, remove and replace the damaged pavement and employ another method of curing as directed by the Resident Engineer.

- B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 150 mm (6 inches).
- C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 0.1 mm (4 mils) in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material. Sheets shall overlap each other at least 300 mm (12 inches). Securely anchor sheeting.
- D. Liquid Membrane Curing: Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 5 m²/L (200 square feet per gallon) for both coats. Do not allow the concrete to dry before the application of the membrane. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint. Immediately re-spray any area covered with curing compound and damaged during the curing period.

3.17 CLEANING

After completion of the curing period, remove the curing material (other than liquid membrane), sweep the concrete clean, and, after removal of all foreign matter from the joints, seal joints as herein specified. Clean the entire concrete of all debris and construction equipment as soon as curing and sealing of joints has been completed.

3.18 PROTECTION

The contractor shall protect the concrete against all damage prior to final acceptance by the Government. Remove concrete containing excessive cracking, fractures, spalling, or other defects and reconstruct the entire section between regularly scheduled joints, when directed by the Resident Engineer, and at no additional cost to the Government. Exclude traffic from vehicular pavement until the concrete is at least seven days old, or for a longer period of time if so directed by the Resident Engineer.

3.19 FINAL CLEAN-UP

Remove all debris, rubbish and excess material from the Station.

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**SECTION 02577
PAVEMENT MARKING**

PART 1 - GENERAL

1.1 DESCRIPTION

This work shall consist of furnishing and applying paint on pavement surfaces, in the form of traffic lanes, parking bays, areas restricted to handicapped persons, crosswalks, and other detail pavement markings, in accordance with the details as shown or as prescribed by the Resident Engineer. Conform to the Manual on Uniform Traffic Control Devices for Streets and Highways, published by the U.S. Department of

Transportation, Federal Highway Administration, for details not shown.

1.2 SUBMITTALS

A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS, furnish Manufacturer's Certificates and Data certifying that the following materials conform to the requirements specified.

B. Paint

1.3 APPLICABLE PUBLICATIONS

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

B. Federal Specifications (Fed. Spec.):

TT-B-1325CBeads (Glass Spheres); Retro-Reflective

TT-P-1952D Paint, Traffic Black, and Airfield Marking,
Waterborne

C. Master Painters Institute (MPI):

No. 97-2002Latex Traffic Marking Paint

PART 2 - PRODUCTS

2.1 PAINT

Paint for marking pavement (parking lot and zone marking) shall conform to MPI No. 97, color as shown. Paint for obliterating existing markings shall conform to Fed. Spec. TT-P-1952D. Paint shall be in containers of at least 18 L (5 gallons). A certificate shall accompany each batch of paint stating compliance with the applicable publication.

2.2 REFLECTIVE GLASS BEADS

Beads shall conform to Fed. Spec. TT-B-1325C, Type I, Gradation A. When used in regions of high humidity, coat beads with silicone or other

suitable waterproofing material to assure free flow. Furnish the glass beads in containers suitable for handling and strong enough to prevent loss during shipment. A certificate shall accompany each batch of beads stating compliance with this section.

2.3 PAINT APPLICATOR

Apply all marking by approved mechanical equipment. The equipment shall provide constant agitation of paint and travel at controlled speeds. Synchronize one or more paint "guns" to automatically begin and cut off paint flow in the case of skip lines. The equipment shall have manual control to apply continuous lines of varying length and marking widths as shown. Provide pneumatic spray guns for hand application of paint in areas where a mobile paint applicator cannot be used. If the equipment does not have a glass bead dispenser, use a separate piece of equipment.

Adjust and synchronize the equipment with the paint applicator so that the reflective beads are distributed uniformly on the paint lines within ten seconds without any waste. An experienced technician that is thoroughly familiar with equipment, materials, and marking layouts shall control all painting equipment and operations.

2.4 SANDBLASTING EQUIPMENT

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall furnish not less than 0.08 m³/s (150 cfm) of air at a pressure of not less than 625 kPa (90 psi) at each nozzle used.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Thoroughly clean all surfaces to be marked before application of paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement with scrapers, wire brushings, sandblasting, mechanical abrasion, or approved chemicals as directed by the Resident Engineer. The application of paint conforming to Fed. Spec. TT-P-1952 is an option to removal of existing paint markings on asphalt pavement. Apply the black paint in as many coats as necessary to completely obliterate the existing markings. Where oil or grease are present on old pavements to be marked, scrub affected areas with several applications of trisodium phosphate solution or other

approved detergent or degreaser, and rinse thoroughly after each application. After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint. Pavement marking shall follow as closely as practicable after the surface has been cleaned and dried, but do not begin any marking until the Resident Engineer has inspected the surface and gives permission to proceed. The Contractor shall establish control points for marking and provide templates to control paint application by type and color at necessary intervals. The Contractor is responsible to preserve and apply marking in conformance with the established control points.

3.2 APPLICATION

Apply uniformly painted and reflective pavement marking of required color(s), length, and width with true, sharp edges and ends on properly cured, prepared, and dried surfaces in conformance with the details as shown and established control points. The length and width of lines shall conform within a tolerance of plus or minus 75 mm (3 inches) and plus or minus 3 mm (1/8 inch), respectively, in the case of skip markings. The length of intervals shall not exceed the line length tolerance. Temperature of the surface to be painted and the atmosphere shall be above 10°C (50°F) and less than 35°C (95°F). Apply the paint at a wet film thickness of 0.4 mm (0.015 inch). Disperse reflective glass beads evenly on the wet paint at a rate of 720 g/L (6 pounds per gallon) of paint. Apply paint in one coat. At the direction of the Resident Engineer, markings showing light spots may receive additional coats. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of asphalt, and pick-up, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the marking, discontinue paint operations until cause of the slow drying is determined and corrected. Remove and replace marking that is applied at less than minimum material rates; deviates from true alignment; exceeds stipulated length and width tolerances; or shows light spots, faulty distribution of beads, smears, or other deficiencies or irregularities. Use carefully controlled sand blasting, approved grinding equipment, or other approved method to remove marking so that the surface to which the marking was applied will not be damaged.

3.3 PROTECTION

Conduct operations in such a manner that necessary traffic can move without hindrance. Protect the newly painted markings so that, insofar as possible, the tires of passing vehicles will not pick up paint. Place

warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic. Efface and replace damaged portions of markings at no additional cost to the Government.

3.4 DETAIL PAVEMENT MARKING

Use Detail Pavement Markings, exclusive of actual traffic lane marking, at exit and entrance islands and turnouts, on curbs, at crosswalks, at parking bays, and at such other locations as shown. Show the International Handicapped Symbol at indicated parking spaces. Color shall be as shown. Apply paint for the symbol using a suitable template that will provide a pavement marking with true, sharp edges and ends. Place detail pavement markings of the color(s), width(s) and length(s), and design pattern at the locations shown.

3.5 TEMPORARY PAVEMENT MARKING

When shown or directed by the Resident Engineer, apply Temporary Pavement Markings of the color(s), width(s) and length(s) shown or directed. After the temporary marking has served its purpose and when so ordered by the Resident Engineer, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that the surface to which the marking was applied will not be damaged. As an option, an approved preformed pressure sensitive, reflective, adhesive tape type of temporary pavement marking of the required color(s), width(s) and length(s) may be furnished and used in lieu of temporary painted and reflective marking. The Contractor shall be fully responsible for the continued durability and effectiveness of such marking during the period for which its use is required. Remove any unsatisfactory tape type marking and replace with painted and reflective markings at no additional cost to the Government.

3.6 FINAL CLEAN-UP

Remove all debris, rubbish and excess material from the Station.

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SECTION 03300
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 01410, TESTING LABORATORY SERVICES.
- B. Concrete roads, walks, and similar exterior site work: Section 02514, SITE WORK CONCRETE.

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN:

- A. Testing agency retained and reimbursed by the Contractor and approved by Resident Engineer.
- B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology. Accompany request for approval of testing agency with a copy of Report of Latest Inspection of Laboratory Facilities by CCRL.
- C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.4 TOLERANCES:

- A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 mm (+0 inch) and -20 mm (-3/4 inch).
- B. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 10, 13, and 16 (Nos. 3, 4, and 5) (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 mm (+0 inch) and -13 mm (-1/2 inch) where gross bar length is less than 3600 mm (12 feet), or +0 mm (+0 inch) and -20 mm (-3/4 inch) where gross bar length is 3600 mm (12 feet) or more.
- C. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +20 mm (+3/4 inch) and - 6 mm (-1/4 inch). Tolerance of thickness of beams more than 300 mm (12 inch) but less than 900 mm (3 feet) is +20 mm (+3/4 inch) and -10 mm (-3/8 inch).
- D. Slab Finishes: ACI 117, Section 4.5.6, F-number method in accordance with ASTM E1155, except as follows:
 - 1. Test entire slab surface, including those areas within 600 mm (2 feet) of construction joints and vertical elements that project through slab surface.

2. Maximum elevation change which may occur within 600 mm (2 feet) of any column or wall element is 6 mm (0.25 inches).
3. Allow sample measurement lines that are perpendicular to construction joints to extend past joint into previous placement no further than 1500 mm (5 feet).

1.5 REGULATORY REQUIREMENTS:

- A. ACI 315 - Details and Detailing of Concrete Reinforcement.
- 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 01340, SAMPLES AND SHOP DRAWINGS.
- B. Samples:

Portland cement, 3.5 kg (eight pounds).

- C. Shop Drawings:

Reinforcing steel: Complete shop drawings

- D. Mill Test Reports:

Reinforcing steel.

Cement.

- E. Manufacturer's Certificates:

Abrasive aggregate.

Lightweight aggregate for structural concrete.

Air-entraining admixture.

Chemical admixtures, including chloride ion content.

Waterproof paper for curing concrete.

Liquid membrane-forming compounds for curing concrete.

Non-shrinking grout.

Liquid hardener.

Waterstops.

Expansion joint filler.

Adhesive binder.

- F. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology and copy of report of latest CCRL, Inspection of Laboratory.
- G. Test Report for Concrete Mix Designs: Trial mixes including water-cement ratio curves, concrete mix ingredients, and admixtures.
- H. Shoring and Reshoring Sequence: Submit for approval a shoring and reshoring sequence for flat slab/flat plate portions, prepared by a registered Professional Engineer. As a minimum, include timing of form

stripping, reshoring, number of floors to be reshored and timing of reshore removal to serve as an initial outline of procedures subject to modification as construction progresses. Submit revisions to sequence, whether initiated by Resident Engineer (see FORMWORK) or Contractor.

1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.
- B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement 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
 - 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.

1.9 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. Federal Specifications (Fed. Spec.):
MM-L-751HLumber Softwood
- C. American Concrete Institute (ACI):
117-90 Standard Specifications for Tolerances for
Concrete Construction and Materials
117R-90 Commentary on Standard Specifications for
Tolerances for Concrete Construction and
Materials
211.1-91 Standard Practice for Selecting Proportions for
Normal, Heavyweight, and Mass Concrete 211.2-
98 Standard Practice for Selecting Proportions for
Structural Lightweight Concrete 214-77
..... Recommended Practice for Evaluation of Strength
Test Results of Concrete
301-96 Standard Specifications for Structural Concrete
304R-89 Guide for Measuring, Mixing, Transporting, and
Placing Concrete
305R-91 Hot Weather Concreting
306R-88 Cold Weather Concreting
308-92 Standard Practice for Curing Concrete
309R-96 Guide for Consolidation of Concrete
315-92 Details and Detailing of Concrete Reinforcement
318/318R-99 Building Code Requirements for Reinforced
Concrete and Commentary 347R-
94..... Guide to Formwork for Concrete
- D. American National Standards Institute and American Hardboard Association
(ANSI/AHA):
A135.4-95Basic Hardboard
- E. American Society for Testing and Materials (ASTM): A82-97
.....Standard Specification for Steel Wire, Plain,
for Concrete Reinforcement A185-97 Standard
Specification for Steel Welded Wire
Fabric, Plain, for Concrete Reinforcement
A615/A615M-00..... Standard Specification for Deformed and Plain

Billet-Steel Bars for Concrete Reinforcement

A653/A653M-99..... Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

A706/A706M-98 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

A767/A767M-97 Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

A775/A775M-97 Standard Specification for Epoxy-Coated Reinforcing Steel Bars

A820-96 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete

A996/A996M-00 Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

C31/C31M-98 ~~Standard Specification for~~
Test Specimens in the field

C33-99 Standard Specification for Concrete Aggregates

C39/C39M-99 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C94/C94M-00 Standard Specification for Ready-Mixed Concrete

C143/C143M-98 Standard Test Method for Slump of Hydraulic Cement Concrete

C150-99 Standard Specification for Portland Cement

C171-97 Standard Specification for Sheet Materials for Curing Concrete

C172-99 Standard Specification for Sampling Freshly Mixed Concrete

C173-94 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C192/C192M-98 ~~Standard Specification for~~
Test Specimens in the Laboratory

C231-97 ~~Standard Specification for~~
Mixed Concrete by the Pressure Method

C260-00 Standard Specification for Air-Entraining Admixtures for Concrete

C309-98 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

C330-99 ~~Standard Specification for~~
Aggregates for Structural Concrete

C494/C494M-99Standard Specification for Chemical Admixtures
for Concrete

C496-96.....Standard Test Method for Splitting Tensile
Strength of Cylindrical Concrete Specimens

C567-99 ~~Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens~~
Lightweight Concrete

C618-99 Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use as a
Mineral Admixture in Concrete

C666-97 ~~Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens~~
to Rapid Freezing and Thawing

C881-99 ~~Standard Specification for Polyethylene
Bonding Systems for Concrete~~
Bonding Systems for Concrete

C1107-99 ~~Standard Specification for Polyethylene
Bonding Systems for Concrete~~
Hydraulic-Cement Grout (Non-shrink)

D6-95 ~~Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens~~
and Asphaltic Compounds

D297-93 Standard Test Methods for Rubber Products-
Chemical Analysis

D1751-99 Standard Specification for Preformed Expansion
Joint Filler for Concrete Paving and Structural
Construction (Non-extruding and Resilient
Bituminous Types)

D4397-96 Standard Specification for Polyethylene Sheeting
for Construction, Industrial and Agricultural
Applications

E1155-96.....Standard Test Method for Determining FF

F. American Welding Society (AWS):

D1.4-98Structural Welding Code - Reinforcing Steel

G. Concrete Reinforcing Steel Institute (CRSI):

DA4-90..... Manual of Standard Practice

H. National Cooperative Highway Research Program (NCHRP):

Report No. 244-81Concrete Sealers for the Protection of Bridge
Structures

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

PS 1-83Construction and Industrial Plywood

J. U. S. Army Corps of Engineers Handbook for Concrete and Cement:

CRD C513-74Rubber Waterstops

CRD C572-74.....Polyvinyl chloride Waterstops

PART 2 - PRODUCTS:

2.1 FORMS:

- A. Wood: Fed Spec MM-L-751H, 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, Type 2, Grade 2-M-2, exterior bond not less than 5 mm (3/16 inch) thick.
 - 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. Form Ties: Develop a minimum working strength of 13.35 kN (3000 pounds) when fully assembled. Ties shall be adjustable in length to permit tightening of forms and not have any lugs, cones, washers to act as spreader within form, nor leave a hole larger than 20 mm (3/4 inch) diameter, or a depression in exposed concrete surface, or leave metal closer than 40 mm (1 1/2 inches) to concrete surface. Wire ties not permitted. Cutting ties back from concrete face not permitted.

2.2 MATERIALS:

- A. Portland Cement: ASTM C150 Type I or II.
- B. Coarse Aggregate: ASTM C33.
 - 1. Size 67. 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.

- C. Lightweight Aggregates for Structural Concrete: ASTM C330, Table 1. Maximum size of aggregate not larger than one-fifth of narrowest dimension between forms, nor three-fourth of minimum clear distance between reinforcing bars. Contractor to furnish certified report to verify that aggregate is sound and durable, and has a durability factor of not less than 80 based on 300 cycles of freezing and thawing when tested in accordance with ASTM C666.
- D. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 μ m (No. 100) sieve.
- E. Mixing Water: Fresh, clean, and potable.
- F. Admixtures:
 - 1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
 - 2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
 - 3. High-Range Water-Reducing Admixture (Superplasticizer) : ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - 4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
 - 5. Air Entraining Admixture: ASTM C260.
 - 6. Calcium Nitrite corrosion inhibitor: ASTM C494 Type C.
 - 7. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
 - 8. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.
- G. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).
- H. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.
- I. Welded Wire Fabric: ASTM A185.
- J. Reinforcing Bars to be Welded: ASTM A706.
- K. Galvanized Reinforcing Bars: ASTM A767.
- L. Epoxy Coated Reinforcing Bars: ASTM A775.

- M. Cold Drawn Steel Wire: ASTM A82
- N. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at .8Kg/m² (1.5 pounds per square yard), or square mesh at .6Kg/m² (1.17 pounds per square yard).
- O. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
- P. Expansion Joint Filler: ASTM D1751.
- Q. Sheet Materials for Curing Concrete: ASTM C171.
- R. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
- S. Abrasive Aggregate: Aluminum oxide grains or emery grits.
- T. Liquid Densifier/Sealer: 100% active colorless aqueous silicate solution.
- U. Non-Shrink Grout:
 - 1. ASTM C1107, pre-mixed, produce a compressive strength of at least 35 MPa (5000 psi) at three 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.
- V. Adhesive Binder: ASTM C881.
 - 1. Polyvinyl Chloride Waterstop: CRD C572.
 - 2. Rubber Waterstops: CRD C513.
 - 3. Bentonite Water Stop: Flexible strip of bentonite 25 mm x 20 mm (1 inch by 3/4 inch), weighing 8.7 kg/m (5.85 lbs. per foot) composed of Butyl Rubber Hydrocarbon (ASTM D297), Bentonite (SS-S-210-A) and Volatile Matter (ASTM D6).
 - 4. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).
 - 5. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m³ (1.5 lb. per cubic yard). Product shall have a UL rating.

6. Steel Fibers: ASTM A820, Type I cold drawn, high tensile steel wire for use as primary reinforcing in slab-on-grade. Minimum dosage rate 18 kg/m³ (30 lb. per cubic yard).
7. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.
8. Bonding Admixture: Non-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, admixtures, weight of fine and coarse aggregate per m³ (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement ratio, and consistency of each cylinder in terms of slump.
 3. Prepare a curve showing relationship between water-cement 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. 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, 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 approval of design mix.
- C. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength		Non-Air- Entrained	Air-Entrained	
Min. 28 Day Comp. Str.	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio
MPa (psi)				
35 (5000) ^{1,3}	375	0.45	385	0.40
30 (4000) ^{1,3}	(630)	0.55	(650)	0.50
25 (3000) ^{1,3}	325	0.65	340	0.55
25 (3000) ^{1,2}	(550)	*	(550)	*

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of $f'c$. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of $f'c$.
2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.

* Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.

D. 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)

* 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.

E. Air-Entrainment: Air-entrainment of normal weight concrete shall conform with Table III. Air-entrainment of lightweight structural concrete shall conform with Table IV. Determine air content by either ASTM C173 or ASTM C231.

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

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

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

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

- F. 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.
- G. Lightweight structural concrete shall not weigh more than air-dry unit weight shown. Air-dry unit weight determined on 150 mm by 300 mm (6 inch by 12 inch) test cylinders after seven days standard moist curing followed by 21 days drying at 23 degrees C (73.4 degrees Fahrenheit), and 50 (plus or minus 7) percent relative humidity. Use wet unit weight of fresh concrete as basis of control in field.
- H. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).
- I. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. Air content as shown in Table III or Table IV.
- J. Enforcing Strength Requirements: Test as specified in Section, 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°C (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: Design in accordance with ACI 347 is the responsibility of the Contractor. The Contractor shall retain a registered Professional Engineer to design the formwork, shores, and reshores.
 - 1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and 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.

- F. Architectural Liner: Attach liner as recommended by the manufacturer with tight joints to prevent leakage.
- 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 and ACI 315, unless otherwise shown.
- B. Placing: Place reinforcement conforming to CRSI DA4, unless otherwise shown.
 1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. // Use epoxy-coated tie wire with epoxy-coated reinforcing. // Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 315. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of brick or stone supports will not be permitted.
 2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.
 3. Splice column steel at no points other than at footings and floor levels unless otherwise shown.

- C. Spacing: Minimum clear distances between parallel bars, except in columns and multiple layers of bars in beams shall be equal to nominal diameter of bars. Minimum clear spacing is 25 mm (1 inch) or 1-1/3 times maximum size of coarse aggregate.
- D. Splicing: Splices of reinforcement made only as required or shown or specified. Accomplish splicing as follows:
1. Lap splices: Do not use lap splices for bars larger than Number 36 (Number 11) . Minimum lengths of lap as shown.
 2. Welded splices: Splicing by butt-welding of reinforcement permitted providing the weld develops in tension at least 125 percent of the yield strength (fy) for the bars. Welding conform to the requirements of AWS D1.4. Welded reinforcing steel conform to the chemical analysis requirements of AWS D1.4.
 - a. Submit test reports indicating the chemical analysis to establish weldability of reinforcing steel.
 - b. Submit a field quality control procedure to insure proper inspection, materials and welding procedure for welded splices.
 - c. Department of Veterans Affairs retained testing agency shall test a minimum of three splices, for compliance, locations selected by Resident Engineer.
 3. Mechanical Splices: Develop in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.
 - a. Initial qualification: In the presence of Resident Engineer, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing laboratory will perform load test.
 - b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.
- E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by Resident Engineer.

- F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.
- G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

3.3 VAPOR BARRIER:

- A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier.
 - 1. Place 100 mm (4 inches) of fine granular fill 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 CONSTRUCTION JOINTS:

- A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 24,000 mm (80 feet) in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by Resident Engineer.
- B. Locate construction joints in suspended floors near the quarter-point of spans for slabs, beams or girders, unless a beam intersects a girder at center, in which case joint in girder shall be offset a distance equal to twice width of beam. Provide keys and inclined dowels as shown. Provide longitudinal keys as shown.
- C. Place concrete for columns slowly and in one operation between joints. Install joints in concrete columns at underside of deepest beam or girder framing into column.
- D. Allow 2 hours to elapse after column is cast before concrete of supported beam, girder or slab is placed. Place girders, beams, grade beams, column capitals, brackets, and haunches at the same time as slab unless otherwise shown.

3.5 EXPANSION JOINTS:

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

3.6 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 subject to approval of Resident Engineer.
- D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.
1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
 2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.
 3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.

4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after it's initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
6. On bottom of members with severe congestion of reinforcement, deposit 25 mm (1 inch) layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer) . Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.
7. Concrete on metal deck:
 - a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.
 - 1) The Contractor shall become familiar with deflection characteristics of structural frame to include proper amount of additional concrete due to beam/deck deflection.

- E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch) intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.
1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
 2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.7 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.

3.8 COLD WEATHER:

Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Resident Engineer.

3.9 PROTECTION AND CURING:

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

1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer's instructions. Apply immediately after finishing. Maximum coverage $10\text{m}^2/\text{L}$ (400 square feet per gallon) on steel troweled surfaces and $7.5\text{m}^2/\text{L}$ (300 square feet per gallon) on floated or broomed surfaces for the curing/sealing compound.
2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with tape.
3. Paper: Utilize widest practical width paper and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

3.10 REMOVAL OF FORMS:

- A. Remove in a manner to assure complete safety of structure after the following conditions have been met.
1. Where structure as a whole is supported on shores, forms for beams and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened

sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.

2. Take particular care in removing forms of architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.
- B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Supporting forms or shoring not removed until strength of control test cylinders have attained at least 70 percent of minimum 28-day compressive strength specified. // For post-tensioned systems supporting forms and shoring not removed until stressing is completed. // Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.
- C. Reshoring: Reshoring is required if superimposed load plus dead load of the floor exceeds the capacity of the floor at the time of loading. // In addition, for flat slab/plate, reshoring is required immediately after stripping operations are complete and not later than the end of the same day. // Reshoring accomplished in accordance with ACI 347 at no additional cost to the Government.

3.11 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.

3.12 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.

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. Adjust as necessary where monitoring of previous placements indicates unshored structural steel deflections to other than a level profile.
3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.
4. Use straightedges specifically made for screeding, such as hollow magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.
5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.

6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. 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:

Slab on Grade:

Specified overall value	F _F 25/F _L 20
Minimum local value	F _F 17/F _L 15

Level suspended slabs (shored until after testing) and topping slabs:

Specified overall value FF 25/FL 20
Minimum local value FF 17/FL 15

Unshored suspended slabs:

Specified overall value FF 25
Minimum local value FF 17

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:

Slab on grade:

Specified overall value FF 36/FL 20
Minimum local value FF 24/FL 15

Level suspended slabs (shored until after testing) and topping
slabs

Specified overall value FF 30/FL 20
Minimum local value FF 24/FL 15

Unshored suspended slabs:

Specified overall value FF 30
Minimum local value FF 24

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 F_F , F_L , and other finish requirements.

Measurements will occur within 72 hours after completion of
concrete placement (weekends and holidays excluded). Make
measurements before shores or forms are removed to insure the "as-

built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.

- b. Contractor not experienced in using F_F and F_L criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.

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.

3.13 SURFACE TREATMENTS:

- A. Use on exposed concrete floors and concrete floors to receive carpeting.
- B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.
- 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.

3.14 APPLIED TOPPING:

- A. Separate concrete topping on floor base slab of thickness and strength shown. Topping mix shall have a maximum slump of 200 mm (8 inches) for concrete containing a high-range water-reducing admixture (superplasticizer) and 100 mm (4 inches) for conventional mix. Neatly bevel or slope at door openings and at slabs adjoining spaces not receiving an applied finish.
- B. Placing: Place continuously until entire section is complete, struck off with straightedge, leveled with a highway straightedge or highway bull float, floated and troweled by machine to a hard dense finish. Slope to floor drains as required. Do not start floating until free water has disappeared and no water sheen is visible. Allow drying of surface moisture naturally. Do not hasten by "dusting" with cement or sand.

3.15 PRECAST CONCRETE ITEMS:

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

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SECTION 04200
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for construction of masonry unit walls.

1.2 RELATED WORK

- A. Sealants and sealant installation: Section 07920, SEALANTS AND CAULKING.
- B. Color and texture of masonry units: Section 09050, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULE.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Samples:
 - 1. Concrete masonry units, when exposed in finish work.
 - 3. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.
- C. Certificates:
 - 1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
 - 2. Indicating that the following items meet specification requirements:
 - a. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
 - 3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A82-97A..... Steel Wire, Plain, for Concrete Reinforcement
 - C55-00 Concrete Building Brick
 - C90-00 Load-Bearing Concrete Masonry Units
- C. Masonry Industry Council:
 - Hot and Cold Weather Masonry Construction Manual, 1999.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.

1. Unit Weight: Normal weight.
2. Fire rated units for fire rated partitions.
3. Sizes: Modular
4. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
5. Use concrete masonry units exposed in finished work with 25 mm (one inch) minimum radius rounded vertical exterior corners.

B. Concrete Brick: ASTM C55, Grade N.

2.2 ANCHORS, TIES, AND REINFORCEMENT

A. Joint Reinforcement:

1. Form from wire complying with ASTM A82.
2. Galvanized after fabrication.
3. Width of joint reinforcement 40 mm (1-5/8 inches) less than nominal width of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcement at least 3000 mm (10 feet) in length.
6. Joint reinforcement in rolls is not acceptable.
7. Joint reinforcement that is crimped to form drip is not acceptable.
8. Maximum spacing of cross wires 400 mm (16 inches) to longitudinal wires.
9. Ladder Design:
 - a. Longitudinal wires deformed 4 mm (0.1620 inch) diameter wire.
 - b. Cross wires 2.6 mm (0.1055 inch) 4 mm (0.1483 inch) diameter.
10. Trussed Design:
 - a. Longitudinal and cross wires not less than 4 mm (0.1483 inch nominal) diameter.
 - b. Longitudinal wires deformed.

PART 3 - EXECUTION

3.1 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:
- B. Maximum variation from plumb:
 1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
 2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
 3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- C. Maximum variation from level:
 1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).

2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).

D. Maximum variation from linear building lines:

1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).

2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:

1. Minus 6 mm (1/4 inch).

2. Plus 13 mm (1/2 inch).

F. Maximum variation in prepared opening dimensions:

1. Accurate to minus 0 mm (0 inch).

2. Plus 6 mm (1/4 inch).

3.2 INSTALLATION GENERAL

A. Keep finish work free from mortar smears or spatters, and leave neat and clean.

B. 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 brick work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.

4. Tool Exposed interior joints in finish work concave unless specified otherwise.

3.3 REINFORCEMENT

A. Joint Reinforcement:

1. Use as joint reinforcement in single wythe concrete masonry unit walls or partitions.

3.4 CONCRETE MASONRY UNITS

A. Kind and Users:

1. Use Fire-Resistant Rated Units in fire rated partitions of type and construction that will provide fire rating shown.

B. Laying:

1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length, except where stack bond is required.

2. Do not wet concrete masonry units before laying.

3. Key into existing masonry wall in sawtooth manner.

4. Lay first course in a full mortar bed.

5. Set anchorage items as work progress.

6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
7. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
8. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings not less than 50 mm (2 inches) by 75 mm (3 inches).

3.5 CLEANING AND REPAIR

A. General:

1. Clean exposed masonry surfaces on completion.
2. Protect adjoining construction materials 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. Concrete Masonry Units:

1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
2. Allow mud to dry before brushing.

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**SECTION 05120
STRUCTURAL STEEL**

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01410, TESTING LABORATORY SERVICES.
- B. Painting: Section 09900, PAINTING.
- C. Steel Joist: Section 05210, STEEL JOIST.
- D. Steel Decking: Section 05311, STEEL DECKING.
- E. Fireproofing: Section 07253, SPRAYED-ON FIREPROOFING.

1.3 QUALITY ASSURANCE:

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

1.4 TOLERANCES:

Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by Section 7, Code of Standard Practice for Buildings and Bridges, and by Standard Mill Practice - General Information (AISC ASD Manual, Ninth Edition, Page 1-145, except as follows:

- A. Elevation tolerance for column splice points at time member is erected is 10 mm (3/8 inch).
- B. Elevation tolerance for top surface of steel beams and girders at connections to columns at time floor is erected is 13 mm (1/2 inch).
- C. Elevation tolerance for closure plates at the building perimeter and at slab openings prior to concrete placement is 6 mm (1/4 inch).

1.5 DESIGN:

- A. Connections: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent

with the details shown on the Drawings, supplementing where necessary. The details shown on the Drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the Resident Engineer of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the Resident Engineer. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

1.6 REGULATORY REQUIREMENTS:

- A. AISC: Specification for Structural Steel Buildings - Allowable Stress Design.
- B. AISC: Code of Standard Practice for Steel Buildings and Bridges.

1.7 SUBMITTALS:

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop and Erection Drawings: Complete
- C. Certificates:
 - 1. Structural steel.
 - 2. Steel for all connections.
 - 3. Welding materials.
 - 4. Shop coat primer paint.
- D. Test Reports:
 - 1. Welders' qualifying tests.
- E. Design Calculations and Drawings:
 - 1. Connection calculations, if required.
- F. Record Surveys.

1.8 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 (Ninth Edition, 1989)
 - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Second Edition, 1995)
 - 3. Code of Standard Practice for Steel Buildings and Bridges (March 2000).
- C. American National Standards Institute (ANSI):

B18.22.1-98..... Plain Washers

B18.22M-00.....Metric Plain Washers

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

A6/A6M-02 Standard Specification for General Requirements
for Rolled Structural Steel Bars, Plates,
Shapes, and Sheet Piling

A36/A36M-01 ~~Subpart 601.1~~
Steel

A53/A53M-01..... Standard Specification for Pipe, Steel, Black
and Hot-Dipped, Zinc-Coated Welded and Seamless

A123/A123M-02 ~~Subpart 601.1~~
Galvanized) Coatings on Iron and Steel Products

A242/A242M-01 Standard Specification for High-Strength Low-
Alloy Structural Steel

A283/A283M-00 ~~Subpart 601.1~~
Tensile Strength Carbon Steel Plates

A307-00 ~~Subpart 601.1~~
and Studs, 60,000 psi Tensile Strength

A325-02 Standard Specification for Structural Bolts,
Steel, Heat Treated, 120/105 ksi Minimum Tensile
Strength

A490-02..... Standard Specification for Heat-Treated Steel
Structural Bolts 150 ksi Minimum Tensile
Strength

A500-01..... Standard Specification for Cold Formed Welded
and Seamless Carbon Steel Structural Tubing in
Rounds and Shapes

A501-01 ~~Subpart 601.1~~
Seamless Carbon Steel Structural Tubing

A572/A572M-01 ~~Subpart 601.1~~
Low-Alloy Columbium-Vanadium Structural Steel

A992/A992M-02 ~~Subpart 601.1~~
Shapes

E. American Welding Society (AWS):

D1.1-02Structural Welding Code-Steel

F. Research Council on Structural Connections (RCSC) of The Engineering
Foundation:

Specification for Structural Joints Using ASTM A325 or A490 Bolts

G. Military Specifications (Mil. Spec.):

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

H. Occupational Safety and Health Administration (OSHA):

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

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Structural Steel: ASTM A36.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Structural Tubing: ASTM A501.
- D. Steel Pipe: ASTM A53, Grade B.
- E. Bolts, Nuts and Washers:
 - 1. High-strength bolts, including nuts and washers: ASTM A325.
 - 2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
 - 3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.
- F. Zinc Coating: ASTM A123.
- G. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.

PART 3 - EXECUTION

3.1 CONNECTIONS (SHOP AND FIELD):

- A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
- B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than proof load given in Specification for Structural Joints Using ASTM A325 or A490 Bolts. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators or the turn-of-the-nut method. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

3.2 FABRICATION:

Fabrication in accordance with Chapter M, Specification for Steel Buildings - Allowable Stress Design and Plastic Design.

3.3 SHOP PAINTING:

- A. General: Shop paint steel with primer in accordance with Section 6, Code of Standard Practice for Steel Buildings and Bridges.
- B. Shop paint for steel surfaces is specified in Section 09900, PAINTING.
- C. Do not apply paint to following:
 - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.

2. Surfaces which will be encased in concrete.
 3. Surfaces which will receive sprayed on fireproofing.
 4. Top flange of members which will have shear connector studs applied.
- D. Structural steel in the interstitial space that does not receive sprayed on fireproofing shall be painted with primer in accordance with general requirement of shop painting.
- E. Zinc Coated (Hot Dip Galvanized) per ASTM A123 (after fabrication):
Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.

3.4 ERECTION:

- A. General: Erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges.
- B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges.

3.5 FIELD PAINTING:

- A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.
- B. Finish painting of steel surfaces is specified in Section 09900, PAINTING.

3.6 SURVEY:

Upon completion of finish bolting or welding on any part of the work, and prior to start of work by other trades that may be supported, attached, or applied to the structural steel work, submit a certified report of survey to Resident Engineer for approval. Reports shall be prepared by Registered Land Surveyor or Registered Civil Engineer as specified in Section, 01010, GENERAL REQUIREMENTS. Report shall specify that location of structural steel is acceptable for plumbness, level and alignment within specified tolerances specified in the AISC Manual.

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**SECTION 05210
STEEL JOISTS**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies open web, longspan, steel joists.

1.2 RELATED WORK:

- A. Structural Steel: Section 05120, STRUCTURAL STEEL.
- B. Finish Painting: Section 09900, PAINTING.

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 Institution: Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, (40th Edition, 1994).

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop and Erection Drawings: Complete.
 - 1. Fabrication drawings including details and schedules for the fabrication and assembly of each joist.
 - 2. Erection drawings showing the size and location of each joist, bridging, cross bracing, bearing details, connections, welds, bolts and bearing plates.
- C. Certificates: Steel Joist Institution compliance.
- D. Design Calculations: If requested by the Resident Engineer, submit complete calculations covering the design of all members and connections. Calculations must be specifically applicable to the joists supplied.

1.6 QUALITY ASSURANCE:

- A. 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 (ninth Edition, 1989)
 - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (second Edition, 1994)

- C. American Society for Testing and Materials (ASTM): A307-97 Carbon Steel Bolts and Studs, 400 MPa (60,000 psi) Tensile Strength A325-97.....Structural Bolts, Steel, Heat Treated, 800/700 MPa (120/105 ksi) Minimum Tensile Strength A490-97 Heat-Treated Steel Structural Bolts, 1000 MPa (150 ksi) Minimum Tensile Strengths
- D. American Welding Society (AWS):
D1.1-00Structural 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 (40th Edition, 1994)
- G. U.S. Army Corps of Engineers:
CRD-C-621-88 Specification for Non-Shrink Grout
- SPEC WRITER NOTE: Update material requirements to agree with applicable requirements (types, grades, classes, and other related items) specified in the referenced Applicable Publications.

PART 2 - PRODUCTS

2.1 OPEN WEB STEEL JOISTS:

K-Series conforming to Steel Joist Institute Standard Specifications or as indicated on the Drawings..

2.2 ACCESSORIES - FITTINGS:

- A. Accessories and fittings, including end supports and bridging, in accordance with Standard Steel Joist Institute Specification under which joists were designed.
- B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.
- C. High-strength bolts, including nuts and washers: ASTM A325 or A490 heavy hexagon structural bolts.

SPEC WRITER NOTE: Select bedding mortar type to suit project standards, or retain all as contractor's option.

2.3 BEDDING MORTAR:

- A. For joist ends bearing on concrete or masonry, provide bedding mortar as follows:
 - 1. Portland cement and sand, mixed at a ratio of 1 part cement to 3 parts sand, by volume, with enough water for placement and hydration.

2. Non-metallic, shrinkage-resistant mortar; premixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C-621.

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. 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.
 6. 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.
 7. Header Units: Provide header units to support all joists at openings in floor or roof system not framed with steel shapes.
 8. 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: 1. 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 09900, PAINTING.

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SECTION 05311
STEEL DECKING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies material and services required for installation of steel decking as shown and specified.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01410, TESTING LABORATORY SERVICES.
- B. Finish Painting: Section 09900, PAINTING.

1.3 DESIGN REQUIREMENTS:

Design steel decking in accordance with AISI publication, "Specification for the Design of Cold-formed Steel Structural Members" except as otherwise shown or specified.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and similar information necessary for completing installation as shown and specified, including supplementary framing, sump pans, ridge and valley plates, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics.
- D. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit."
- E. 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:

- B. 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.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM): A36/A36M-00
..... Standard Specification for Carbon Structural Steel
- A611-97 Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled
- A653/A653M-99 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C423-99 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C. American Institute of Steel Construction (AISC):
1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (ninth Edition, 1989)
 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (second Edition, 1994)
- D. American Iron and Steel Institute (AISI):
Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)
- E. American Welding Society (AWS):
D1.3-89 Structural Welding Code - Sheet Steel
- F. Factory Mutual (FM Global):
1. Loss Prevention Data Sheet 1-28: Wind Loads to Roof Systems and Roof Deck Securement (1998)
 2. Factory Mutual Research Approval Guide (2000)
- G. Military Specifications (Mil. Spec.)
MIL-P-21035B Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Steel Decking: ASTM A653, Structural Quality, Type B.
- B. Galvanizing: ASTM A653, G60.
- C. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- D. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section,

PAINTING, primer coating shall be compatible with specified finish painting.

E. Miscellaneous Steel Shapes: ASTM A36.

F. Welding Electrode: E60XX minimum.

G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:

1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
2. Continuous Sheet Metal edging: At openings, concrete slab edges and roof deck edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
4. Ridge and Valley Plates: Provide 1.3 mm (18 gauge), minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 40 mm per meter (1/2 inch per foot).
5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the Drawings. Fabricate cant strips from 1 mm (20 gauge) metal with a minimum 125 mm (5 inch) face width.
6. Seat Angles for Deck: Where a beam does not frame into a column.
7. Sump Pans for Roof Drains: Fabricated from single piece of minimum 1.9 mm (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 75 mm (3 inches) wide. Recess pans not less than 38 mm (1 1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

SPEC WRITER NOTE: Delete below unless
acoustical deck selected.

8. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

2.2 REQUIREMENTS:

- A. Provide steel decking of the type, depth, gauge, and section properties as shown.
- B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth and minimum gage requirements as shown on the Contract Documents.
 - 1. Wide Rib (Type B) deck.
 - 2. Finish: Galvanized G-60.
- E. Do not use steel deck for hanging supports for any type or kind of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Provide steel decking in sufficient lengths to extend over 3 or more spans, except for interstitial levels.
- E. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.
- F. Fastening Deck Units:
 - 1. Fasten floor deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.

2. Tack weld or use self-tapping No. 8 or larger machine screws at 915 mm (3 feet) o.c. for fastening end closures. Only use welds to attach longitudinal end closures.
3. Weld side laps of adjacent floor deck units that span more than 1524 mm (5 feet). Fasten at midspan or 915 mm (3 feet) o.c., whichever is smaller.
4. Provide any additional fastening necessary to comply with the requirements of Underwriters Laboratories and/or Factory Mutual to achieve the required ratings.
5. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 2.1 kPa (45 psf) at eave overhang and 1.4 kPa (30 psf) for other roof areas.

G. Cutting and Fitting:

1. Cut all metal deck units to proper length in the shop prior to shipping.
2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced by the trade requiring the opening.
4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Resident Engineer. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

3.2 WELDING:

Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.3.

3.3 FIELD REPAIR:

Areas scarred during erection and welds thoroughly cleaned and touched-up. Touch-up paint for zinc-coated units shall be zinc rich galvanizing repair paint.

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SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies wood blocking and nailers.

1.2 RELATED WORK:

A. Gypsum Wallboard: Section 09260.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop Drawings showing framing connection details, fasteners, connections and dimensions.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Locate lumber within construction on well drained areas, supported at least 150 mm (6 inches) above floor.

1.5 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Forest and Paper Association (AFPA):
National Design Specification for Wood Construction
WCD Number 1-01 Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
A190.1-92..... Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
B18.2.1A-99 Square and Hex Bolts and Screws
B18.2.2-87 (R99) Square and Hex Nuts
B18.6.1-81 (R97) Wood Screws
B18.6.4-98 Thread Forming and Thread Cutting Tapping Screws
and Metallic Drive Screws
- E. American Plywood Association (APA): E30-1996
..... Design/Construction Guide - Residential and
Commercial
- F. American Society for Testing And Materials (ASTM):

- A653/A653M-00 Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
- C954-00 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
- C1002-01 Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases
- D1760-01 Pressure Treatment of Timber Products
- F1667-01 Nails, Spikes, and Staples
- C. Commercial Item Description (CID):
- A-A-55615 Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)
- I. Military Specification (Mil. Spec.):
- MIL-L-19140E Lumber and Plywood, Fire-Retardant Treated
- K. U.S. Department of Commerce Product Standard (PS)
- PS 1-95 Construction and Industrial Plywood
- PS 20-70 (R86) American Softwood Lumber Standard

PART 2 - PRODUCTS

2.1 LUMBER:

- A. Unless otherwise specified, each piece of lumber bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
1. Identifying marks in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Lumber Other Than Structural:
1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
 2. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and, members 150 mm (6 inches) and wider, Number 2 Grade.
- C. Sizes:
1. Conforming to Prod. Std., PS20.

2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

D. Moisture Content:

1. At time of delivery and maintained at the site.
2. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
3. Lumber over 50 mm (2 inches) thick: 25 percent or less.

E. Fire Retardant Treatment:

1. Mil Spec. MIL-L-19140 with piece of treated material bearing identification of testing agency and showing performance rating.
2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

2.2 PLYWOOD

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

2.4 ROUGH HARDWARE AND ADHESIVES:

- A. Miscellaneous Bolts: Expansion Bolts: C1D, A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Use 13 mm (1/2 inch) bolt unless shown otherwise.
- B. Washers
 1. ASTM F844.
 2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.
- C. Screws:
 1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.
 2. Wood to Steel: ASTM C954, or ASTM C1002.
- D. Nails:
 1. Size and type best suited for purpose unless noted otherwise. Use aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
 2. ASTM F1667:
 - a. Common: Type I, Style 10.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

- A. Conform to applicable requirements of the following:

1. AFPA WCD-number 1, Manual for House Framing 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 Manual for House Framing where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
- b. Use eight penny or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
- c. Use 16 penny or larger nails for nailing through 50 mm (2 inch) thick lumber.
- d. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
- e. Nailing Schedule; Using Common Nails:

2. Bolts:

- a. Fit bolt heads and nuts bearing on wood with washers.
- b. Countersink bolt heads flush with the surface of nailers.
- c. Embed in concrete and solid masonry or use expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
- d. Use toggle bolts to hollow masonry or sheet metal.

3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.

- a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
- b. ASTM C 954 for steel over 0.84 mm (0.033 inch) thick.

4. Power actuated drive pins may be used where practical to anchor to solid masonry, concrete, or steel.
5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Use metal plugs, inserts or similar fastening.

C. Blocking Nailers, and Furring:

1. Install furring, blocking, nailers, and grounds where shown.
2. Use longest lengths practicable.
3. Use fire retardant treated wood and wood plywood blocking.
4. Fastening blocking to substrate:
 - a. Fasten with screws at ends and not over 600 mm (24 inches) between ends.
 - c. Stagger fasteners from side to side of wood member over 75 mm (3 inches) in width.

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**SECTION 06200
FINISH CARPENTRY AND MILLWORK**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior millwork.
- B. Items specified.
 - Reception Counter (27)
 - Mounting Strips, Shelves, and Rods
 - Chair Rail
 - Corner Guards (Waiting
 - Base
 - Wood Bumpers

1.2 RELATED WORK

- A. Framing, furring and blocking: Section 06100, ROUGH CARPENTRY.
- B. Wood doors: Section 08210, WOOD DOORS.
- C. Color and texture of finish: Section 09050, COLOR DESIGN.
- D. Stock Casework: Section 12302, WOOD CASEWORK.
- E. Electrical light fixtures and duplex outlets: Division 16, ELECTRICAL.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop Drawings:
 - 1. Millwork items - Quarter full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
 - 2. Show construction and installation.
- C. Samples:

Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).
- D. Manufacturer's literature and data:
 - 1. Finish hardware
 - 2. Electrical components

1.4 DELIVERY, STORAGE AND HANDLING

- A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.
- B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Resident Engineer. Store at a minimum temperature of 21°C (70°F) for not less than 10 days before installation.
- C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
- D638, D790, D696..... Solid Polymers
 - A167-99Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip B221-00. Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - E84-00Surface Burning Characteristics of Building Materials
 - F436-00Hardened Steel Washers
- C. American National Standard Institute (ANSI)
- 2124.3 & 6 Type Six..... Solid Polymers
- D. American Hardboard Association (AHA):
- A135.4-95 Basic Hardboard
- E. Builders Hardware Manufacturers Association (BHMA):
- A156.9-94 Cabinet Hardware
 - A156.11-99 Cabinet Locks
 - A156.16-97Auxiliary Hardware
- F. Hardwood Plywood and Veneer Association (HPVA):
- HP.1-00Hardwood and Decorative Plywood
- G. National Particleboard Association (NPA):
- A208.1-93Wood Particleboard
- H. American Society of Mechanical Engineers (ASME): B18.2.1-96
- Square and Hex Bolts and Screws (Inch Series)
- I. Architectural Woodwork Institute (AWI): AWI-97 Architectural Woodwork Quality Standards and Quality Certification Program
- J. National Electrical Manufacturers Association (NEMA):
- LD 3-00.....High-Pressure Decorative Laminates
 - LD 3.1-95.....Application, Fabrication and Installation of High-Pressure Decorative Laminates
- K. U.S. Department of Commerce, Product Standard (PS):
- PS1-95Construction and Industrial Plywood
 - PS20-70 (R86)American Softwood Lumber Standard
- L. Federal Specifications (Fed. Spec.):
- A-A-1922A Shield Expansion

A-A-1936 Contact Adhesive

A-A-3052 Urea Resin Type Adhesive
 FF-N-836D Nut, Square, Hexagon Cap, Slotted, Castle
 FF-S-111D(1) Screw, Wood
 MM-L-736(C) Lumber, Hardwood
 WW-P-541E/Gen

1.6 WARRANTY

- A. Ten year (10) warranty against defects in material to replace or repair defective solid polymer materials.

PART 2 - PRODUCTS

2.1 LUMBER

A. Grading and Marking:

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

B. Sizes:

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

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

D. Softwood: PS-20, exposed to view appearance grades:

1. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
2. Use Prime for painted or opaque finish.

E. Use edge grain Wood members exposed to weather.

2.2 PLYWOOD

A. Softwood Plywood:

1. Prod. Std.
2. Grading and Marking:
 - a. Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood.

- b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
- 3. Plywood, 13 mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.
- 4. Plastic Laminate Plywood Cores:
 - a. Exterior Type, and species group.
 - b. Veneer Grade: A-C.
- 5. Shelving Plywood:
 - a. Interior Type, any species group.
 - b. Veneer Grade: A-B or B-C.
- 6. Other: As specified for item.

2.3 PARTICLEBOARD

- A. ANSI A208.1
- B. Plastic Laminate Particleboard Cores:
 - 1. Use Type 1, Grade 1-M-3, or Type 2, Grade 2-M-2, unless otherwise specified.
 - 2. Use Type 2, Grade 2-M-2, exterior bond, for tops with sinks.
- C. General Use: Type 1, Grade 1-M-3 or Type 2, Grade 2-M-2.

2.4 PLASTIC LAMINATE

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

2.5 SOLID POLYMERS

- A. Homogeneous filled acrylic. For corner guards, 6 mm (1/4 inch) thick, 2 1/2" wide each leg. Manufacturers' adhesive at outside corner 1/8" bullnose.
- B. For chairrail, 12mm (1/2 inch) size as shown on drawing, maximum length between joints. 1/8" bullnose at outside corners.

2.6 ADHESIVE

- A. For Plastic Laminate: Fed. Spec. A-A-1936.

- B. Fed. Spec. A-A-3052: Unextended urea resin for interior millwork.
- C. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.
- D. For solid polymers: two part adhesive, non porous chemical bond.

2.7 HARDWARE

A. Rough Hardware:

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

B. Finish Hardware

- 1. Cabinet Hardware: ANSI A156.9.
 - a. Door/Drawer Pulls: B02011.
 - b. Adjustable Shelf Standards: B4061 with shelf rest B04083.
 - c. Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.
 - d. Cabinet Door Catch: B0371 or B03172.
 - e. Vertical Slotted Shelf Standard: B04103 with shelf brackets B04113, sized for shelf depth.
- 2. Cabinet Locks: ANSI A156.11.
 - a. Drawers and Hinged Door: E07262.
 - b. Sliding Door: E07162.
- 3. Auxiliary Hardware: ANSI A156.16.
 - a. Shelf Bracket: B04041, japanned or enameled finish.
 - b. Combination Garment rod and Shelf Support: B04051 japanned or enamel finish.
 - c. Closet Bar: L03131 chrome finish of required length.

2.8 MOISTURE CONTENT

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

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

2.9 FIRE RETARDANT TREATMENT

- A. Where wood members and plywood are specified to be fire retardant treated, the treatment shall be in accordance with Mil. Spec. MIL-L19140.
- B. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings.
- C. Each piece of treated material shall bear identification of the testing agency and shall indicate performance in accordance with such rating of flame spread and smoke developed.
- D. Treat wood for maximum flame spread of 25 and smoke developed of 25.
- E. Fire Resistant Softwood Plywood:
 - 1. Use Grade A, Exterior, plywood for treatment.
 - 2. Meet the following requirements when tested in accordance with ASTM E84.
 - a. Flame spread: 0 to 25.
 - b. Smoke developed: 100 maximum.

2.10 FABRICATION

- A. General:
 - 1. Except as otherwise specified, use AWI Custom Grade for architectural woodwork and interior millwork.
 - 2. Finish woodwork shall be free from pitch pockets.
 - 3. Except where special profiles are shown, trim shall be standard stock molding and members of the same species.
 - 4. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.
 - 5. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
 - 6. Interior trim and items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.
 - 7. Plastic Laminate Work:
 - a. Factory glued to either a plywood or a particle board core, thickness as shown or specified.
 - b. Cover exposed edges with plastic laminate, except where aluminum, stainless steel, or plastic molded edge strips are shown or specified. Use plastic molded edge strips on 19 mm (3/4-inch) molded thick or thinner core material.
 - c. Provide plastic backing sheet on underside of countertops, thru-wall counter including back splashes and end splashes of countertops.

- d. Use backing sheet on concealed large panel surface when decorative face does not occur.

B. Shelves and Rods:

- 1. Plastic laminate covered, 19 mm (3/4 inch) thick plywood or particle board core with edges and ends having plastic molded edge strips. Size, finish and number as shown.
- 2. Rod or Closet Bar: L03131. Combination Garment and Shelf Support, intermediate support for closet bar: B04051 for rods over 1800 mm (6 feet) long.

C. Reception Counter:

- 1. Fabricate to AWI premium grade construction in conformance with AWI Section 400, CASEWORK.
- 2. Use softwood or particle board for structural framing member's. Space not over 400 mm (16 inches) on center.
- 3. Use laminated plastic for exposed vertical surfaces.
- 4. Use solid polymer laminated to particle board for all counter surfaces.
- 5. Provide cut outs for electrical devices and outlets.

D. Registration Cubicles:

- 1. Fabricate to AWI premium grade construction.
- 2. Use softwood for framing, space members not over 600 mm (24 inches) on center. Use particle board for counter concealed members.
- 3. Use plastic laminate on particle board for patient side of counter support.
- 4. Use solid polymer writing surface pattern on counter.
- 5. Secure writing surfaces to divided panels with screws and to center support with mounting strips screwed to panel and top at underside.

E. Counter or Work Tops:

- 1. Fabrication with 1/2" solid polymer over 26 mm (1 inch) thick core unless shown otherwise.
 - a. Use bull nosed solid polymer for exposed edges of tops 38 mm (1-1/2 inches).
 - b. Use one piece counters for straight runs.
 - c. Miter corners for field joints with overlapping blocking on underside of joint.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain work areas and storage areas to a minimum temperature of 21°C (70°F) for not less than 10 days before and during installation of interior millwork.

- B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2 INSTALLATION

A. General:

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

B. Reception Counter and Registration Booths:

1. Secure framing to floor with expansion bolts.
2. Secure counter top to support with wood cleats or metal angles screwed on 150 mm (6 inch) centers.
3. Conceal fasteners on corridor side. Exposed fasteners permitted under counter top and in knee spaces on staff side.

C. Chairrails & Corner Guards:

1. Install in one piece and one length when practical.
2. Secure rails with adhesive.

D. Install with butt joints in straight runs and miter at corners.

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SECTION 07220
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Installation of roof and deck insulation, on new construction ready to receive roofing or waterproof membrane.

1.2 RELATED WORK

- A. Wood blocking and edge strips: Section 06100, ROUGH CARPENTRY.
- B. Sheet metal components: Section 07600, FLASHING AND SHEET METAL.

1.3 QUALITY CONTROL

- A. Supervision of work by persons that are knowledgeable and experienced in roofing. See submittals for documentation of supervisors qualification.
- B. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data:
 - 1. Roofing cement, each type
 - 2. Roof insulation, each type
 - 3. Fastening requirements
 - 4. Insulation span data for flutes of metal decks
- C. Samples:
 - 1. Roof insulation, each type
 - 2. Nails and fasteners, each type
- D. Certificates:
 - 1. Indicating type, thickness and thermal conductance of insulation. (Average thickness for tapered insulation).
 - 2. Indicating materials and method of application of insulation system on metal decks meet the requirements of Factory Mutual Research Corporation for Class 1 Insulated Steel Deck Roofs.
- E. Laboratory Test Reports: Thermal values of insulation products.
- F. Layout of tapered roof system showing units required.
- G. Documentation of supervisors training and experience showing knowledge of roofing procedures.

1.5 DELIVERY, STORAGE AND MARKING

- A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer or seller.

- B. Keep materials dry, and store in dry, weathertight facilities or under canvas tarps. Use of polyethylene or plastic tarps to cover materials is not permitted. Store above ground or deck level on wood pallets. Cover ground under stored materials with plastic tarp.
 - 1. Store rolled materials (felts, base sheets, paper) on end. Do not store materials on top of rolled material.
 - 2. Store foam insulation away from areas where welding is being performed and where contact with open flames is possible.
- C. Protect from damage from handling, weather and construction operations before, during, and after installation.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - UU-B-790A.....Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)
- C. American Society for Testing and Materials (ASTM):
 - C208-95Cellulosic Fiber Insulating Board
 - C209-98Test Methods for Cellulosic Fiber Insulating Board
 - C552-00Cellular Glass Thermal Insulation
 - C726-00.....Mineral Fiber Roof Insulation Board
 - C728-97Perlite Thermal Insulation Board
 - C1289-98Faced Rigid Cellular Polyisocynurate Thermal Insulation Board
 - D41-94Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
 - D312-00.....Asphalt Used in Roofing
 - D2178-97.....Asphalt Glass Felt Used in Roofing and Waterproofing
 - D2822-91 (R-97)Asphalt Roof Cement
 - F1667-00Driven Fasteners: Nails, Spikes, and Staples
- D. Factory Mutual Engineering and Research Corporation (FM):
 - Construction Bulletin 1-28 Insulated Steel Decks. P8016-88.....Specification Tested Product Guide
- E. National Roofing Contractors Association (NRCA):
 - The NRCA Roofing and Waterproofing Manual - Fourth Edition.
- F. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory

G. U.S. Department of Commerce (NBS):

PS 1-83Construction and Industrial Plywood

H. National Particleboard Association (NPA): A208.1-

93Mat-Formed Wood Particleboard

PART 2 - PRODUCTS

2.1 INSULATION

A. Cellular Glass: ASTM C552, Type IV, roof board.

B. Mineral Fiberboard: ASTM C726.

C. Perlite Board: ASTM C728.

D. Isocyanurate Board: ASTM C1289, Type I, Class 2.

E. Tapered Roof Insulation System Segments:

1. Fabricate of mineral fiberboard, isocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections.
2. Cut to provide high and low points with crickets and slopes as shown.
3. Minimum thickness of tapered sections; 13 mm (1/2 inch), unless manufacturers allow taper to zero mm (inch).

2.3 MISCELLANEOUS

A. Building Paper (Sheathing Paper):

1. Fed. Spec. UU-B-790, Type I, Barrier paper, Grade D, Water - Vapor permeable, Style 1a, Uncreped, not reinforced; or, Style 1b, Uncreped, not reinforced, red rosin sized.
2. Weighing approximately 3 kg/10 m² (six pounds per 100 square feet).

B. Tapered Edge Strips:

1. Tapered 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
2. Cellulosic Fiberboard: ASTM C208.
3. Mineral Fiberboard: ASTM C726.
4. Perlite Board: ASTM C728.

2.4 FASTENERS

A. Fasteners for securing insulation to steel decks:

1. Conform to requirements of Factory Mutual Research Corporation for wind uplift.
2. Self-drilling galvanized screws with 50 mm (two inch) diameter disk.
3. Antibackout thread design.
4. Have a pullout resistance of 14 kg (30 pounds) minimum.

2.5 RECOVERED MATERIALS

A. Comply with following minimum content standards for recovered materials:

Material Type	Percent by Weight
Perlite composite board	23 percent post consumer recovered paper
Plastic rigid foams: Polyisocyanurate/polyurethane	
Rigid foam	9 percent recovered material
Foam-in-place	5 percent recovered material
Glass fiber reinforced	6 percent recovered material
Rock wool material	75 percent recovered material

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

PART 3 - EXECUTION

3.1 GENERAL

- A. Do not apply roof insulation if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon.
- B. Entire roof deck construction of any section of the building shall be completed before insulation system work is begun. Curbs, blocking, edge strips, and other components which insulation, roofing and base flashing is attached to shall be in place ready to receive insulation and roofing. Coordinate roof insulation operations with roofing and sheet metal work so that insulation is installed to permit continuous roofing operations.
- C. Insulation system materials shall be dry and damage free when applied. Do not use broken insulation or insulation with damaged facings. Remove damaged insulation from the site immediately.
- D. Dry out surfaces, including the flutes of metal deck, that become wet from any cause during progress of the work before roofing work is resumed. Apply materials only to dry substrates.
- E. Except for temporary protection specified, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, fog, snow, ice) or frost is present in any amount in or on the materials when temperature is below 10 °C (50 °F) . Do not apply materials to substrate having temperature of 10 °C (50 °F) or less.
- F. Phased construction is not permitted. The complete installation of all flashing, insulation, and roofing shall be completed in the same day except for the area where temporary protection is required when work is stopped.

3.2 SURFACE PREPARATION

- A. Sweep decks to broom clean condition. Remove all dust, dirt or debris.
- B. Remove projections that might damage materials.

3.3 VAPOR RETARDER

A. General:

- 1. Install a continuous vapor retarder on roof decks as specified.
Install a vapor retarder when phenolic insulation is used.
- 2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
- 3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.

B. Steel Deck:

- 1. Material and method of application of roofing systems used on metal decks shall meet the requirements of Underwriters Laboratories for Class A or Factory Mutual Research Corporation for Class I Insulated Steel Roof Deck.
- 2. Mechanically anchor a 25 mm (one inch) thick layer of mineral fiber board, cellular glass, or perlite board to meet the requirements of Factory Mutual Research Corporation for Class 1-60 Insulated Steel Deck Roofs.
- 3. Locate the long dimension edge joints to have solid bearing on top of decking ribs; do not cantilever over rib openings or flutes.

3.4 SELECTION OF RIGID INSULATION

A. Insulation Type:

- 1. Use either cellular glass, mineral fiberboard, perlite board, phenolic board, isocyanurate board, or urethane board or a combination thereof.
- 2. Use not less than two layers of insulation unless specified otherwise.
- 3. Use either 25 mm (one inch) thick mineral fiberboard, cellular glass, or perlite board as first layer over steel decks. Do not use phenolic, isocyanurate, or urethane board type insulation directly on steel roof decks.
- 4. Use either 13 mm (1/2 inch) thick perlite board or mineral fiber board as a top layer over urethane board or isocyanurate board. Composite board is acceptable.
- 5. Use only cellular glass block for plaza or promenade decks.
- 6. Where tapered insulation is used, all insulation shall be factory tapered, except perlite board may be field tapered.

7. 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..
 2. The minimum thickness of insulation for metal decks shall not be less than recommended by the insulation manufacturer to span the rib opening (flute size) of the metal deck used.
 3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
 4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).
 5. Use not less than two layers of insulation when insulation is 25 mm (one inch) or more in thickness unless specified otherwise. **3.5**

INSTALLATION OF INSULATION

- A. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer. Bed insulation layers in Type III or IV asphalt firmly pressed into the hot bitumen. Keep bitumen below surface of insulation to receive single ply rubber roofing.
- B. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- C. Cover all insulation installed on the same day by either:
1. The roofing membrane as specified.
 2. Temporary protection as specified.
- D. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- E. Cut to fit tight against blocking or penetrations.
- I. Steel Deck:
1. Material and method of application of insulation systems used on metal decks shall meet the requirements of Underwriters laboratories for Class A or Factory Mutual Research Corporation for Class I Insulated Steel Roof Deck.
 2. Mechanically anchor first layer of insulation to steel deck to conform to FM Class 1-60, Insulated Steel Roof Deck.

3. Locate the long dimension edge joints to have solid bearing on top of deck ribs; do not cantilever over deck rib openings or flutes.

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SECTION 07253
SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies mineral fiber and cementitious coverings to provide fire resistance to interior structural steel members shown.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data:

- 1. Manufacturer's complete and detailed application instructions and specifications.
 - 2. Manufacturer's repair and patching instructions.

- C. Certificates:

- 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
 - a. List thickness and density of material required to meet fire ratings.
 - b. Accompanied by complete test report and test record.
 - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.

- D. Miscellaneous:

- 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
 - 2. Manufacturer's written approval of completed installation.
 - 3. Manufacturer's written approval of the applicators of fireproofing material.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver to job-site in sealed containers marked and labeled to show manufacturer's name and brand and certification of compliance with the specified requirements.
- B. Remove damaged containers from the site.
- C. Store the materials off the ground, under cover, away from damp surfaces.
- D. Keep dry until ready for use.
- E. Remove materials that have been exposed to water before installation from the site.

1.4 QUALITY CONTROL

- A. Test for fire endurance in accordance with ASTM E119, for fire rating specified, in a nationally recognized laboratory.
- B. Manufacturer's inspection and approval of surfaces to receive fireproofing as specified under paragraph Examination.
- C. Manufacturer's approval of fireproofing applications.
- D. Manufacturer's approval of completed installation.
- E. Manufacturer's representative shall observe and advise at the commencement of application, and shall visit the site as required thereafter for the purpose of ascertaining proper application.
- F. Pre-Application Test Area.
 - 1. Apply a test area consisting of a typical overhead fireproofing installation, including not less than 4.5 m (15 feet) of beam and deck.
 - a. Apply to one column.
 - b. Apply for the hourly ratings used.
 - 2. Install in location selected by the Resident Engineer, for approval by the representative of the fireproofing material manufacturer and by the Government.
 - 3. Perform Bond test on painted steel in accordance with ASTM E736.
 - 4. Do not proceed in other areas until installation of test area has been completed and approved.
 - 5. Keep approved installation area open for observation as criteria for sprayed-on fireproofing.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C841-99 Installation of Interior Lathing and Furring
 - C847-95(R2000) Metal Lath
 - E84-01 Surface Burning Characteristics of Building Materials
 - E119-00 Fire Tests of Building Construction and Materials
 - E605-93 (R2000) Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members
 - E736-00 Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

- E759-92 (R2000)The Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
- E760-92 (R2000)~~Fire-Resistive~~
Material Applied to Structural Members
- E761-92 (R2000)Compressive Strength of Fire-Resistive Material Applied to Structural Members
- E859-93 (R2000)Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members
- E937-93 (R2000)Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members
- E1042-92 (R1997)Classification for Acoustically, Absorptive Materials Applied by Trowel or Spray. G21-96
.....Determining Resistance of Synthetic Polymeric Materials to Fungi
- C. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory. . . Latest Edition including Supplements
- D. Warnock Hersey (WH):
Certification Listings. .Latest Edition
- E. Factory Mutual System (FM):
Approval GuideLatest Edition including Supplements

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING

- A. ASTM E1042, Class (a), Category A except that the dust removed shall not exceed 0.027 grams/m² (0.0025 g/ft²) of fire proofing material applied.
1. Type I, factory mixed cementitious materials with approved aggregate.
 2. Type II, factory mixed mineral fiber with integral inorganic binders minimum 240 kg/m³ (15 lb/ft³) density per ASTM E605 test unless specified otherwise.
- B. Materials containing asbestos are not permitted.
- C. Fireproofing characteristics when applied in the thickness and density required to achieve the fire-rating specified.

	Characteristic	Test	Results
1 .	Deflection	ASTM E759	No cracking, spalling, or delamination when backing to which it is applied has a deflection up to 1/120 in 3m (10 ft.)
2 .	Corrosion-Resistance	ASTM E937	No promotion of corrosion of steel.
3 .	Bond Impact	ASTM E760	No

cracking, spalling,
or
delamination.

4.	Cohesion/Adhesion (Bond Strength)	ASTM E736	Minimum cohesive/adhesive strength of 9.57 kPa (200 lbf/ft ²) for protected areas. 19.15 kPa (400 lbf/ft ²) for exposed areas.
5.	Air Erosion	ASTM E859	Maximum gain weight of the collecting filter 0.27gm/m ² (0.025 gm/ft ²).
6.	Compressive Strength	ASTM E761	Minimum compressive strength 36 kPa (5 lbf/in ²).
7.	Surface Burning Characteristics with adhesive and sealer to be used	ASTM E84	Flame spread 25 or less smoke developed 50 or less
8.	Fungi Resistance	ASTM G21	Resistance to mold growth when inoculated with aspergillus niger (28 days for general application)

2.2 ADHESIVE

- A. Bonding adhesive for Type II (fibrous) materials as recommended and supplied by the fireproofing material manufacturer.
- B. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

2.3 SEALER

- A. Sealer for Type II (fibrous) material as recommended and supplied by the fireproofing material manufacturer.
- B. Surface burning characteristics as specified for fireproofing material.
- C. Fungus resistant.
- D. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.

2.4 WATER

- A. Clean, fresh, and free from organic and mineral impurities.
- B. pH of 6.9 to 7.1.

2.5 MECHANICAL BOND MATERIAL

- A. Expanded Metal Lath: ASTM C847, minimum weight of 0.92 kg/m² (1.7 pounds per square yard).
- B. Fasteners: ASTM C841.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify surfaces to receive fireproofing are clean and free of dust, soot, oil, grease, water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.

- B. Verify hangers, inserts and clips are installed before the application of fireproofing material.
- C. Verify ductwork, piping, and other obstructing material and equipment is not installed that will interfere with fireproofing installation.
- D. Verify concrete work on steel decking and concrete encased steel is completed.
- E. Verify temperature and enclosure conditions are required by fireproofing material manufacturer.

3.2 APPLICATION

- A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.
- B. Coordinate application of fireproofing material with other trades.
- C. Application of Metal Lath:
 - 1. Apply to beam and columns having painted surfaces which fail ASTM E736 Bond Test requirements in pre-application test area.
 - 2. Apply to beam flanges 300 mm (12-inches) or more in width.
 - 3. Apply to column flanges 400 mm (16-inches) or more in width.
 - 4. Apply to beam or column web 400 mm (16-inches) or more in depth.
 - 5. Tack weld or mechanically fasten on maximum of 300 mm (12-inch) center.
 - 6. See design criteria section of the approved assemblies used.
 - 7. Lap and tie lath member in accordance with ASTM C841.
- D. Mix and apply in accordance with manufacturer's instructions.
 - 1. Mechanically control material and water ratios.
 - 2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
 - 3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
 - 4. Minimum applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purlin or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms shall be as follows:
 - a. Type I - 270 kg/m³ (17 lb/ft³).
 - b. Type II - 350 kg/m³ (22 lb/ft³).
- E. Application shall be completed in one area, inspected and approved by Resident Engineer before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS

- A. Tests of applied material will be performed by VA retained Testing Laboratory. See Section 01410, TESTING LABORATORY SERVICES.
- B. Resident Engineer will select area to be tested in specific bays on each floor using a geometric grid pattern.
- C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test will be rejected.
- D. Areas showing less than required fireproofing characteristics will be rejected on the following field tests.
 - 1. Test for cohesion/adhesion: ASTM E736.
 - 2. Test for bond impact strength: ASTM E760.

3.3 PATCHING AND REPAIRING

- A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.
- B. Perform corrective measures in accordance with fireproofing material Manufacturer's recommendations.
 - 1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
 - 2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
 - 3. Hand mixing of material is not permitted.
- C. Repair:
 - 1. Respray all test and rejected areas.
 - 2. Patch fireproofing material which is removed or disturbed after approval.
- D. Perform final inspection of sprayed areas after patching and repair.

3.5 SCHEDULE

- A. Apply fireproofing material on exterior structural steel members and on underside of roof decks.
- B. Type I:
 - 1.1.5 hour fire rating.
- C. Type II:
 - 1. 1.5 hour fire rating.

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SECTION 07270
FIRESTOPPING SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

- A. Sealants and application: Section 07920, SEALANTS AND CAULKING.
- B. Fire and smoke damper assemblies in ductwork: Section 15840, DUCTWORK AND ACCESSORIES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

1.4 DELIVERY AND STORAGE

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

1.5 GUARANTEE

Firestopping work subject to the terms of the Article GUARANTY of Section GENERAL CONDITIONS, except extend the guaranty period to five years.

1.6 QUALITY ASSURANCE

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

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM): E84-01
.....Surface Burning Characteristics of Building Materials

- E814-02Fire Tests of Through-Penetration Fire Stops
- C. Factory Mutual Engineering and Research Corporation (FM):
Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):
Annual Issue Building Materials Directory
Annual Issue Fire Resistance Directory
1479-00Fire Tests of Through-Penetration Firestops
- E. Warnock Hersey (WH):
Annual Issue Certification Listings

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m² (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
1. Contain no flammable or toxic solvents.
 2. Have no dangerous or flammable outgassing during the drying or curing of products.
 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall have following properties:
1. Classified for use with the particular type of penetrating material used.

- 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
- 3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

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

3.4 CLEAN-UP AND ACCEPTANCE OF WORK

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

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SECTION 07410
PREFORMED WALL AND ROOF PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies composite metal wall panels as shown to match existing panels on adjacent campus buildings.
- B. Panel system requirements include the following components:
 - 1. Aluminum faced composite panels with mounting system. Panel mounting system includes anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete installation.
 - 2. Parapet coping as integral component of the panel system.

1.2 RELATED WORK

- A. Sealant: Section 07920, SEALANTS AND CAULKING.

1.3 MANUFACTURER'S QUALIFICATIONS

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

1.5 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Samples: Metal panel, 150 mm (six inch) square, showing finish, each color and texture.
- C. Shop Drawings: Wall panels, showing details of construction and installation. Collateral steel framing thickness and kind of material, closures, flashing, fastenings and related components and accessories.
- D. Manufacturer's Literature and Data: Wall panels

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A36/A36M-00 Structural Steel
 - A653/A653M-01 Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - A463-01 Steel Sheet, Cold-Rolled, Aluminum-Coated, by the Hot-Dip Process
 - A611-97 Structural Steel, Sheet, Carbon, Cold-Rolled

- A924/A924M-99 Steel Sheet, Metallic Coated by the Hot-Dip Process
- B209/209M-01 Aluminum and Aluminum Alloy Sheet and Plate
- C442-99 Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board
- C553-00 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- C591-00 Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
- C612-00 ~~Metal-Faced Rigid Thermal Insulation~~
- E119-00 Fire Test of Building Construction and Materials
- C. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500 Series Metal Finishes Manual
- D. Aluminum Association
1. AA-C22-A41: Anodized - Clear Coating
 2. AA-C22-A42: Anodized - Clear Color Coatings

PART 2 - PRODUCTS

2.1 ALUMINUM FACE SHEET

Thickness: Thickness: 4MM (0.157")

Alloy: AA3000 Series (Painted)

AA5000 Series (Anodized)

2.2 FASTENERS

Fasteners for aluminum panels shall be aluminum or stainless steel of size, type and holding strength as recommended by manufacturer.

2.3 GYPSUM BACKING BOARD

ASTM C442, Type X, Plain face, Square edge.

2.6 FABRICATION

A. Composite Panels

1. ALUCOBOND material manufactured by Alcan Composites USA, Inc.
2. Items of same function and performance, which have received prior approval from the resident engineer, shall be allowed for this project. Approval shall be based on documentation submitted showing adequacy of material.

B. Bond Integrity

When tested for bond integrity, in accordance with ASTM D1781, there shall be no adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below the following values:

Peel Strength: 115 N mm/mm (22.5 in lb/in) as manufactured
115 N mm/mm (22.5 in lb/in after 21 days
soaking in water at 70 degrees F

C. Fire Performance

ASTM E 64 Flame spread less than 25, smoke developed less than 450

ASTM D 1929 A self ignition temperature of 650° or greater

ASTM D 635 Requires a CC1 classification

D. Composition

Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

E. Tolerances

1. Panel bow: Maximum 0.8% of any 72" panel
2. Panel Lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
3. Maximum deviation from panel flatness shall be 1/8" in 5'-0" on panel in any direction for assembled units. (Non-accumulative-No Oil Canning)

F. System Characteristics

1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving approval, may be acceptable, provided details and characteristics comply with size and profile requirements, and material/performance standards.
2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromises of a neat and flat appearance.

G System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.

H Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.

- I. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
- J. The finish side of the panel shall have a removable plastic film applied prior to fabrication which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

2.7 SYSTEM TYPE

A. Rout and Return Wet

System must provide a wet seal (caulked) reveal joint as detailed on drawings. The sealant type shall be as specified in section 07900 and with foamed type backer rod as indicated on the drawings.

2.8 FINISH

A. For composite wall panels the finishes shall be as follows for aluminum face sheets:

- 1. Main Panels: Clear Anodized-AA-C22-A41 Architectural Class or Coil Coated KYNAR 500 based Polyvinyl Fluoride (PVDF) to match existing adjacent panels.
- 2. Accent Band: Coil Coated KYNAR 500 based Polyvinyl Fluoride (PVDF)
- 3. Colors to be selected from manufacturer's standard.

2.9 SYSTEM PERFORMANCE

A. Wind Load: Local Code or minimum 20 PSF.

Normal to the plane of the wall between supports, deflection of the secured perimeter framing members shall not exceed $L/175$ or $3/4'$, whichever is greater.

Normal to the plane of the wall, the maximum panel deflection shall not exceed $L/60$ of the full span

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install panels in accordance with the manufacturer's approved erection instructions and diagrams, except as specified otherwise. Panels shall be in full and firm contact with supports and with each other at side and end laps. Where panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they shall, after the necessary repairs have been made with material of the same type and color as the weather coating, be approved before being installed. All cut ends and edges,

including those at openings through the sheets shall be sealed completely. Correct defects or errors in the materials in an approved manner. Replace materials which cannot be corrected in an approved manner with nondefective material. Provide molded closure strips where indicated and whenever sheets terminate with open ends after installation.

- B. Wall Panels: Apply panels with the configuration in a vertical position. Provide panels in the longest obtainable lengths, with end laps occurring only at structural members. Install closure strips, flashings, and sealing material in an approved manner that will assure complete weather tightness. Flashing will not be required where approved "self-flashing" panels are used.
- D. Flashing: All flashing and related closures and accessories in connection with the preformed metal panels shall be provided as indicated and as necessary to provide a watertight installation. Details of installation, which are not indicated, shall be in accordance with the panel manufacturer's printed instruction and details, or the approved shop drawings. Installation shall allow for expansion and contraction of flashing.
- E. Fasteners: Fastener spacings shall be in accordance with the manufacturer's recommendations, and as necessary to withstand the design loads indicated.

3.2 ISOLATION OF ALUMINUM

- A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze, or other metal compatible with aluminum by one of the following:
 - 1. Painting the dissimilar metal with a prime coat of Zinc-Molybdate followed by two coats of aluminum paint.
 - 2. Placing a non-abrasive tape or gasket between the aluminum and the dissimilar metal.
- B. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of alkali-resistant bituminous paint.
- C. Paint aluminum in contact with wood or other absorptive materials, that may become repeatedly wet, with two coats of bituminous paint, or two coats of aluminum paint. Seal joints with caulking material.

3.3 PROTECTION AND CLEANING

- A. Protect panels and other components from damage during and after erection, and until project is accepted by the Government.

B. After completion of work, all exposed finished surfaces of panels shall be cleaned of soil, discoloration and disfiguration. Touch-up abraded surfaces of panels.

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SECTION 07532
EPDM SHEET ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Ethylene Propylene Diene Monomer (EPDM) sheet roofing mechanically fastened to roof deck.
- B. Fire rated roof system.

1.2 RELATED WORK

- A. Treated wood framing, blocking, and nailers: Section 06100, ROUGH CARPENTRY.
- B. Roof Insulation: Section 07220, ROOF AND DECK INSULATION.
- C. Metal cap flashings, copings, fascias, and expansion joints: Section 07600, FLASHING AND SHEET METAL.

1.3 QUALITY ASSURANCE

- A. Approved applicator by the membrane roofing system manufacturer, and certified by the manufacturer as having the necessary expertise to install the specific system.
- B. Pre-Roofing Meeting:
 - 1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and Resident Engineer,
 - 2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 - 3. Inspect roof deck at this time to:
 - a. Verify that work of other trades which penetrates roof deck is completed.
 - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
 - c. Examine samples and installation instructions of manufacturer.
 - d. Perform pull out test of fasteners (See paragraph 3.2).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Applicators approval certification by manufacturer.

C. Shop Drawings:

1. Sheet membrane layout.
2. Fastener pattern, layout, and spacing requirements.
3. Termination details.

D. Manufacturers installation instructions revised for project.

E. Samples:

1. Sheet membrane: One 150 mm (6 inch) square piece.
2. Sheet flashing: One 150 mm (6 inch) square piece.
3. Fasteners: Two, each type.
4. Welded seam: Two 300 mm (12 inch) square samples of welded seams to represent quality of field welded seams.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials as specified by manufacturer.

B. Store volatile materials separate from other materials with separation to prevent fire from damaging the work, or other materials. **1.6**

GUARANTEE

Roofing work subject to the terms of the Article GUARANTY of Section, GENERAL CONDITIONS, except extend the guaranty period to five years.

1.7 APPLICABLE PUBLICATIONS

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

- B. American Society for Testing and Materials (ASTM): A167-99
.....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet and Strip
- B209-02 Aluminum and Aluminum-Alloy Sheet and Plate
- D751-00Coated Fabrics
- D2103-97 Polyethylene Film and Sheeting
- D2240-02 Rubber Property - Durometer Hardness
- D3884-01 Abrasive Resistance of Textile Fabrics (Rotary
Platform, Double-Head Method)
- D4637-96 EPDM Sheet Used in Single-Ply Roof Membrane
- D4586-00 Asphalt Roof Cement, Asbestos Free
- E96-00 Water Vapor Transmission of Materials
- E108-00 Fire Tests of Roof Coverings
- G21-96 Resistance of Synthetic Polymeric Materials to
Fungi
- C. National Roofing Contractors Association (NRCA):
Fifth Edition..... The NRCA Roofing and Waterproofing Manual.
- D. Federal Specifications (Fed. Spec.)

FF-S-107C(2) Screws, Tapping and Drive
 FF-S-111D(1) Screw, Wood
 UU-B-790A..... Building Paper, Vegetable Fiber (Kraft,
 Waterproofed, Water Repellent and Fire
 Resistant)

E. Factory Mutual Engineering and Research Corporation (FM):
 Annual Issue..... Approval Guide Building Materials

F. Underwriters Laboratories, Inc (UL):
 Annual Issue Building Materials Directory
 Annual Issue Fire Resistance Directory

G. Warnock Hersey (WH):
 Annual Issue Certification Listings

PART 2 - PRODUCTS

2.1 EPDM SHEET ROOFING

A. Conform to ASTM D4637, Type I, Grade 1, black color.

B. Additional Properties:

PROPERTY	TEST METHOD	REQUIREMENT
Shore A Hardness	ASTM D2240	55 to 75 Durometer
Water Vapor Permeance	ASTM E96	Minimum 0.14 perms Water Method
Fungi Resistance	ASTM G21	After 21 days, no sustained growth or discoloration.
Fire Resistance	ASTM E108 Class A	No Combustion Beyond Flame/Heat Source

C. Thickness:

1. Use 1.5 mm (0.060-inch) thick sheet for mechanically anchored system.

D. Pipe Boots:

1. Molded EPDM designed for flashing of round penetrations, 200 mm (8
 inch) minimum height.

2. Color same as roof membrane.

2.2 EPDM FLASHING SHEET

A. Conform to ASTM D4637, Type I, Grade 1, Class U, unreinforced, color,
 same as roof membrane modified as specified for flashing.

B. Self curing EPDM flashing, adaptable to irregular shapes and surfaces.

C. Minimum thickness 1.5 mm (0.060-inch).

2.3 MISCELLANEOUS ROOFING MEMBRANE MATERIALS

A. Sheet roofing manufacturers specified products.

B. Splice Adhesive: For roofing and flashing sheet.

- C. Lap Sealant: Liquid EPDM rubber for roofing sheet exposed lap edge.
- D. Bonding Adhesives: Neoprene, compatible with roofing membrane, flashing membrane, insulation, metals, concrete, and masonry for bonding roofing and flashing sheet to substrate.
- E. Fastener Sealer: One part elastomeric adhesive sealant.
- F. Temporary Closure Sealers (Night Sealant): Polyurethane two part sealer.
- G. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.
- H. Asphalt Roof Cement: ASTM D4586.

2.4 FASTENERS

- A. Fasteners and washers required for securing sheet roofing to deck:
 - 1. Steel stress plate washers as required by sheet roofing manufacturer:
 - a. Coated against corrosion.
 - b. Separate or attached to fastener.
 - c. Approximately 50 mm (2 inch) diameter or 40 mm x 65 mm (1-1/2 by 2-1/2 inches) rectangular plate with rounded corners, minimum thickness 0.6 mm (0.023-inch).
 - 2. Fastening strip or batten strip for securing roof membrane to deck:
 - a. Stainless steel strip: ASTM A167 type 302 or 304, minimum 0.5 mm (0.018-inch) thick.
 - b. Aluminum strip: ASTM B209, minimum 2.4 mm (0.094-inch) thick.
 - c. Rounded corners on strips.
 - d. Form strips 38 mm (1-1/2 inches) wide, 3000 mm (10 feet) maximum length with 6 mm x 10 mm (1/4 by 3/8 inch) punched slotted holes at 100 mm (4 inch) centers; centered on width of strip. Punch holes 2 mm (1/16 inch) larger than fastener shank when shank is larger than 5 mm (3/16 inch).
 - 3. Steel decks: Screws; Fed Spec FF-S-107, hardened nylon screw or steel screw coated to resist corrosion, self drilling, anti-backout thread design. Minimum pullout resistance of 135 Kg (300 pounds), minimum thread penetration of 13 mm (1/2 inch).
 - 5. Concrete and Masonry Wall Surfaces:
 - a. Nail penetration 13 mm (1/2 inch).
 - 6. Wood:
 - a. Screws; Fed. Spec. FF-S-111, Type I, Style 2.5, coated to resist corrosion, length to provide 19 mm (3/4 inch) minimum penetration.
 - b. Nails: Barbed shank, galvanized.
 - 7. Washers: Neoprene backed metal washer 28 mm (1-1/8 inch) minimum diameter.

8. To Sheet Metal: Self tapping screw; Fed. Spec. FF-S-107, 2 mm (No. 14), sheet metal screw, minimum thread penetration of 6 mm (1/4 inch); stainless steel.
- B. Pipe Compression Clamp or Drawband:
 1. Stainless steel or cadmium plated steel drawband.
 2. Worm drive clamp device.
- C. Surface mounted base flashing clamp strip:
 1. Stainless steel strip, ASTM A167, type 302 or 304, dead soft temper, minimum 0.5 mm (0.018-inch) thick.
 2. Aluminum strip: ASTM B209 24 mm (.094-inch) thick.
 3. For exposed location, form strips with 6 mm (1/4 inch) wide top edge bent out 45 degrees (for sealant) from 40 mm (1-1/2 inch) wide material; 2400 mm (8 feet) maximum length with slotted 6 mm x 10 mm (1/4 by 3/8-inch) holes punched at 200 mm (8 inch) centers, centered between bend and bottom edges.
 4. For locations covered by cap flashings, form strips 30 mm (1-1/4 inch) wide, 2400 mm (8 feet) maximum length with slotted holes 6 mm x 10 mm (1/4 by 3/8 inch) punched at 200 mm (8 inch) centers, centered on strip width.

2.5 VAPOR RETARDER OR SEPARATION SHEETS

- A. Polyethylene film: ASTM D2103, 0.2 mm (6 mils) thick.
- B. Building Paper: Fed. Spec. UU-B-790.
 1. Water vapor resistance: Type I, Grade A, Style 4, reinforced.
 2. Water vapor permeable: Type I, Grade D, Style 4, reinforced.

2.6 FLEXIBLE TUBING

- A. Closed cell neoprene, butyl polyethylene, vinyl, or polyethylene tube or rod.
- B. Diameter approximately 1-1/2 times joint width.

PART 3 - EXECUTION

3.1 GENERAL

- A. Do not apply roof membrane if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless protection provided to distribute loads less than one-half compression resistance of roofing system materials.
 1. Curbs, blocking, edge strips, and other components to which roofing and base flashing is attached in place ready to receive insulation and, roofing.
 2. Coordinate roof operation with sheet metal work and roof insulation work so that insulation and flashing are installed concurrently to permit continuous roofing operations.

3. Complete installation of flashing, insulation, and roofing in the same day except for the area where temporary protection is required when work is stopped.
- B. Phased construction is not permitted.
- C. Dry out surfaces //, including the flutes of metal deck, // that become wet from any cause during progress of the work before roofing work is resumed.
- D. Apply materials only to dry substrates.
- E. Except for temporary protection specified, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, fog, ice, or frost) is present in any amount in or on the materials.
1. Do not apply materials to substrate having temperature of 4°C (40 degrees F) or less, or when materials applied with the roof require higher application temperature.
 2. Do not apply materials when the temperature is below 4°C (40 degrees F).
- F. Temporary Protection:
1. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.
 2. Temporarily seal exposed surfaces of insulation within the roofing membrane.
 3. Do not leave insulation surfaces or edges exposed.
 4. Use polyethylene film or building paper to separate roof sheet from bituminous materials.
 5. Apply the temporary seal and water cut off by extending the roof membrane beyond the insulation and securely embedding the edge of the roof membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant (night sealant) and weight edge with sandbags, to prevent displacement; space sandbags not over 2400 mm (8 foot) centers. Check daily to insure temporary seal remains watertight. Reseal open areas and weight down.
 6. Before the work resumes, cut off and discard portions of the roof membrane in contact with roof cement or bituminous materials.
 - a. Cut not less than 150 mm (6 inches) back from bituminous coated edges or surfaces.
 - b. Remove temporary polyethylene film or building paper.
 7. Remove and discard sandbags contaminated with bituminous products.

8. For roof areas that are to remain intact and that are subject to foot traffic and damage, provide temporary wood walkways with notches in sleepers to permit free drainage.
9. Provide 2 mm (6 mil) polyethylene sheeting or building paper cover over roofing membrane under temporary wood walkways and adjacent areas. Round all edges and corners of wood bearing on roof surface.

3.2 PREPARATION

- A. Test pull out resistance of fasteners in deck in the presence of the Resident Engineer before starting roofing work. Tests are not required for wood.
 1. Test applicable fastener type in applicable deck.
 2. Install fasteners through a sample of the insulation, if any is to be used, into the structural deck.
 3. Test the pull out resistance with a pull out tester.
 4. Test one fastener in each deck level and one for every 230 m² (2500 square feet) of deck type and level.
 5. Test at locations designated by Resident Engineer.
 6. Do not proceed with the roofing work if the pull out resistance of the fasteners is less than specified.
 7. Test results:
 - a. Repeat tests using other type fasteners or use additional fasteners to stay within the pullout load resistance criteria.
- B. Remove dirt, debris, and surface moisture. Cover or fill voids greater than 6 mm (1/4 inch) wide to provide solid support for roof membrane.
- C. Install separation sheet over bituminous material on deck surface lapping edges and ends 150 mm (6 inches) or as recommended by roof membrane manufacturer.
 1. Do not install of separation sheet beyond what can be covered by roofing membrane each day.
 2. Use polyethylene, or building paper, that will be compatible with seaming method.
 3. Insure separation sheet completely isolates bituminous materials from EPDM roofing membrane.
 4. Turn up at penetrations, or other surfaces where bituminous materials occur, to cover bituminous product.
 5. Turn down over edges of blocking at perimeters to cover blocking.

3.3 INSTALLATION OF ROOFING AND FLASHING

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with EPDM roofing membrane.
- B. If possible, install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. If possible, start at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet. Coordinate with roof insulation installation.
- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as sheet is being rolled out and remove defective areas.
 - 1. Allow 30 minutes for relaxing before proceeding.
 - 2. Lap edges and ends of sheets 75 mm (3 inches) or more as recommended by the manufacturer. Clean lap surfaces as specified by manufacturer.
 - 3. Adhesively splice laps. Apply pressure as required. Seam strength of laps as required by ASTM D4637.
 - 4. Check seams to ensure continuous adhesion and correct defects.
 - 5. Finish edges of laps with a continuous beveled bead of lap sealant to sheet edges to provide smooth transition as specified by manufacturer.
 - 6. Finish seams as the membrane is being installed (same day).
 - 7. Anchor perimeter to deck or wall as specified.
- F. Membrane Perimeter Anchorage:
 - 1. Install batten strip or steel stress plate with fasteners at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated in accordance with membrane manufacturer's instructions on top of roof membrane to wall or deck.
 - 2. Mechanically fastened as follows:
 - a. Top of mechanical fastener set flush with top surface of the nailing strip or stress plate.
 - b. Space mechanical fasteners a maximum 300 mm (12 inches) on center.
 - c. Start 25 mm (1 inch) from the end of the nailing strip when used.
 - d. When strip is cut round edge and corners before installing.
 - e. Set fasteners in lap sealant and cover fastener head with fastener sealer including batten strip or stress plate.
 - f. Stop fastening strip where the use of the nailing strip interferes with the flow of the surface water, separate by a 150 mm (6 inch) space, then start again.

- g. After mechanically fastening cover and seal with a 225 mm (9 inch) wide strip of flashing sheet. Use splice adhesive on all laps and finish edge with sealant as specified.
- h. At gravel stops // fascia-cants // turn the membrane down over the front edge of the blocking, cant, or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; with fasteners spaced not over 150 mm (6 inches) on centers.
- i. At parapet walls intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 150 mm (6 inches) on center or as shown in NRCA manual (Fifth Edition)

H. Mechanical Anchorage:

- 1. Secure the membrane to the structural deck with fasteners through stress plate or batten strips spaced and patterned in accordance with the membrane manufacturer's instructions to achieve a Factory Mutual 1-60 Wind Uplift rating.
- 2. When fasteners are installed within the laps of adjoining sheets, position the fastener so that the stress plates are a minimum 13 mm (1/2 inch) from the edge of the sheets.
- 3. Apply lap sealant under stress plate or batten strip and anchor to deck while lap sealant is still fluid. Cover fastener head with fastener sealer.
- 4. Where fasteners are installed over the membrane after the seams have been welded, cover the fasteners with a minimum 200 mm (8 inch) wide round EPDM membrane cap centered over the fastener stress plate. If batten strips are used cover the strip with a minimum 200 mm (8 inch) wide EPDM strip centered over the batten. Splice covers to roof membrane and finish edges with sealant as specified.
- 5. Before installing fasteners into cast in place concrete, pre-drill the correct size hole into the deck. Drill the hole 10 mm (3/8 inch) deeper than the fastener penetration.

- I. Install flashings as the membrane is being installed (same day) . If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.

J. Flashing Roof Drains:

- 1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
 - a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.

- b. Do not allow the roof cement to come in contact with the EPDM roof membrane.
 - c. Adhere the EPDM roof membrane to the metal flashing with the membrane manufacturer's recommended bonding adhesive.
 - 2. Turn down the metal drain flashing and EPDM roof membrane into the drain body and install clamping ring and stainer.
- M. Installing EPDM Base Flashing and Pipe Flashing:
 - 1. Install EPDM flashing membranes to pipes, walls or curbs to a height not less than 200 mm (8 inches) above roof surfaces and 100 mm (4 inches) on roof membranes. Install in accordance with NRCA manual.
 - a. Adhere flashing to pipe, wall or curb with bonding adhesive.
 - b. Form inside and outside corners of EPDM flashing membrane in accordance with NRCA manual (Fifth Edition). Form pipe flashing in accordance with NRCA manual (Fifth Edition).
 - c. Lap ends not less than 100 mm (4 inches).
 - d. Adhesively splice flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
 - 2. Anchor top of flashing to walls or curbs with fasteners spaced not over 150 mm (6 inches) on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.
 - 3. Apply sealant to top edge of flashing.

3.4 FIELD QUALITY CONTROL

- A. Examine and probe seams in the membrane and flashing in the presence of the Resident Engineer and Membrane Manufacturer's Inspector.
- B. Probe the edges of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal bonds, voids, skips, and fishmouths.
- C. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through the seams where directed by the Resident Engineer.
 - 1. Cut one sample for every 450 m (1500 linear feet) of seams.
 - 2. Cut the samples perpendicular to the longitudinal direction of the seams.
 - 3. Failure of the samples to maintain the standard of quality within a reasonable tolerance of the approved samples will be cause for rejection of the work.
- D. Repair areas of welded seams where samples have been taken or marginal bond voids or skips occur.

- E. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

3.5 TEMPORARY ROOF

- A. Install temporary roof when sequences of work or weather does not permit installation of a completed permanent roof system or roof would be subject to phasing of roof work, construction traffic, scaffolds, and work over roof area.
- B. Use of 1.15 mm (0.045-inch) thick non-reinforced EPDM membrane or other temporary membrane as approved.
- D. Secure membrane to deck with mechanical fasteners or temporary ballast not exceeding deck dead load capacity.
- E. Repair cuts, tears, and punctures with patches to keep system watertight.
- F. Install permanent roof system within one year.

- - - E N D - - -

**SECTION 07600
FLASHING AND SHEET METAL**

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for flashing and insulated expansion joint covers are specified in this section.

1.2 RELATED WORK

- B. Single ply base flashing system: Section 07532, EPDM SHEET ROOFING, Section 07540.
- C. Flashing components of factory finished roofing and wall systems: Section 07410, PREFORMED WALL AND ROOF PANELS.
- D. Sealant compound and installation: Section 07920, SEALANT AND CAULKING.
- G. Paint materials and application: Section 09900, PAINTING. I. Flashing of Roof Drains: Section 15400, PLUMBING SYSTEMS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop Drawings:
 - Flashings
 - Copings
 - Gravel Stop-Fascia
 - Gutter and Conductors
 - Expansion joints
 - Fascia-cant
- C. Manufacturer's Literature and Data:
 - Two-piece counterflashing
 - Thru wall flashing
 - Expansion joint cover, each type
 - Nonreinforced, elastomeric sheeting
 - Copper clad stainless steel
 - Polyethylene coated copper
 - Bituminous coated copper
 - Copper covered paper
 - Fascia-cant

D. Certificates: Stating that aluminum has been given - specified finish thickness of anodizing. Coating formulators approvals as specified.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below for a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.

- B. American Society for Testing and Materials (ASTM): A167-99
Stainless and Heat-Resisting Chromium-Nickel
 Steel Plate, Sheet, and Strip D173-97..Bitumen-
 Saturated Cotton Fabrics Used in Roofing
 and Waterproofing
 A653/A653M-02 Steel Sheet Zinc-Coated (Galvanized) or Zinc
 Alloy Coated (Galvanized) by the Hot- Dip
 Process
 B32-00 Solder Metal
 B209-02Aluminum and Aluminum-Alloy Sheet and Plate
 B370-98Copper Sheet and Strip for Building Construction
 D412-98..... Vulcanized Rubber and Thermoplastic Elastomers-
 Tension
 D1187-97.....Asphalt Base Emulsions for Use as Protective
 Coatings for Metal
 D1784-99 Rigid Poly (Vinyl Chloride) (PVC) Compounds and
 Chlorinated Poly (Vinyl Chloride) (CPVC)
 Compounds
 D3656-97 Insect Screening and Louver Cloth Woven from
 Vinyl-Coated Glass Yarns D4586-00
Asphalt Roof Cement, Asbestos Free
- C. Sheet Metal and Air Conditioning Contractors National Association
 (SMACNA) : Architectural Sheet Metal Manual (Fifth Edition, 1993).
- D. National Association of Architectural Metal Manufacturers (NAAMM):
 AMP 500 Series.....Metal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):
 605-98 Voluntary Specification for High Performance
 Organic Coatings on Architectural Extrusions
 Panels
- F. Federal Specification (Fed. Spec):
 A-A-1925A..... Shield, Expansion; (Nail Anchors)
 UU-B-790A..... Building Paper, Vegetable Fiber

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Solder: ASTM B32; flux type and alloy composition as required for use
 with metals to be soldered.
- B 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.

C Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m²(6 lbs/100 sf).

D Bituminous Paint: ASTM D1187, Type I.

E Fasteners:

1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.

2. Nails:

- a. Minimum diameter for copper nails: 3 mm (0.109 inch).
- b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
- c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
- d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.

3. Rivets: Not less than 3 mm (1/8 inch)diameter.

4. Expansion Shields: Fed. Spec. A-A-1925A.

F Sealant: As specified in Section SEALANTS AND CAULKING for exterior locations.

G Insect Screening: ASTM D3656, 18 by 18 regular mesh.

H Roof Cement: ASTM D4586.

2.2 SHEET METAL THICKNESS

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B Thickness of aluminum or galvanized steel is specified with each item.

2.3 FABRICATION, GENERAL

A. Jointing:

1. In general, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
3. Joints shall conform to following requirements:
 - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
 - b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.

- c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
4. Flat and lap joints shall be made in direction of flow.
5. Edges of bituminous coated copper, copper covered paper, nonreinforced elastomeric sheeting and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
6. Soldering:
 - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
 - b. Wire brush to produce a bright surface before soldering lead coated copper.
 - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
 - d. Completely remove acid and flux after soldering is completed.
- B. Expansion and Contraction Joints:
 1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
 2. Space joints as shown or as specified.
 - 3 Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
 - 4 Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
 - 5 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 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 1.6 mm (0.0625 inch) thick aluminum.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:

1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.

G. Metal Options:

1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.

2.4 FINISH

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.

- B. In accordance with NAAMM Metal Finishes Manual, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
 - 1 Aluminum:
 - a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
 - b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
 - c. Fluorocarbon Finish: AAMA 605.2, high performance organic coating.
 - d. Mill finish.
 - 2 Steel and Galvanized Steel:
 - a. Finish painted under Section PAINTING unless specified as prefinished item.
 - b. Manufacturer's finish:
 - 1) Baked on prime coat over a phosphate coating.
 - 2) Baked-on prime and finish coat over a phosphate coating.
 - 3) Fluorocarbon Finish: AAMA 605.2, high performance organic coating.

SPEC WRITER NOTE:

- 1. See Sheet Metal Manual for wall flashings. Provide drips on drainage sides.
- 2. Clearly detail flashings at copings, building set backs, sills, spandrels, lintels, and grade.
- 3. Coordinate with waterproofing or dampproofing to show interface.

2.5 THROUGH-WALL FLASHINGS

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
 - 1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
 - 2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
 - 1. Either copper, stainless steel, or copper clad stainless steel.
 - 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.

3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.
- C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
1. Use same metal and thickness as counter flashing.
 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
 3. Form exposed portion as snap lock receiver for counter flashing upper edge.
- D. For Flashing at Architectural Precast Concrete Panels or Stone Panels.
1. Use plan flat sheet of stainless steel.
 2. Form exposed portions with drip as specified or receiver.
- 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.
- SPEC WRITE NOTE: Do not use galvanized steel for base flashing.

2.6 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.

2.7 COUNTERFLASHING (CAP FLASHING OR HOODS)

- A. Either copper or stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip.
 1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
 2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
 3. Two-piece, lock in type flashing may be used in lieu of one piece counter-flashing.
 4. Manufactured assemblies may be used.
 5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.

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.

2.8 GRAVEL STOPS

A. General:

1. Fabricate in lengths not less than 2400 mm (8 feet) long and maximum of 3000 mm (10 feet).
2. Fabricate internal and external corners as one-piece with legs not less than 600 mm (2 feet) or more than 1200 mm (4 feet) long.
3. Fabricate roof flange not less than 100 mm (4 inches) wide.
4. Fabricate top edge to extend above roof not less than 25 mm (one inch) for embedded gravel aggregate and not less than 100 mm (4 inches) for loose laid ballast.
5. Fabricate lower edge outward at an angle of 45 degrees to form drip and as fascia or as counter flashing as shown.
 - a. Fabricate of one-piece material of suitable width for fascia height of 250 mm (10 inch) maximum or counterflashing lap of not less than 100 mm (4 inch) over base flashing.
 - b. Fabricate bottom edge of formed fascia to receive edge strip.
 - c. When fascia bottom edge forms counter flashing over roofing lap roofing not less than 150 mm (6 inches).

B. Formed Flat Sheet Metal Gravel Stops and Fascia:

1. Fabricate as shown of // .05 mm (0.018 inch) thick // stainless steel //, // 0.5 Kg (20 ounce) // copper //, // 1.25 mm (0.050 inch) thick // aluminum. //
2. When fascia exceeds 150 mm (6 inches) in depth, form one or more horizontal stops not less than 13 mm (1/2 inch) high in the fascia.
3. Fabricate as two-piece fascia when fascia depth exceeds 250 mm (10 inches).
4. At joint between ends of sheets, provide a concealed clip soldered or welded near one end of each sheet to hold the adjoining sheet in lapped position. The clip shall be approximately 100 mm (4 inches) wide and shall be the full depth of the fascia less 25 mm (one inch) at top and bottom. Clip shall be of the same thickness as the fascia.
5. Provide edge strip as specified with lower hooked edge bent outward at an angle of 45 degrees.

C. Formed (Corrugated Sheet) Sheet Metal Gravel Stops and Fascia:

1. Fabricate as shown of // 0.4 mm (0.015 inch) thick stainless steel // 0.5 Kg (16 ounce) copper // 0.8 mm (0.032 inch) thick aluminum.
2. Sheets shall have 2 mm (1/16 inch) deep corrugations either transversely or diagonally rolled into the sheet. Crimped sheets are not acceptable.
3. Factory fabricate prepackaged system, complete with fastenings.

4. Provide concealed flashing splice plate at joints not less than 150 mm (6 inches) long and continuous edge strip at lower edge of fascia made from same metal.
5. Fabricate as two-piece fascia when fascia depth exceeds 175 mm (7 inches).

2.9 BITUMEN STOPS

- A. Fabricate bitumen stops for bituminous roofing edges for use with formed sheet metal gravel stops, pipe penetrations, and other penetrations through roof deck without a curb.
- B. Fabricate with 19 mm (3/4 inch) vertical legs and 75 mm (3 inch) horizontal legs.
- C. When used with gravel stop or metal base flashing use same metal for bitumen stop in thickness specified for concealed locations.

SPEC WRITER NOTE: Verify wall thickness and thickness of sheet metal, with SMACNA MANUAL for walls over 300 mm (12 inches) thick. If prefinished galvanized steel is used specify as if aluminum.

2.10 COPINGS

- A. Fabricate of 1.25 mm (0.050 inch) thick aluminum sheets 2400 mm to 3000 mm (8 to 10 feet) long.
- B. Fabricate coping to profile shown.
- C. Use continuous edge strips with drips at bottom edges on exterior wall side. Use slotted holes for fasteners on roof wall side if continuous cleats or edge strips are not used.
- D. Form joints between sections with either alternate 4 or 5 as shown on plate 68, SMACNA, unless shown otherwise.
- E. Fabricate corners with mitered joints, riveted and soldered locked and sealed if aluminum.
- F. Fabricate ends of coping terminating at vertical building surfaces to form a slot for the installation of sealant.
- G. Fabricate exterior ends of coping closures of same appearance as exterior wall side.

2.11 REGLETS

- A. Fabricate reglets of one of the following materials:
 1. 0.4 Kg (16 ounce) copper.
 2. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
 3. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.

4. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

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, SEALANTS AND CAULKING.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) (saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.

8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
 - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
 - b. Paint dissimilar metal with a coat of bituminous paint.
 - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
 - a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
 - b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of

concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.

2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches)and use thickness of metal as specified for exposed locations.
 3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
 4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
 5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
 6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
 7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
 8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
 9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section, SEALANTS AND CAULKING.
 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 (one inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
 12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
 13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
 14. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 - b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- B. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if

any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.

C. Flashing at Veneer Walls:

1. Install near line of finish floors over shelf angles or where shown.
2. Turn up against sheathing.
3. At stud framing, hem top edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
4. At concrete backing, extend flashing into reglet as specified.
5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.

D. Lintel Flashing when not part of shelf angle flashing:

1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.

E. 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.

F. 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.

G. 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.
- C. 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.
- D. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

- A. General:
 - 1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
 - 2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
 - 3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
 - 4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
 - 5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
 - 6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.
- B. One Piece Counterflashing:

1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
3. Where flashing is surface mounted on flat surfaces.
 - a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center.
 - 1) Locate fasteners in masonry mortar joints.
 - 2) Use screws to sheet metal or wood.
 - b. Fill joint at top with sealant.
4. Where flashing or hood is mounted on pipe.
 - a. Secure with draw band tight against pipe.
 - b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
 - c. Completely fill joint at top with sealant.
- C. Two-Piece Counterflashing.
 1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.
 2. Surface applied type receiver:
 - a. Secure to face construction in accordance, with manufacturers instructions.
 - b. Completely fill space at the top edge of receiver with sealant.
 3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.
- D. Where vented edge occur install so lower edge of counterflashing is against base flashing.
- E. When counter flashing is a component of other flashing install as shown.

3.5 REGLETS

- A. Install reglets in a manner to provide a watertight installation.
- B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.
- C. Butt and align end joints or each section of reglet and securely hold in position until concrete or mortar are hardened.
 1. Coordinate reglets for anchorage into concrete with formwork construction.

2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.6 COPINGS

A. General:

1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section, SEALANTS AND CAULKING.

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.

- - - E N D - - -

SECTION 07920
SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

- A. Sealing of site work concrete paving: Section 02514, SITE WORK CONCRETE.
- B. Firestopping penetrations: Section 07270, FIRESTOPPING SYSTEMS.
- C. Glazing: Section 08810, GLASS AND GLAZING.
- D. Sound rated gypsum partitions/sound sealants: Section 09250, GYPSUM WALLBOARD.
- E. Mechanical Work: Section 15050, BASIC METHODS AND REQUIREMENTS (MECHANICAL).

1.3 QUALITY CONTROL:

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 - 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:

1. Locate test joints where indicated or, if not indicated, as directed by Contracting Officer.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Resident Engineer seven days in advance of dates and times when test joints will be erected.
- E. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this section.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
 1. Caulking compound
 2. Primers
 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

1.5 PROJECT CONDITIONS:

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

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 DELIVERY, HANDLING, AND STORAGE:

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

1.7 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.8 GUARANTY:

- A. Guaranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Guaranty" Article specified in Section 01001, GENERAL CONDITIONS, except that guaranty period shall be extended to two years.
- B. General Guaranty: Special guarantees specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other guarantees made by Contractor under requirements of Contract Documents.

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C509-00Elastomeric Cellular Preformed Gasket and Sealing Material.
 - C612-00Mineral Fiber Block and Board Thermal Insulation.
 - C717-03Standard Terminology of Building Seals and Sealants.
 - C834-00Latex Sealants.
 - C919-02 Use of Sealants in Acoustical Applications.
 - C920-02Elastomeric Joint Sealants.

C1021-01Laboratories Engaged in Testing of Building

Sealants

- C1193-00Standard Guide for Use of Joint Sealants.
 C1330-02 Specification for Cylindrical Sealant Backing
 for Use with Cold Liquid Applied Sealants.
 D1056-00 Specification for Flexible Cellular Materials—
 Sponge or Expanded Rubber. E84-03 ..Surface
 Burning Characteristics of Building
 Materials.

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

PART 2 - PRODUCTS**2.1 SEALANTS:**

- A. Sealants S-1 through S-8 and S-10 NOT USED
 I. S-9:
 1. ASTM C920 silicone.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-30.
 6. Non-yellowing, mildew resistant.
 B. S-11:
 1. ASTM C920 polyurethane.
 2. Type M/S.
 3. Class 25.
 4. Grade P/NS.
 5. Shore A hardness of 35 to 50.
 C. S-12:
 1. ASTM C920, polyurethane.
 2. Type M/S.
 3. Class 25, joint movement range of plus or minus 50 percent.
 4. Grade P/NS.
 5. Shore A hardness of 25 to 50.

2.2 CAULKING COMPOUND:

- A. C-1: ASTM C834, acrylic latex.
 B. C-2: One component acoustical caulking, non drying, non hardening,
 synthetic rubber.

2.3 COLOR:

- A. Sealants used with unpainted concrete shall match color of adjacent concrete.
- B. Caulking shall be light gray or white, unless specified otherwise.

2.4 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 °C (minus 26 °F) . Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 FILLER:

- A. Mineral fiber board: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.7 CLEANERS-NON POUROUS SURFACES:

- A. Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION**3.1 INSPECTION:**

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
 - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printer instructions.
 - 1. Apply primer prior to installation of back-up rod or bond breaker

tape.

2. Use brush or other approved means that will reach all parts of joints.

F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION:

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

A. General:

1. Apply sealants and caulking only when ambient temperature is between 5 degrees C and 38 degrees C (40 and 100 degrees F).
2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
4. Apply caulking and sealing compound in accordance with manufacturer's printer instructions.
5. Avoid dropping or smearing compound on adjacent surfaces.
6. Fill joints solidly with compound and finish compound smooth.
7. Tool joints to concave surface unless shown or specified otherwise.
8. Finish paving or floor joints flush unless joint is otherwise detailed.

9. Apply compounds with nozzle size to fit joint width.
 10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
 2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
 3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
 4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
 5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

- A. 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.
- B. 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.
- C. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and

percent elongations, sealant fill, sealant configuration, and sealant dimensions.

- 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.
- E. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

3.8 LOCATIONS:

A. Sanitary Joints:

- 1. Walls to Plumbing Fixtures: Type S-9
- 2. Counter Tops to Walls: Type S-9
- 3. Pipe Penetrations: Type S-9

B. Horizontal Traffic Joints:

- 1. Concrete Paving, Unit Pavers: Type S-11 or S-12

C. Interior Caulking:

- 1. Typical Narrow Joint 6 mm, (1/4 inch) or less at Walls and Adjacent Components: Type C-1, C-2, C-3.
- 2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Type C-1, C-2, C-3.
- 3. Exposed Acoustical Joint at Sound Rated Partitions Type C-2
- 4. Concealed Acoustic Sealant Type C-1, C-2, C-3.

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SECTION 08110
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies steel doors, steel frames and related components.
- B. Terms relating to steel doors and frames as defined in ANSI A123.1 and as specified.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturers Literature and Data:
 - 1. Fire rated doors and frames, showing conformance with NFPA 80 and Underwriters Laboratory, Inc., or Inchcape Testing Services or Factory Mutual fire rating requirements.

1.3 SHIPMENT

- A. Prior to shipment label each door and frame to show location, size, door swing and other pertinent information.
- B. Fasten temporary steel spreaders across the bottom of each door frame.

1.4 STORAGE AND HANDLING

- A. Store doors and frames at the site under cover.
- B. Protect from rust and damage during storage and erection until completion.

1.5 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. Door and Hardware Institute (DHI):
 - A115 Series..... Steel Door and Frame Preparation for Hardware, Series A115.1 through A115.17 (Dates Vary)
- C. Steel Door Institute (SDI):
 - A250.8-98..... Standard Steel Doors and Frames
- D. American Society for Testing and Materials (ASTM): A568/568-M-03
 - Steel, Sheet, Carbon, and High-Strength, Low-alloy, Hot-Rolled and Cold-Rolled A1008-04
 - Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability
- E. The National Association Architectural Metal Manufacturers (NAAMM):
 - Metal Finishes Manual (1988 Edition)
- F. National Fire Protection Association (NFPA):

- 80-99Fire Doors and Fire Windows
- G. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory
- H. Inchcape Testing Services (ITS):
Certifications Listings .. Latest Edition
- I. Factory Mutual System (FM):
Approval Guide

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.
- B. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.
- C. Prime Paint: Paint that meets or exceeds the requirements of A250.8.

2.2 FABRICATION GENERAL

- A. GENERAL:
1. Follow SDI A250.8 for fabrication of standard steel doors, except as specified otherwise. Doors to receive hardware specified in Section 08710, Door Hardware. Tolerances as per SDI A250.8. Thickness, 44 mm (1-3/4 inches), unless otherwise shown.
 2. When vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.
- B. Standard Duty Doors: SDI A250.8, Level 1, Model 2, full flush seamless design with vertical steel stiffness and mineral fiberboard core of size and design shown. Use for interior locations only. Do not use for stairwell doors, security doors and detention doors.
- C. Heavy Duty Doors: SDI A250.8, Level 2, Model 2, full flush seamless design with vertical steel stiffness and polystyrene core of size and design shown.

2.3 METAL FRAMES

- A. General:
1. SDI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
 2. Frames for exterior doors: Fabricate from 1.7 mm (0.067 inch) thick galvanized steel conforming to ASTM A525.
 3. Frames for labeled fire rated doors.
 - a. Comply with NFPA 80. Test by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual.
 - b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements. Provide

labels of metal or engraved stamp, with raised or incised markings.

4. Frames for doors specified to have automatic door operators; service window: minimum 1.7 mm (0.067 inch) thick.

5. Knocked-down frames are not acceptable.

B. Reinforcement and Covers:

1. SDI A250.8 for, minimum thickness of steel reinforcement welded to back of frames.
2. Provide mortar guards securely fastened to back of hardware reinforcements.

C. Terminated Stops: SDI A250.8.

D. Glazed Openings:

- a. Integral stop on corridor, or security side.
- b. Design rabbet width and depth to receive glazing material or panel shown or specified.

E. Frame Anchors:

1. Floor anchors:

- a. At bottom of jamb use 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive two 6 mm (1/4 inch) floor bolts. Use 50 mm x 50 mm (2 inch by 2 inch) 9 mm by (3/8 inch) clip angle for lead lined frames, drilled for 9 mm (3/8 inch) floor bolts.
- b. Where mullions occur, provide 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two 6 mm (1/4 inch) floor bolts and frame anchor screws.
- c. Where sill sections occur, provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for 6 mm (1/4 inch) floor bolts and frame anchor screws. Space floor bolts at 50 mm (24 inches) on center.

2. Jamb anchors:

- a. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 600 mm (24 inches) apart, except for fire rated frames space anchors as required by labeling authority.
- b. Form jamb anchors of not less than 1 mm (0.042 inch) thick steel unless otherwise specified.
- c. Anchors for stud partitions: Either weld to frame or use lock-in snap-in type. Provide tabs for securing anchor to the sides of the studs.
- d. Anchors for frames set in prepared openings:

- 1) Steel pipe spacers with 6 mm (1/4 inch) inside diameter welded to plate reinforcing at jamb stops or hat shaped formed strap spacers, 50 mm (2 inches) wide, welded to jamb near stop.

- 2) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass thru frame and spacers.

f. Anchors for observation windows and other continuous frames set in stud partitions.

- 1) In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.

- 2) Anchors spaced 600 mm (24 inches) on centers maximum.

g. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

2.6 SHOP PAINTING

SDI A250.8.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Plumb, align and brace frames securely until permanent anchors are set.

1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
2. Use wood spreaders at bottom of frame if the shipping spreader is removed.
3. Protect frame from accidental abuse.
4. Where construction will permit concealment, leave the shipping spreaders in place after installation, otherwise remove the spreaders after the frames are set and anchored.
5. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.

B. Floor Anchors:

1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts.
2. Power actuated drive pins may be used to secure frame anchors to concrete floors.

C. Jamb Anchors:

1. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.

D. Install anchors for labeled fire rated doors to provide rating as required.

3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

Install doors and hardware as specified in Section 08750, INSTALLATION OF DOORS AND HARDWARE.

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SECTION 08410
ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies aluminum entrance work including storefront construction, hung doors, interior ICU sliding doors, and other components to make a complete assembly.

1.2 RELATED WORK:

- A. Glass and Glazing: Section 08810, GLASS AND GLAZING.
- B. Hardware: Section 08710, BUILDERS HARDWARE.
- C. Automatic Door Operators: Section 08721, AUTOMATIC DOOR OPERATORS.
- D. Texture and color of finish: Section 09050, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES.
- E. Electrical Work: Division 16 - ELECTRICAL

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop Drawings: (1/4 full scale) showing construction, anchorage, reinforcement, and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Doors, each type.
 - 2. Entrance and Storefront construction.
- D. Samples:
 - 1. Two samples of anodized aluminum of each color showing finish and maximum shade range.
- E. Manufacturer's Certificates:
 - 1. Stating that aluminum has been given specified thickness of anodizing.
 - 2. Indicating manufacturer's qualifications specified.

1.4 QUALITY ASSURANCE:

- A. Approval by Contracting Officer is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.
- B. Certify manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.

- B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - B209-96Aluminum and Aluminum-Alloy Sheet and Plate
 - B221-96Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - E283-91.....Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - E331-96 Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
 - F468-98.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
 - F593-98Stainless Steel Bolts, Hex Cap Screws, and Studs
- C. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500 Series.....Metal Finishes Manual
- D. American Architectural Manufacturer's Association (AAMA):
 - 605.2-92High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels
- E. American Welding Society (AWS):
 - D1.2-97Structural Welding Code Aluminum

1.7 PERFORMANCE REQUIREMENTS:

- A. Shapes and thickness of framing members shall be sufficient to withstand a design load of not less than [1.4] [_____] kilopascals ([30] pounds per square foot) of supported area with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65. Provide glazing beads, moldings, and trim of not less than 1.25 mm (0.050 inch) nominal thickness.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, ASTM B209 and B221:
 - 1. Alloy 6063 temper T5 for doors, door frames.

2. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.

B. Fasteners:

1. Aluminum: ASTM F468, Alloy 2024.
2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

2.2 FABRICATION:

- A. Fabricate doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.
- B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.
- C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.
- D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section, BUILDERS HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.
- E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

2.3 PROTECTION OF ALUMINUM:

- A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
- B. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
- C. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
- D. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.4 FRAMES:

- A. Fabricate doors, frames, mullions, transoms, frames for fixed glass and similar members from extruded aluminum not less than 3 mm (0.125-inch) thick.
- B. Provide integral stops and glass rebates and applied snap-on type trim.

- C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.

2.5 STILE AND RAIL DOORS:

- A. Nominal 45 mm (1-3/4 inch) thick, with stile and head rail 90 mm (3-1/2 inches) wide, and bottom rail 250 mm (10 inches) wide.
- B. Bevel single-acting doors 3 mm (1/8 inch) at lock, hinge and meeting stile edges. Provide clearances of 2 mm (1/16 inch) at hinge stiles, 3 mm (1/8 inch) at lock stiles and top rails, and 5 mm (3/16 inch) at floors. Form glass rebates integrally with stiles and rails. Glazing beads may be formed integrally with stiles and rails or applied type secured with fasteners at 150 mm (six inches) on centers.
- C. Construct doors with a system of welded joints or interlocking dovetail joints between stiles and rails. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel rod extending into the stiles, and having a self-locking nut and washer at each end. Reinforce stiles and rails to prevent door distortion when tie rods are tightened. Provide a compensating spring-type washer under each nut to take up any stresses that may develop. Construct joints between rails and stiles to remain rigid and tight when door is operated.
- D. Weatherstripping: Provide removable, woven pile type (silicone-treated) weatherstripping attached to aluminum or vinyl holder. Make slots for applying weatherstripping integral with doors and door frame stops. Apply continuous weatherstripping to heads, jambs, bottom, and meeting stiles of doors and frames. Install weatherstripping so doors can swing freely and close positively.

2.6 REINFORCEMENT FOR BUILDERS HARDWARE:

- A. Fabricate from stainless steel plates.
- B. Hinge and pivot reinforcing: 4.55 mm (0.1793 inch) thick.
- C. Reinforcing for lock face, flush bolts, concealed holders, concealed or surface mounted closers: 2.66 mm (0.1046 inch) thick.
- D. Reinforcing for all other surface mounted hardware: 1.5 mm (0.0598 inch) thick.

2.7 TRIM

- A. Fabricate trim shown from 1.5 mm (0.0625 inch) thick sheet aluminum of longest available lengths.
- B. Use concealed fasteners.
- C. Provide aluminum stiffener and other supporting members shown or as required to maintain the integrity of the components.

2.8 FINISH

- A. In accordance with NAAMM AMP 500 series.

B. Anodized Aluminum

1. Clear Finish: Chemically etched medium matte, with clear anodic coating, Class I Architectural, 7 mils thick.

PART 3 - EXECUTION**3.1 INSTALLATION:**

- A. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.
- B. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.
- C. Install hardware specified under Section 08710, BUILDERS HARDWARE.
- D. Install hung door operators specified under Section 08721, AUTOMATIC DOOR OPERATORS.

3.2 ADJUSTING:

After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

3.3 PROTECTION, CLEANING AND REPAIRING:

Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

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**SECTION 08710
BUILDERS HARDWARE**

PART 1 - GENERAL

1.1 DESCRIPTION

Builders hardware and related items necessary for complete installation and operation of doors.

1.2 RELATED WORK

- A. Application of Hardware: Section 08210, WOOD DOORS 08110, STEEL DOORS AND FRAMES.
- B. Caulking: Section 07920, SEALANTS AND CAULKING.
- C. Painting: Section 09900, PAINTING.

1.3 GENERAL

- A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.
- B. Hardware for Labeled Fire Doors and Exit Doors: conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, larger sized, 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.
- C. 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. Provide 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 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- 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)	ANS I /BHMA Finish Designation
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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 be 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.

1.5 DELIVERY AND MARKING

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 item by Project Specification type or 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.

1.6 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 "HW" followed by a number. Each number designates a set of hardware items applicable to a door type.
- B. Manufacturers' Catalog Number References: Where manufacturers' products are specified herein, products of other manufacturers which are considered equivalent to those specified, may be used. Manufacturers whose products are specified are identified by abbreviations as follows:

Adams-Rite	Adams Rite Mfg. Co.	Glendale, CA
Grant	Grant Pulley & Hardware Co.	Woodside, NY
Glynn Johnson	Glynn Johnson Co.	Chicago, IL
LCN	LCN Closers	Princeton, IL
Firemark	Rixon-Firemark Co.	Chicago, IL
Soss	Soss Mfg. Co.	Detroit, MI
Stanley	The Stanley Works	New Britain, CT
Trimco	Triangle Brass Mfg. Co.	Los Angeles, CA
Unican	Simplex Security Systems	Collinsville, CT
Von Duprin	Von Duprin Hardware Co.	Indianapolis, IN
Zero	Zero Weather Stripping Co.	New York, NY

- C. Keying: All cylinders shall be keyed into existing Grand Master Key System. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be Schlage Everest 7 pin small format interchangeable core; keyway B145. Keying information shall be furnished at a later date by the Resident Engineer.

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. 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):
F883-1997 Padlocks
- C. Builders Hardware Manufacturers Association Inc.
A156.1-1997 Butts and Hinges
A156.2-1996 Bored and Pre-assembled Locks and Latches
A156.4-1992 Door Controls (Closers) (BHMA 301)
A156.5-1992 Auxiliary Locks and Associated Products (BHMA 501)
A156.6-1994 Architectural Door Trim (BHMA 1001)
A156.8-1994 Door Controls-Overhead Stops and Holders (BHMA 311)
A156.15-1995 Closer Holder Release Devices
A156.16-1997 Auxiliary Hardware
A156.18-1993 Materials and Finishes (BHMA 1301)
A156.21-1996 Thresholds

- A156.22-1996 Door Gasketing Systems
- D. Steel Door Institute (SDI)
 - 100-1991 Standard Steel Doors and Frames
- E. National Fire Protection Association (NFPA):
 - 80-1995 Standard for Fire Doors and Windows
 - 101-1997 Life Safety Code
- F. Underwriters Laboratories, Inc. (UL):
 - Building Materials Directory (1998)

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. ANSI A156.1. The following types of butt hinges shall be used for the types of doors listed, except where otherwise specified.
 - 1. Exterior Doors: Type A2112 for doors 900 mm (3 feet) wide or less. Type A2111 for doors over 900 mm (3 feet) wide. Hinges for exterior doors shall have non-removable pins.
 - 2. Interior Doors: Type 8112 for doors 900 mm (3 feet) wide or less. Type A8111 for doors over 900 mm (3 feet) wide.
 - 3. Automatic doors hung on butts, provide Type A2111 for exterior doors and aluminum doors, and Type A8111 for other doors.
 - 4. Labeled Wood Fire Doors: Type 8411 or Type 8412; these hinges shall be thru bolted to door with hex nuts and bolts.

2.2 DOOR CLOSING DEVICES

Closing devices shall be products of one manufacturer for each type specified.

2.3 OVERHEAD CLOSERS

- A. ANSI A156.4, Grade 1.
- B. Closers shall conform to the following:
 - 1. The closer shall have 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: Size closers in accordance with manufacturer's recommendations or provide multi-size closers, sizes 1 through 6.
 - 4. Material of closer shall be forged or cast iron.
 - 5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
 - 6. Closers shall have full size cover.
 - 7. Closers shall have adjustable hydraulic back-check and separate valves for closing and latching speed.

2.4 DOOR STOPS

- A. ANSI A156.16.
- B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
- C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L22251 (rubber pads having concave face) to receive turn piece or button.
- D. Substitute floor stops Type L22141 or L22161 as appropriate, when wall bumpers would not provide an effective door stop.
- E. Provide stop Type L22011 or L22181, as applicable for exterior doors.
- F. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.
- G. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.

2.5 LOCKS AND LATCHES

- A. 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 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.
- B. In addition to above requirements, locks and latches shall comply with following requirements:
 - 1. Mortise Lock and Latch Sets: ANSI/BHMA A156 13 Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets shall have lever handles similar to Falcon S-lever Design. Lever handle shall be fabricated from wrought stainless steel. No substitute lever design or material shall be accepted. All locks and latchsets shall be furnished with curved lip strike and wrought box. Lock function F02 shall be furnished with key plates similar to Russwins No. A70. All lock cases installed on lead lined doors shall be lead lined

before applying final hardware finish. Furnish armored fronts for all mortise locks.

2. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.5.

2.6 KEYS

- A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locksets	2 keys each
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	1 key

2.7 KEY CABINET

- A. ANSI Standard A156.5. Provide key cabinet made of cold rolled, 1.2 mm (0.0478 inch) thick furniture steel electro-welded. Doors shall have "no sag" continuous brass-pin piano type hinge and be equipped with chrome plated locking door handles, hook cam and two parasentric keys. All locks shall be nickel plated with solid brass pin tumbler cylinder keyed as directed. Key Cabinet and Key Control System shall accommodate all keys for this project plus 25 percent.
- B. Key tags shall consist of two sets: Permanent self-locking and loan key snaphook type with tag colors as follows: Red fiber marker of the permanent self-locking type approximately 32 mm (1-1/4 inch) in diameter engraved with the legend "FILE KEY MUST NOT BE LOANED." Also furnish for each hook a white cloverleaf key marker with snap-hooks engraved with the legend "LOAN KEY."
- C. The manufacturer of the lock cylinders and locks shall attach a key tag to keys of each lock cylinder and shall mark thereon the respective item number and key change number. Provide each group of keys in a key gathering envelope (supplied by Key Cabinet Manufacturer) in which the lock manufacturer shall include the following information: Item number, key change number and door number. The contractor shall furnish the Key Cabinet Manufacturer the hardware and keying schedules and change keys.
- D. The Key Cabinet Manufacturer shall set up a three-way cross index system, including master keys, listing the keys alphabetically, the hooks numerically and the key changes numerically on different colored index cards. Index cards shall be typewritten and inserted in a durable binder. Attach the keys to the two sets of numbered tags supplied with the cabinet. (The permanent tag and the loan key tag) . Instruct the

owner in proper use of the system. Install cabinet as directed by the Resident Engineer.

2.8 ARMOR PLATES, COMBINATION KICK-MOP PLATES AND DOOR EDGING

- A. ANSI Standard A156.6.
- B. Provide protective plates as specified below:
 - 1. Kick-mop plates and armor plates plastic or metal, Type J100 series, color as required.
 - 2. Provide kick-mop plates for both sides of each new door, except where noted as not required. Kick-mop plates shall be 200 mm (8 inches) high. On push side of doors where jamb stop extends to floor, make combination kick-mop 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 combination kick-mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
 - 3. Kick-mop plates are not required on following door sides:
 - Armor plate side of doors
 - Exterior side of exterior doors
 - Closet side of closet doors
 - Storage side of doors to or from storage spaces
 - Both sides of aluminum entrance doors
 - 4. Armor plate for doors are listed under Article "Hardware Sets". Armor plates shall be 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt cross bar.

2.9 FLUSH BOLTS (LEVER EXTENSION)

- A. ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors. Modify flush bolts to fit stiles of aluminum doors on double-acting doors.
- B. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).
- C. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.

2.10 FLUSH BOLTS (AUTOMATIC)

ANSI A156.16. 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).

2.11 DOOR PULLS

ANSI A156.6. Pull plate 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Cut plates of door pulls for cylinders, or turn pieces where required.

2.12 PUSH PLATES

ANSI A156.6. Plastic, Type J302, 200 mm (8 inches) wide by 350 mm (14 inches) high. Provide plastic Type J300 plates 100 mm (4 inches wide by 350 mm (14 inches) high) where push plates are specified for doors with stiles less than 200 mm (8 inches) wide. Color shall be as specified for kick-mop plates in Section 09050, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES. Cut plates for cylinders, and turn pieces where required. When wood grain plastic plates are specified in INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES Section, grain in plates shall run in same direction as grain of face veneer of wood doors.

2.13 THRESHOLDS

A. ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, thresholds shall be installed in a bed of sealant with machine screws and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.

2.14 AUTOMATIC DOOR BOTTOM SEAL

ANSI A156.22

2.15 WEATHERSTRIPS (FOR EXTERIOR DOORS)

ANSI A156.22 Air leakage not to exceed 0.50 CFM per foot of crack length (0.000774m³/s/m).

2.16 MISCELLANEOUS HARDWARE

A. Access Doors (including Sheet Metal, Screen and Woven Wire Mesh Types): Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E76213,

conforming to ANSI A156.5. Key locks as directed. Ship lock prepaid to the door manufacturer. Hinges shall be provided by door manufacturer.

- B. Cylinders for Various Partitions and Doors: Key cylinders same as entrance doors of area in which partitions and door occur, except as otherwise specified. Provide cylinders to operate locking devices where specified for following partitions and doors:

- Folding doors and partitions
- Wicket door (in roll-up door assemblies)
- Slide-up doors
- Swing-up doors
- Fire-rated access doors-Engineer's key set
- Doors from corridor to electromagnetic shielded room
- Day gate on vault door

- C. Mutes: ANSI A156.16. Provide door mutes or door silencers Type L03011, of white or light gray color, on each steel door frame, except 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.

2.17 FINISHES

- A. Exposed surfaces of hardware shall have ANSI A156.18 (BHMA Standard 1301), 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, 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
 3. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color, Dull Brass color or Bronze color.
 4. Thresholds: Mill finish aluminum.
 5. Other primed steel hardware: 652
- D. Hardware Finishes for Existing Buildings: U.S. Standard finishes to match finishes of hardware in (similar) existing spaces except where otherwise specified.
- E. Color of Plastic Items: See Section, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES. Where colors other than chocolate brown

or black are specified, color of core material may be different than color of face.

- F. 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.

2.18 BASE METALS

Apply specified U.S. Standard finishes on different base metals as following:

Finish	Apply On
652	<u>Steel</u>
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 Resident Engineer for approval.

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 regular arm. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.
- B. Substitute parallel arm or top jamb mounting for regular arm mounting where the following conditions occur:
1. Where door swing, in full open position, would be limited to less than 90 degrees due to partition construction and closer location.
 2. Where door to room opens outward into corridor, except security bathroom and anteroom doors which shall have closer installed parallel arm on exterior side of doors.
 3. Where exterior doors open outward.

C. Hinge Size Requirements:

Thickness of Door	Width of Door	Height of Hinge
45 mm (1-3/4 inch)	900 mm (3feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	125 mm (5 inches)
35 mm (1-3/8 inch) (hollow core wood doors)	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

D. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim.

E. 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.

F. 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

G. 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.

H. 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.

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SECTION 08721
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies equipment, controls and accessories required to provide automatic operation of hinged doors with an automatic locking system.

1.2 RELATED WORK

- A. Aluminum frames entrance work; Section 08410, ALUMINUM ENTRANCES AND STORE FRONTS.
- B. Door hardware; Section 08710, BUILDERS HARDWARE.
- C. Glass and glazing of doors and frames; Section 08810, GLASS AND GLAZING.
- D. Electric general wiring, connections and equipment requirements; Division 16, ELECTRICAL.
- E. Smoke detectors for control of fire/smoke doors to be wired per Section 13850, FIRE ALARM SYSTEMS.

1.3 MANUFACTURER'S QUALIFICATIONS

- A. Automatic door operators, controls and other equipment shall be products of a manufacturer regularly engaged in manufacturing such equipment for a minimum of three years.
- B. One type of automatic door equipment shall be used throughout the building.

1.4 GUARANTEE

Automatic door operators shall be subject to the terms of the "Guaranty" Article of Section 01001, GENERAL CONDITIONS, except that the Guaranty period shall be two years in lieu of one year.

1.5 MAINTENANCE MANUALS

In accordance with section 01010, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS," furnish maintenance manuals and instructions on automatic door operators.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's literature and data describing operators, power units, controls, door hardware and safety devices.
- C. Shop Drawings:
 - 1. Showing location of controls and safety devices in relationship to each automatically operated door.
 - 2. Showing operator installation.

1.7 DESIGN CRITERIA

- A. Automatic door equipment shall accommodate heavy traffic as well as the weight of the doors. Except as otherwise shown, provide operators which will move the doors from the fully closed to fully opened position in three seconds maximum time interval, when speed adjustment is at maximum setting.
- B. Equipment: UL approved, applicable code. Provide key operated power disconnect wall switch for each door installation.
- C. Electrical Wiring, Connections and Equipment: Provide all motor, starter, controls, associated devices, and interconnecting wiring required for the installation. Provide wiring so that only a single power supply is required. Motors shall be rated one-half horse power and larger and shall be single phase 115 volts. Equipment and wiring shall be as specified in Division 16, ELECTRICAL.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Builders Hardware Manufacturers Association, Inc. (BHMA):
A156.10-99.....Power Operated Pedestrian Doors (BHMA 1601)
- C. National Fire Protection Association (NFPA):
80-99Fire Doors and Windows
101-00.....Life Safety Code

PART 2 - PRODUCTS**2.1 OPERATORS**

- A. Automatic door operators shall be heavy duty type for institutional doors.
- B. Overhead Mounted Operators: Electric type enclosed in housing concealing operator mechanism and mounting brackets. Furnish metal mounting supports, brackets and other accessories necessary for the installation of operators at the head of the door frames.

2.2 ELECTRIC TYPE

- A. General: All operators shall have checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle. Operators shall recycle doors instantaneously to full open position from any point in closing cycle when control switch is reactivated. Operators shall, when automatic power is interrupted or shut-off, permit doors to easily open manually without damage to automatic operator system.

B. Electric Type Operator for Swinging Doors: Operator shall be swinging type enclosed in housing. Operator shall open door by energizing motor and shall stop by electrically reducing voltage and stalling motor against mechanical stop. Door shall close by means of spring energy, and close force shall be controlled by gear system and motor being used as dynamic break without power. System shall operate as manual door control in event of power failure. Opening and closing speeds shall be adjustable.

1. Swing Operator Housing: Housing shall be 140 mm (5-1/2 inches) wide by 150 mm (six inches) high aluminum extrusions with enclosed end caps for application to four-inch and larger frame systems. All structural sections shall have a minimum thickness of 3.7 mm (0.146-inch) and be fabricated of 6063-T5 aluminum alloy.
2. Swing Power Operator: Completely assembled and sealed unit which shall include helical gear drive transmission, mechanical spring and bearings, all located in cast aluminum case and filled with special lubricant for extreme temperature conditions. A "DC" shunt-wound permanent magnet motor with sealed ball bearings shall be attached to transmission system. Complete unit shall be rubber mounted with provisions for easy maintenance and replacement, without removing door from pivots or frame.
3. Connecting hardware for swing overhead concealed type power operator shall have drive arm attached to door with a pin linkage rotating in a self-lubricating bearing and adjustable slide block, traveling in an interconnected track and top pivot assembly. Top track and pivot assembly shall be fabricated of steel. Door shall not pivot on shaft of operator.
4. Electrical Control: Operator shall have a self contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator. Relays shall be plug-in type for individual replacement and all connecting harnesses shall have interlocking plugs. Control shall also include time delay for normal cycle. Swing door control shall include safe-swing circuit with optional switching which automatically limits power and slows door when approached from the doors swing area.

C. On pairs of doors, operators shall allow either door to be opened manually without the other door opening.

2.3 POWER UNITS

Provide separate self-contained electric units, for automatic operators located on each floor of the building. Interruption or failure of power units for operators located on one floor of the building shall not interfere with continuous performance of automatic operated doors located on other floors. Capacity and size of power units shall be in accordance with automatic operator manufacturer's specifications.

2.5 DOOR CONTROLS

- A. Opening and closing actions of doors shall be actuated by controls and safety devices specified, and conform to BHMA 156.10. Controls shall cause doors to open instantly when control device is actuated; hold doors in open positions; then, cause doors to close, unless safety device or reactivated control interrupts operation.
- B. Manual Controls:
 - 1. Keyless entry pad operable by identification card.
 - 2. Push Plate Wall Switch: Recess type, cast aluminum or stainless steel push plate minimum 100 mm by 100 mm (four-inch by four-inch), with 13 mm (1/2-inch) high letters "To Operate Door--Push" engraved on face of plate.
- C. Unless otherwise Specified, all doors shall operate for two way traffic so that door operation can be controlled from either direction of approach.

2.6 SAFETY DEVICES

- A. Area over which doors swing or slide shall be a safety section and anyone standing in path of door's movement shall be protected by a safety device, except where push controls are shown.
- B. Time delay switches shall be adjustable between 3 to 60 seconds and shall control closing cycle of doors.
- C. Each swing door shall have installed on the pull side a presence sensor to detect any person standing in the door swing path and prevent the door from opening.

2.7 FIRE DOORS AND FRAMES FOR USE WITH AUTOMATIC DOOR OPERATORS

- A. Furnish and install Automatic Swinging Fire Door Package consisting of two swinging door operators and all accessories; including necessary connecting hardware, as shown and in accordance with manufacturer's working drawings, wiring diagrams and instructions. Use only equipment listed by the Underwriters Laboratories Inc., and meeting provisions of NFPA 80 and 101. The work under this section shall be coordinated with the work of all trades. Header construction shall be adequate to support the operator provided.

- B. Furnish and install Automatic Swinging Fire Door Package consisting of the following equipment per package, per door:
- Operators, connecting rods and door arms.
 - Control Box (Flush mount or surface mount).
 - Electric Latch. 1-1/2 Pair Stanley number FBB-168 hinges. Control relays and push plate wall switches. Labeled Swinging Fire Door Frame w/Door; "B" labeled. Frame and door shall be designed to accommodate latch control system. Fire exit hardware (panic device).
 - Smoke detectors as required.
 - Reset button for automatic operation.
- C. Operators - Power Opening and Spring Closing: Opening action shall be controlled for required speed and power at door location. Closing speed shall be controlled by power springs. Built-in adjustable two-stage checking cylinders for both opening and closing limits. Operators to contain plug-in type electrical control relays. Operators to instantaneously recycle to full open position from any point in closing cycle. Operator shall be UL listed.
- D. Frames and Doors: "B" labeled for double egress applications and for perimeter applications. Doors shall be hinge hung and designed to accommodate latch control system.
- E. Operating Sequence of System - Normal Operation With Power On: The electric solenoid latches in the header shall be normally held in the retracted position, electrically. This shall allow normal use of the doors in the automated mode. Fire exit hardware shall not latch as long as the electric solenoid latches are held in the energized retracted position.
1. UL listed smoke detectors and fire alarm local building system shall be the triggering mechanism for the fire mode.
 2. Power Failure or Fire Mode: In either event, the electric solenoid latch coils shall be de-energized. The latches shall extend into the tripping position. The operators shall be de-energized--the springs shall close the doors. When the doors reach the closed position, they shall latch mechanically by the fire exit hardware. The doors shall only be opened by manually operating the fire exit hardware cross bars.
 3. Resetting for Automatic Operation: When reset button of magnetic control or control box is pressed, electric solenoid latch shall return to the retracted position electrically. Fire exit door bolts shall be reset by pressing fire exit cross bars of each door. Doors

should now be in their automatic mode. The control system shall be UL listed.

- F. Actuating control shall be the following, selected to suit the existing traffic conditions and conform to the operating limits of the control. Optional 3-30 second plug-in time delay relay shall be provided when required. Manual controls shall be Push Plate Switch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate installation of equipment with other related work. Manual controls and power disconnect switches shall be recessed or semi-flush mounted in partitions. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment, in finish work.
- B. Install power units in locations shown. Where units are to be mounted on walls, provide metal supports or shelves for the units. All equipment, including time delay switches, shall be accessible for maintenance and adjustment.
- C. Operators shall be adjusted and must function properly for the type of traffic (pedestrians, carts, stretchers and wheelchairs) expected to pass through doors. Each door leaf of pairs of doors shall open and close in synchronization. On pairs of doors, operators shall allow either door to be opened manually without the other door opening.
- D. Install controls at positions shown and make them convenient for particular traffic expected to pass through openings. Maximum height of push plate wall switches from finished floors shall be 40 inches unless otherwise approved by the Resident Engineer.

3.2 SCHEDULE

- A. Vestibule Doors at ED Entrance A125.
 - 1. Operator: Overhead mounted.
 - 2. Controls: Push Plate Wall Switch, Motion sensor, and keyless entry pad (card).
 - 3. Safety Devices: Presence Sensor.
- B. Pair of Doors at Corridors AC1-F, AC1-C, and AC1-D.
 - 1. Operators: Overhead mounted.
 - 2. Controls: Push plates wall switch and keyless entry pad (card).
 - 3. Safety Device: Presence Sensors.

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SECTION 08745
ELECTROMAGNETIC LOCKING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the furnishing and installation of a low-voltage electromagnetic delayed egress locking device door control and monitoring system.
- B. Provide all outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation. 1. Wire runs shall be in conduit.
- C. Requirements for conduit, wiring, devices, boxes and other items required to provide line current (110V-AC to 125V-AC) to the console and to the power supply and control unit at each door location, are specified in Division 16, ELECTRICAL.

1.2 RELATED WORK

- A. Hollow metal doors and frames: Section 08110, STEEL DOORS AND FRAMES.
- B. Aluminum hinged doors and entrance construction: Section 08410, ALUMINUM ENTRANCES AND STOREFRONTS.
- C. Door hardware: Section 08710, BUILDERS HARDWARE.
- D. Power-operated doors: Section 08721, AUTOMATIC DOOR OPERATORS.
- E. Fire Alarm System: SECTION 13850, FIRE ALARM - LOCAL BUILDING SYSTEM.
- F. Section 16050, BASIC METHODS AND REQUIREMENTS (ELECTRICAL).
- G. Section 16111, CONDUIT SYSTEMS.
- H. Section 16127, CABLES, LOW VOLTAGE (600 VOLTS AND BELOW).

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Approval of Contracting Officer is required for products or services of proposed manufacturer, suppliers and installers and will be based upon conformance to the following:
 - 1. Locking devices, power supplies, controls and monitoring system shall be products of a single manufacturer regularly and currently engaged in production of electromagnetic security locking systems.
 - 2. The manufacturer's products shall have been in satisfactory operation on at least three similar installations for not less than three years. Submit list of installations.
 - 3. The installer shall be a permanent organization approved by means of a certification letter from all the manufacturers, having facilities and employing trained personnel with technical qualifications and experience to prepare for the installation, to install the required system and to provide periodic maintenance. The installer shall have

been installing security systems for a period of not less than three years.

- B. Door and frame components, including locking device, shall be tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory for Accident Hazard or Fire Listed Hardware.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA):
 - 101-1997 Life Safety Code
 - 70-1996 National Electrical Code

1.5 SUBMITTALS

- A. Provide submittals in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Product Data:
 - 1. Complete descriptive data and details for each component, including dimensions, finishes, wiring diagrams, test reports, operation and installation instructions.
 - 2. Details for the complete system, including color-coded wiring diagrams, interface with other systems, specific locations of all concealed components, operation and maintenance procedures.
- C. Equipment Schedule at each door opening.
 - 1. Provide elevation drawings for each opening showing components location and conduit runs.
 - 2. Provide point to point wire connections of each component and at the completion of the project provide a complete set of as built drawings.

1.6 DELIVERY AND STORAGE

- A. Components of the system shall be delivered to job site in their original cartons, labeled with complete information for identification and containing installation instructions, screws and mounting accessories.
- B. Store equipment in a dry storage facility and in an orderly manner, protected from damage by weather and construction operations. **1.7**

GUARANTEE

- A. Principal components of the system, including the control console, electromagnetic locks and power-control units shall be guaranteed against malfunctions due to defects in materials and workmanship and shall be subject to the terms of Article GUARANTY of Section 01001, GENERAL CONDITIONS, except that the guaranty period shall be five years.

- B. Also furnish written service contract for a period of two years from date of final acceptance providing for quarterly inspection and call-back service and prompt adjustment, repair or replacement of malfunctioning components without additional cost to the Government.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer's offering products to conform to this specification are Locknetics, Forestville, CT., Securitron Corp., Sparks, NV.

2.2 SYSTEM DESCRIPTION

- A. Locking system shall be a "fail-safe open" system so that all doors will fail unlocked in the event of a power failure. The electromagnetic locking system will not be connected to the emergency power supply.
 - 1. All components shall be from one manufacturer.
- B. Electromagnetic locks shall release immediately (authorized exit) if one of the following occurs:
 - 1. Fire alarm is activated.
 - 2. Power fails.
 - 3. Key or card operated switch is activated (without setting off alarm).
 - 4. Console release switch is activated (without setting off alarm).
 - 5. Other authorized release is activated.
- C. Electromagnetic locks shall release after 15 seconds of unauthorized exit but central console shall be notified immediately if one of the following occurs and shall set off local alarms:
 - 1. Pushing on the exit device for a minimum of 3 seconds with a force not to exceed 67 N (15 lbf).
 - 2. Exit device push bar is activated.
 - 3. Push plate operator is activated.
 - 4. Pull station operator is activated.
 - 5. Other unauthorized release is activated.
- D. Automatic Control:
 - 1. Electromagnetic Locks shall be controlled by time devices and shall be wired through console to allow locks to be unlocked or locked as required during certain time of day.
 - 2. Provide field programmable time clocks so that each exit can be individually controlled. Locate time clock in the security station room A125 A. Provide nameplates to identify door controlled.
- E. Once the door lock has been released by the application of force to the releasing device, relocking shall be by manual means only.

- F. Each lock or pair condition shall be wired through a separate power supply and be controlled and monitored by a central control console and additionally monitored by a second console.
- G. Lock control wiring shall be supervised so that any break between lock and console shall cause a notice at the console.
- H. Automatic Doors: Push plate wall switch or other method to operate automatic doors shall have signs in conformance with NFPA 101, and shall be wired through 15 second time delay so that switch will not open doors until delay release of electromagnet has occurred.
 - 1. When the electromagnet device is de-energized, normal switches to operate automatic doors shall be operable.
- I. Exit device shall be installed on each exterior door equipped with electromagnetic lock to accomplish activation of 15 second time delay.
- J. Door Sign: On the door adjacent to the release device, provide sign in letters at least 25mm (1 inch) high and 3mm (1/8 inch) in stroke width on a contrasting background that reads "PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 SECONDS".

2.3 LOCKING DEVICES

- A. Locks shall be electromagnetic type, without mechanical linkage utilizing no moving parts, and securing the door to its frame solely by electromagnetic force.
 - 1. For a pair of swinging doors, two electromagnetic devices shall be mounted in a common housing.
- B. Locking device shall be rated 24V-DC plus or minus 15 percent at 2 amps, and shall have a minimum deadweight holding force of not less than 675 Kg (1500 pounds) for swinging doors. The locking device shall remain de-energized or energized while the door is open.
- C. The device shall be equipped with a built-in power sensor capable of determining whether the required bond between the lock and door-mounted armature has occurred.
- D. Lock housing dimensions shall not exceed 350 mm (14 inches) in length for a single unit, or 625 mm (25 inches) in length for a double door unit to provide minimum interference with door hardware. Housing shall not project more than 70 mm (2 3/4 inches) into the door opening.
- E. The lock shall have an internal, replaceable voltage kick-back protection.
- F. A door status switch, single pole double throw adjustable for sensitivity, shall be semi or fully concealed within the lock housing to prevent tampering and attempts to defeat the system.
 - 1. Door status switch shall be flush mounted on sliding doors.

- G. The door-mounted armature shall have provisions for adjusting alignment to compensate for normal door wear and abuse.

2.4 POWER SUPPLY AND CONTROL UNIT

- A. The power supply-control unit shall power and control the electromagnetic lock. One unit shall be provided for each entrance and shall be capable of supply and control for a pair of doors. If located more than 12 m (40 feet) from the lock, wire size shall be increased for the additional voltage drop.
- B. Unit shall have provisions for interfacing with panic hardware egress switch(es).
- C. The power supply of 24V DC (filtered and regulated) to the lock shall be rated for continuous duty and the unit shall perform properly at 115V AC with maximum 15 percent voltage drop. The unit shall include a fused primary for total system protection.
- D. If needed, the unit shall include a residual magnetism neutralizing module to insure that residual magnetism does not exert holding power (exceeding 20 pounds) following an authorized release of the lock.

2.5 CONTROL AND MONITORING CONSOLES

- A. Central Control and Monitoring Console:
 - 1. Provide a central control and monitoring console in the department security office, room A125 A.
 - 2. The central control console shall be a desk top unit, consisting of a main control and monitoring circuit, fire alarm interface, individual control and monitoring circuits for the number of controlled openings required, and power supply for each circuit. Desk top unit to have heavy duty 125V cord with straight blade 20A plug. Provide cord with equipment grounding conductor bonded to equipment chassis.
 - 3. External connections shall be through easily accessible and clearly marked screw terminals on the console's back panel or in a separate enclosure.
 - 4. The main control and monitoring circuit shall include a three-position On/Off /By-pass key switch, Power-on light, Hazard Alarm light, Manual Reset of hazard alarm circuit with a manual resettable alarm indicator and an audible violation alarm with manual override switch. Each control and monitoring circuit shall include interconnected closed relays for greater reliability and longer life, and shall consist of three combination indicator/actuators equipped with replaceable extended life lamps.
 - 5. Operation of main control circuit: Activating fire system only shall release all doors, except when key switch on console is in by-pass (or

override) mode (for scheduled test). It shall be possible to relock by actuating a reset (push button) switch after fire alarm has been reset. A violation of any station shall sound audible in addition to illuminating the appropriate red indicator light.

6. Operation of individual control and monitoring circuits: Each circuit shall service a door or a pair of doors. Monitoring shall be accomplished by a system of red, amber and green lights mounted in the console.

- a. The green secure lamps occupying the (bottom) row shall show each door to be closed and secured when the electromagnetic lock is energized. The alternate action control switch position shall permit authorized maintained unlocking of the selected door from the console.
- b. The amber Access lamps occupying the (middle) row shall show each door to be closed but not secured. The momentary action control shall provide authorized momentary unlocking, door automatically relocking upon closing.
- c. The red Open lamps occupying the (top) row shall show each door open. When a door is illegally opened, the red lamp shall be accompanied by the audible violation alarm and shall remain lit after the door is closed. The momentary action control shall provide for resetting the Violation alarm and red lamp only after the door has been closed following a violation, and permits testing the violation alarm mode without breaking security.
- d. The red and green station lights shall be lit at the same time to show a door is again secured after having been violated or to indicate a malfunction.

2.6 SUPPLEMENTARY COMPONENTS

- A. Adjustable mounting plate, use for surface mounting.
- B. Filler plates and angle brackets are required depending on door and frame conditions.
- C. Guard plate shall restrict access to door status switch and shear line of magnet.
 1. Provide guard plate where required to prevent tampering with system.
- D. Armature shall be furnished for each door to provide a positive bonding surface for the electromagnet. Unit shall be surface mounted or mortised into door or frame as required.
- E. Swipe card operated switches shall be single pole double throw momentary type with 20 second time delay (adjustable 6 to 20 seconds), to delay

automatic relocking after a legal release of lock and permit sufficient time to pass through the door.

1. Swipe card operated switch shall allow authorized entry or exit by interfacing with the electromagnet and deactivating the magnet without setting off the alarm at the door.
 - a. The operation of the card activated switch shall notify the console through the amber light that authorized entry or exit has taken place.
 2. Swipe card cover plates shall be provided with anti-tamper screws.
- F. The Automatic Door Controller, for authorized operation, shall interface with the electromagnet so that on automatic doors when the key operated switch is activated, or any other prescribed method is used, the doors normal mode of operation will be enabled.
1. For unauthorized operation on automatic doors when the exit device is depressed or any other unauthorized method is used to operate the doors after 15 seconds, the doors normal mode of operation will be enabled.
 2. During this 15 second period an alarm shall sound at the door and also at the console.
 3. The motor on automatic door operator shall be provided with an interlock so that motor will not operate when doors are magnetically locked.
- H. Screws and bolts shall be 304 stainless steel with security type heads to prevent tampering with the system.

2.7 WIRING

- A. Wiring shall be copper stranded, No. 18 AWG minimum with 600 volt insulation.
- B. All wiring shall be color coded and installed in 19 mm (3/4 inch) minimum raceways.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install components of the electromagnetic locking system according to approved submittals, manufacturers detailed instructions, and requirements of NFPA 101, Life Safety Code.
- B. Coordinate the installation with installation of other control systems which interface with the electromagnetic locking system.
- C. Provide all miscellaneous mounting brackets, adapters, switches, electrical boxes, devices, conduit, wiring, fasteners and other items necessary to complete a fully operational system.

D. Perform electrical work to conform to the National Electrical Code and general requirements specified under Division 16, ELECTRICAL.

E. Do not damage finish surfaces of door frames, doors, and other materials. Provide temporary protection suitable for the hazard where appropriate.

3.2 COMPLETION

A. Installer shall visit the site after the system has been installed and before the date of final acceptance to check the installation and operation at each opening, to make or supervise final adjustments, if necessary, and to test and verify that the entire system is functioning properly as designed.

B. Arrange for the manufacturer's representative to give operating and maintenance instructions to Government representatives at the facility for a total of not more than 24 hours after the system has been placed into operation and tested.

C. Contractor shall submit certification that each opening equipped with an electromagnet has been checked by installer. Certificate shall state that egress system is functioning as required by NFPA 101.

3.3 EQUIPMENT SCHEDULES

Submit equipment schedule for approval. Coordinate with Hardware Schedule prepared under Section 08710 and 08721.

- - - E N D - - -

**SECTION 08750
INSTALLATION OF DOORS AND HARDWARE**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the hanging of doors and installation of hardware.
- B. Fitting and preparation for hardware of unfinished wood doors.
- C. Installation of lock cylinders in special doors.

1.2 RELATED WORK

- A. Sealants for Thresholds: Section 07920, SEALANTS AND CAULKING.
- B. Fitting and Preparation for hardware: Section 08110, STEEL DOORS AND FRAMES AND Section 08410, ALUMINUM ENTRANCES AND STORE FRONTS.
- C. Fitting and Preparation for Hardware of prefinished and prefit wood doors: Section 08210, WOOD DOORS.
- D. Special doors specified to have the hardware except cylinders furnished with the door and installed in accordance with the specification for each particular door:
 - 1. Aluminum doors and frames with automatic operators: Section 08721, AUTOMATIC DOOR OPERATORS.
 - 2. Roll-Up Doors and Grills: Section 08331, OVERHEAD ROLL-UP DOORS AND GRILLS.
- E. Door hardware, weatherstripping, seals, and location (height): Section 08710, BUILDER'S HARDWARE.

1.3 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. Door and Hardware Institute (DHI):
A115.1G-94..... Installation Guide for Doors and Hardware
- C. National Fire Protection Association (NFPA):
80-99..... Fire Doors and Windows
- D. American Society for Testing and Materials (ASTM): A167-99
.....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet and Strip

PART 2 - PRODUCTS

2.1 FASTENERS

- A. Use fasteners furnished with hardware for installation.

1. Where fasteners are not furnished with item, use fasteners of suitable size and type to harmonize with item as to material and finish and to suit material to which fastened.
 2. Use machine screws and metal expansion shields to secure hardware to concrete, ceramic or quarry tile, or solid masonry. Do not use fiber, plastic, and lead plugs or adhesives.
- B. Use non-ferrous metal fastenings exposed to weather.

2.2 SHIMS

Stainless steel, type 302 or 304, thickness for conditions required.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

- A. Hang doors and install hardware when concrete work, plastering, tile setting, and other operations have been completed which increase humidity and dust in building.
- B. Do not hang wood doors in areas where materials are not sufficiently dry so as to not affect the dimensional stability of the door.
- C. Install hardware, except hinges, after field painting or sealing, specified in Section PAINTING.
- D. Center doors in the opening or frame with contact surfaces fit tight and even without forcing or warping the components.
- E. Replace doors and frames that do not conform to hardware height requirements.

3.2 FITTING WOOD DOORS

- A. Do not alter pre-fit and pre-finished doors.
- B. Unless otherwise detailed, fit hinged doors with 3 mm (1/8 inch) clearance at hinge stiles, 3 mm (1/8 inch) at top and lock or meeting stiles, and 19 mm (3/4 inch) between bottom rail and floor.
- C. Bevel lock edge and meeting stile of single acting wood doors 3 mm (1/8 inch) for each 50 mm (2 inches) of door thickness.
- D. Immediately after fitting and cutting of wood doors for hardware, seal edges of doors as specified in Section 09900, PAINTING.
- E. Mortise wood doors for hardware using templates furnished under Section, BUILDER'S HARDWARE.
- F. Cut sinkages for lock fronts, strikes, hinges and similar items same size as item installed.

3.3 INSTALLING DOORS AND BUILDER'S HARDWARE

- A. Install hardware at the location (heights) specified.
- B. Install in accordance with the manufacturer's printed instructions and DHI A115.1G unless specified otherwise.

- C. Drill and tap screw holes in steel frames and doors for surface mounted hardware.
- D. Use shims only at hinges where required to provide uniform clearance and alignment of door. Cut shims from stainless steel sheet to same size as hinge.
- E. Do not drive screws in place.
- F. Carefully fit and securely attach hardware items to doors and frames.
- G. Closers including those with hold-open features:
 - 1. Where closers are mounted on doors, mount with sex nuts and bolts; fasten foot to frame with machine.
 - 2. Mount to provide maximum door opening permitted by building construction or equipment.
 - 3. Use regular arm mounting except where door swing is less than 90 degrees or closer is on interior of exterior door or door is equipped with roller latch.
- H. Thresholds:
 - 1. Install thresholds in a bed of sealant with machine screws and expansion shields. For sealant see section, SEALANT AD CAULKING.
 - 2. Cut thresholds to closely fit jambs.
 - 3. Drill and cut for door holders and bottom bolts where required.
- I. Install rain drips for heads of door frames not protected by canopy or soffit.
- J. Install key cabinet as directed by the Resident Engineer.

3.4 INSTALLING FIRE RATED DOORS

- A. Install fire rated doors in accordance with NFPA 80.
- B. Do not remove qualified testing and inspection agency label.

3.5 INSTALLING SOUND CONTROL DEVICES

Install sound rated door gasketing and bottom seal, and adjust to obtain the specified sound rating.

3.6 INSTALLING WEATHERSTRIPPING AND SEALS

- A. Accurately cut and fit weatherstrips and seals. Carefully aligned for full contact and tight seal and secure firmly to maintain weatherproof, waterproof, and lightproof seal without preventing smooth and easy operation of doors.
- B. Provide suitable blocking where necessary to clear hardware; and make adjustments as required to meet special conditions encountered.
- C. Prime paint wood surfaces which have been cut with wood sealer before weatherstrips are installed.

3.7 CLEANING AND ADJUSTING

- A. Adjust Doors, including hardware to operate as designed without binding or deformation of the members.
- B. After installation, clean surfaces, remove temporary labels, paint spots and other defacement.
- C. Clean prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the manufacturer.

3.8 PROTECTION

- A. Protect doors and hardware from damage until completion of the project.
- B. Protective covering for wood doors is specified in Section, WOOD DOORS.

- - - E N D - - -

SECTION 08810
GLASS AND GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies glass, plastic, related glazing materials and accessories. Glazing products specified apply to factory or field glazed items.

1.2 RELATED WORK

- A. Factory glazed by manufacturer in following units:
 - 1. Section 08210, WOOD DOORS.
 - 2. Mirrors: Section 10800, TOILET AND BATH ACCESSORIES.
 - 3. Bullet resisting glass: Section 11022, SERVICE WINDOW UNITS- BULLET RESISTANT.
- C. Option: Windows glazed in factory by window manufacturer.
 - 1. Section 08410, ALUMINUM ENTRANCES AND STOREFRONT

1.3 LABELS

- A. Temporary labels:
 - 1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
 - 2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
 - 3. Temporary labels shall remain intact until glass is approved by Resident Engineer.
- B. Permanent labels:
 - 1. Locate in corner for each pane.
 - 2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
 - a. Tempered glass.
 - b. Laminated glass or have certificate for panes without permanent label.
 - 3. Bullet resistance glass or plastic assemblies in accordance with UL 752 requirements for power rating specified.

1.4 PERFORMANCE REQUIREMENTS

- A. Glass Thickness:
 - 1. Select thickness of glass to withstand dead loads and impact loads acting normal to plane of glass at design pressures calculated in accordance with applicable codes.
 - 2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.

3. Test in accordance with ASTM E 330.
4. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

1.5 SUBMITTALS

- A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Certificates:
 1. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.
 2. Certificate on shading coefficient.
 3. Certificate on "R" value when value is specified.
- C. Guaranties: Submit written guaranty, conforming to General Condition requirements, and to "Guaranty" Article in this Section.
- D. Manufacturer's Literature and Data:
 1. Glass, each kind required.
 2. Transparent (one-way vision glass) mirrors.
 3. Elastic compound for metal sash glazing.
 4. Glazing cushion.
 5. Sealing compound.
 - 6 Bullet resistive material.
- E. Samples:
 1. Size: 150 mm by 150 mm (6 inches by 6 inches).
 2. Transparent (one-way vision glass) mirrors.
- F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

1.7 PROJECT CONDITIONS

Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

1.8 GUARANTY

A. Guaranty: Conform to terms of "Guaranty" Article in Section 01001, GENERAL CONDITIONS, except extend guaranty period for the following:

1. Bullet resistive plastic material to remain visibly clear without discoloration for 10 years.
2. Laminated glass units to remain laminated for 5 years.

1.9 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute (ANSI):

Z97.1-94 Safety Glazing Material Used in Building -
Safety Performance Specifications and Methods of
Test.

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

C542-94 (R1999) Lock-Strip Gaskets.

C716-00 Installing Lock-Strip Gaskets and Infill Glazing
Materials.

C920-02..... Elastomeric Joint Sealants.

C1036-01..... Flat Glass.

C1048-97..... Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass.

C1172-96 Laminated Architectural Flat Glass.

E84-01 Surface Burning Characteristics of Building
Materials.

D. Code of Federal Regulations (CFR): 16 CFR 1201 - Safety Standard for
Architectural Glazing Materials; 1977, with 1984 Revision.

E. Glass Association of North America (GANA):

01 Glazing Manual (1997 Edition).

02 Sealant Manual (1990 Edition).

03 Laminated Glass Design Guide (2000 Edition).

04 Tempered Glass Engineering Standard Manual (2001
Edition).

G. National Fire Protection Association (NFPA):

80- (1999) Fire Doors and Windows.

H. National Fenestration Rating Council (NFRC):

Certified Products Directory (Latest Edition).

I. Safety Glazing Certification Council (SGCC):

Certified Products Directory (Issued Semi-Annually).

J. Underwriters Laboratories, Inc. (UL):

752-00 Bullet-Resisting Equipment. (Rev. thru Nov.1996)

Annual Issue Building Materials Directory

PART 2 - PRODUCT

2.1 GLASS

A. Use thickness stated unless specified otherwise in assemblies.

B. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality q4.
2. Thickness, 6 mm (1/4 inch).

2.2 HEAT-TREATED GLASS

A. Clear Tempered Glass.

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch) as indicated.

2.3 COATED GLASS

A. Spandrel Glass:

1. ASTM C1048, Kind HS, Condition B, Type I.
2. Thickness, 6 mm (1/4 inch).
3. Rigid insulation, 2", aluminum foil backed laminated to glass.

B. Transparent Mirror (One-Way-Vision Glass):

1. ASTM C1036, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).
3. Coated one face with a hard adherent reflective film of chromium or other coating of proven equivalent durability.
4. Visible light transmittance; eight percent, plus or minus two percent.
5. Visible reflectance; sixty percent, plus or minus five percent.
6. Light ratio; mirror side 10 or more; observer side one or less.
7. Assemble with coating covered and protected with a layer of clear glass not less than 3 mm (1/8 inch) thick.
8. Clean interface glass prior to assembly.
9. Tape edge to seal interface and hold panes together.

2.3 LAMINATED GLASS

A. Interlayer between glass panes: ASTM C 1172. Use heat and light stable polyvinyl butyral (PVB) plasticized resin sheeting.

B. Use 1.5 mm (0.060 inch) thick PVB for:

- 1 Heat strengthened glass assemblies.

2.4 LAMINATED GLAZING ASSEMBLIES

A. Clear Glazing:

1. Both panes clear glass ASTM C1036, Type I, Class 1, Quality q3.

2. Thickness: Each pane, 3 mm (1/8 inch) thick.

B. Clear Tempered Glazing:

1. Both panes ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2. Thickness: Each pane 4.8 mm (3/16 inch) thick.

2.5 BULLET RESISTIVE ASSEMBLY

A. Provide protection listed by UL ABPMED as bullet resisting, with a power rating of High Power-Small Arms (HSA) ballistic level in accordance with UL 752.

B. Fabricate from Type I, Class 1, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass.

1. Exterior pane 1/2" thick.

2. Interior pane 1/2" thick.

2.6 GLAZING ACCESSORIES

A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.

B. Setting Blocks: ASTM C864:

1. Channel shape; having 6 mm (1/4 inch) internal depth.

2. Shore a hardness of 80 to 90 Durometer.

3. Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.

4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.

5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.

C. Spacers: ASTM C864:

1. Channel shape having a 6 mm (1/4 inch) internal depth.

2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.

3. Lengths: One to 25 to 76 mm (one to three inches).

4. Shore a hardness of 40 to 50 Durometer.

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.

2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.

- E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.
- F. Glazing Gaskets: ASTM C864:
 - 1. Firm dense wedge shape for locking in sash.
 - 2. Soft, closed cell with locking key for sash key.
 - 3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- G. Glazing Sealants: ASTM C920, silicone neutral cure:
 - 1. Type S.
 - 2. Class 25
 - 3. Grade NS.
 - 4. Shore A hardness of 25 to 30 Durometer.
- H. 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.
- I. Color:
 - 1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be nonstaining.
 - 2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
 - 2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer's approved shop drawings.
- B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

3.2 PREPARATION

- A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 Sealant Manual.

- B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
- C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
- D. Verify that components used are compatible.
- E. Clean and dry glazing surfaces.
- F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION - GENERAL

- A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.
- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.
- D. Do not allow glass to rest on or contact any framing member.
- E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- G. Transparent (One-Way Vision Glass) Mirror: Use continuous channel glazing gasket.
- H. Bullet Resisting Material:
 - 1. Glaze as recommended by manufacturer, using glazing material which will permit expansion and contraction of the bullet resistive material in the frame.

3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing tape or spline to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Trim protruding tape edge.

3.5 REPLACEMENT AND CLEANING

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Resident Engineer.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.6 PROTECTION

Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.13 GLAZING SCHEDULE

- A. Tempered Glass:
 - 1. Install in full and half glazed doors unless indicated otherwise.
 - 2. Install in storefront, windows, and door sidelights adjacent to doors.
 - 3. Use clear tempered glass on interior side lights and doors, unless otherwise indicated or specified.
- B. Clear Glass:
 - 1. Interior observation windows not specified otherwise.
 - 2. Interior pane of dual glazed windows not receiving tempered, laminated or organic coated glass, or other special glass indicated or specified.
- C. Laminated Glass: Install as specified in doors, observation windows and interior pane of dual glazed windows where indicated.
- D. Bullet Resisting Assembly, Install specified assembly in service windows at Security Station.
- E. Transparent Mirror (One-Way-Vision Glass): Install in observation windows where indicated.

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SECTION 09050 – INTERIOR/ EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULE 01-4

VAMC: Edward Hines Jr. Medical Center

Location: Hines, Illinois

Project no. and Name: 578-315, CANOPY/AMBULANCE BAY/DECONTAMINATION AREA BLDG. 200

Submission: 100% Construction Documents

Date: July 1, 2009

SECTION 0905001-04

INTERIOR / EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULE

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 01340, Samples and Shop Drawings provide quadruplicate samples for color approval of materials and finishes specified in this section.

1. COLOR SLIDES-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

2002

PART I - GENERAL**2.1 DIVISION 6 - WOOD AND PLASTIC**

A. FINISH CARPENTRY AND MILLWORK (06200)

1. RECEPTION COUNTER PUBLIC OR PATIENT SIDE					
Room No. and Name	Component	Material	Species	Finish	Color
	Countertop		Corian	Matte	Cobalt
	Vertical Surface(s)	Laminated Plastic	Arborite	Semi-gloss	Natural Birch 7481-58
	Divider		Corian	Semi-gloss	Night Sky
	Reveal	Stainless Steel		Brush Finish	Natural
	Handrail				
	Bumper guard				
	Base		Corian	Semi-gloss	Night Sky

2.2 DIVISION 8 - DOORS AND WINDOWS

A. STEEL DOORS AND FRAMES (08110)

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
Interior Door	Latex Semi-gloss, Sherwin Williams, SW1201 Magic Night
Exterior Door	Acrylic Latex Semi-gloss, Sherwin Williams, A-100 - Color to match exterior window frames.

Frame	Latex Semi-gloss, Sherwin Williams, SW1201 Magic Night
Window frame	Latex Semi-gloss, Sherwin Williams, SW1201 Magic Night

B. WOOD DOORS (08210)

Component	Color of Stain
Door	Minwax Natural Oak #209

C. ACCORDIAN FOLDING DOORS (08353)

Location	Component	Finish	Manufacturer	Manufacturer Color Name/No.
Procedure Rm A144		Vinyl clad fabric	Modernfold	Wax 2065-6-01

D. BUILDERS HARDWARE (08710)

Item	Material	Manufacturer	Mfg. Color Name/No.
Stainless Steel Kick Plates / Armor Plates	Stainless Steel	IPC	
Plastic Kick Plates / Armor Plates	Rigid Vinyl Plastic	C/S Group	WP4, Ocean Grey, #853

2.3 DIVISION 9 - FINISHES

A. CERAMIC TILE (09310)

1. CERAMIC MOSAIC TILE (CT)					
Color	Size	Shape	Pattern	Manufacturer	Mfg. Color Name/No.

CT-1	2" x 2"	Square		American Olean	R03 - Sage
CT-2	4" x 4"	Coved Base		American Olean	R03 - Sage
CT-3	4" x 4"	Square		American Olean	#21 - Light Aspen
CT-4	4" x 4"	Square		American Olean	#03-Sage
CT-5	4" x 4"	Square		American Olean	#08 - Thunder Blue
CT-6	4" x 4"	Coved Base		American Olean	#21 - Light Aspen
CT-7	4" x 4"	Square		American Olean	#05 - Polar White
2. CERAMIC MOSAIC TILE GROUT (09310)					
Finish Code		Manufacturer		Mfg. Color Name/No	
1-GR		TEC		Standard White #931	
2-GR		TEC		Natural Gray #930	

B. ACCOUSTICAL CEILING (AT) (09510)

Finish Code	Component	Color Pattern	Manufacturer	Mfg Name/No.
1-ACT	Type III Units	2 x 4, #2767 White	Armstrong	Cortega Second Look II
2-ACT	Type IV units	2 x 4, #1716	Armstrong	Clean Room Mylar
1-OC		2 x 2, open cell, 3" cell	Chicago Metallic	03-Bronze Magna T-Cell

B. RESILIENT TILE FLOORING (09650)

Finish Code	Size	Material/Component	Manufacturer	Mfg Name/No.
1-VCT	12 X 12 X 1/8	VCT	Armstrong	Standard Excelon, Imperial #51836 Shelter White
2-VCT	12 x 12 x 1/8	VCT	Armstrong	Standard Excelon,

				Imperial #51906 Teal
3-VCT	12 x 12 x 1/8	VCT	Armstrong	Standard Excelon, Imperial #51903 Blue/Gray

C. VINYL SHEET FLOORING (VSF) (09665)

Finish Code	Pattern name	Manufacturer	Mfg. Color Name/No.
1-RSF		Lonseal	#457 Lonwood Natural Buckwheat
2-RSF		Lonseal	#455 Lonwood Natural Nutshell
3-RSF		Lonseal	#456 Lonwood Natural Quail Eggs

D. VINYL SHEET FLOORING, HEAT WELDED SEAMS (WSF) (09666)

Finish Code	Pattern name	Manufacturer	Mfg. Color Name/No.
4-RSF	Biospec Low Contrast	Mannington Commercial	15143 Navy

1. WELDING RODS (WSF) (09666)

Finish code	Manufacturer	Mfg. Color Name/No.
4-RSF	Mannington Commercial	842346

E. EPOXY RESINOUS FLOORING (ERF) (09704)

Finish code	Manufacturer	Mfg. Color Name/No.

1-EF	General Polymers	#330 Blue Stone

F. MULTI-COLOR COATING (MC) (09836)

Finish Code	Manufacturer	Mfg. Color Name/No.
1-PT	Polomyx	PL-00764W (light)
2-PT	Polomyx	PL-00766W (dark)

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.
	3-PT	G-3	Sherwin Williams	SW1011, Origami White
	4-PT	G-3	Sherwin Williams	SW1524, Byzantium
	5-PT	G-3	Sherwin Williams	SW1198, Blue Jade
	6-PT	G-5	Sherwin Williams	SW1201, Magic Night
	7-PT	G-3	Sherwin Williams	SW1025, Origami White
	8-PT	G-3	Sherwin Williams	SW1198, Blue Jade
	9-PT	G-3	Sherwin Williams	SW7077, Ceiling Bright White

10-PT	G-3	Sherwin Williams	SW6240 Windy Blue
P			
P			
P			
P			
P			
P			
P			
P			
P			
3. Stain Code (S)	Gloss and Transparency	Manufacturer	Mfg. Color Name/No.
	Semi		
S			
S			
S			
S			
S	Opaque		
S			
S			
S			
S			
4. Clear coatings Code(CC)	Gloss	Manufacturer	Mfg. Color Name/No.
CC			
CC			

G. RIGID COATED FABRIC WALLCOVERING (W) (09951)

Finish Code	Manufacturer	Mfg. Color Name/No.
WP-2	Sanitas - Impact Design Blenheim	1B21-80 SeaGlass
WP-3	Sanitas - Impact Design Blenheim	1B21-92 Tawny Shimmer

2.4 DIVISION 10 - SPECIALITIES

A. WALL GUARDS AND CORNER GUARDS (10260)

Item	Material	Manufacturer	Mfg. Color Name/No.
Corner Guards	Rigid Vinyl	CG-1, CG-2 - IPC CG-3, CG-4 - Corian CG-5, CG-6 - C/S Group	Taupe Black Quartz 2-SS C/S #853, Ocean Grey
Wall Guards and Handrail		HR-1, IPC HR-2, CVS Group	IPC Taupe C/S #853 Ocean Grey
Wall Guard	WP-1, WP-4, Rigid Vinyl Plastic	WP1-IPC, WP4-C/S	WP-1, Taupe, WP4, Ocean Grey, #853
Bumper Rail		BR-1 - IPC BR-2, Corian BR-3, C/S Group	BR-1 Taupe BR-2, Black Quartz 2-SS C/S #853 Ocean Grey

B. LOCKERS (10500)

Item	Finish	Manufacturer	Mfg. Color Name/No.
Lockers	Baked Enamel	Lyons	GN777-GM

C. TOILET AND BATH ACCESSORIES (10800)

Item	Material	Manufacturer	Mfg. Color Name/No.
TA-1 Paper Towel Disp (recessed)	Stainless Steel	Bobrick	B-359

TA-2 Paper Towel Disp with Waste	Stainless Steel	Bobrick	B-369
TA-3 Toilet Tissue Dispenser	Stainless Steel	Bobrick	B-697
TA-4 Paper Towel Disp. (Surface)	Stainless Steel	Bobrick	B-262
TA-5 Coat Hook	Stainless Steel	Bobrick	B-6707
TA-6 Grab Bar	Stainless Steel	Bobrick	B6800 Series
TA-7 Mop Rack	Stainless Steel	Bobrick	B-269
TA-8 Mirror, Surface mount	Stainless Steel	Bobrick	B290, 18x30
TA-9 Soap Dispenser, Surface	Stainless Steel	Bobrick	B-40
TA-11 Shower Rod	Stainless Steel	Bobrick	B-6047
TA-12 Soap Dish, Recessed	Stainless Steel	Bobrick	B-4380
TA-13 Towel Bar	Stainless Steel	Bobrick	B-530, 18"
TA-14 Semi-recessed Paper Towel w/ waste	Stainless Steel	Bobrick	B-399

2.5 DIVISION 12-FURNISHINGS

A. COUNTERTOPS AND ACCESSORIES (12303)

Component	Finish	Manufacturer	Mfg. Color Name
Plastic Laminate	Textured ARP Surface	Nevamar	Teal Slate Matrix MR-3-67

C. MOLDED PLASTIC CASEWORK (12347)

Component	Finish	Manufacturer	Mfg. Color Name
Component	Co/Struc	Herman Miller	Inner Tone light HF
Support Rails			
Free Standing			

Support			
Shelf Unit			
Hardware			
Countertops	Textured ARP Surface	Nevamar	Teal Slate Matrix MR-3-67
Panels			

2.6 DIVISION 16-ELECTRICAL

A. PATIENT WALL SYSTEMS (16685)

Colors to be selected by Architect from manufacturer's standards.

--- E N D---

SECTION 09100
NON-LOAD BEARING FRAMING SYSTEMS

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. Section 09260, GYPSUM BOARD SYSTEM
- B. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09500, ACOUSTICAL TREATMENT.
- C. Lathing & Cement Plastering, Section 09205, LATHING & CEMENT PLASTERING.

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 01340, SAMPLES AND SHOP DRAWINGS.
- 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 fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.
- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM) A123-00 Zinc
 (Hot-dip Galvanized) Coatings on Iron and
 Steel Products
- A653/A653M-00 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-
 Iron Alloy Coated (Galvannealed) by the Hot-Dip
 Process
- C11-98 Terminology Relating to Gypsum and related
 Building Materials and Systems
- C635-00 Manufacture, Performance, and Testing of Metal
 Suspension System for Acoustical Tile and Lay-in
 Panel Ceilings
- C636-96 ~~Thin Metal Ceiling Systems~~
 for Acoustical Tile and Lay-in Panels
- C645-00 Non-Structural Steel Framing Members
- C754-00 Installation of Steel Framing Members to Receive
 Screw-Attached Gypsum Panel Products
- C841-99 Installation of Interior Lathing and Furring
- C954-00 Steel Drill Screws for the Application of Gypsum
 Panel Products or Metal Plaster Bases to Steel
 Studs from 0.033 in. (0.84 mm) to 0.112 in.
 (2.84 mm) in Thickness
- C1002-00 ~~Self-Drilling Screws~~
 Panel Products or Metal Plaster Bases
- E580-00 Application of Ceiling Suspension Systems for
 Acoustical Tile and Lay-in Panels in Areas
 Requiring Moderate Seismic Restraint.
- C. Federal Specification (Fed. Spec.):
- FF-P-395B Pin, Drive, Guided And Pin Drive, Power Actuated
 (Fasteners For Powder Actuated And Hand Actuated
 Fastening Tools)

PART 2 - PRODUCTS

2.1 PROTECTIVE COATING

Galvanize steel studs, runners (track), rigid (hat section) furring channels, with coating designation of G-60 minimum, per ASTM 123.

2.2 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes and shown.
 - 1. Use ASTM A525 steel, 0.9 mm (0.0359-inch) thick bare metal (20 gauge).
 - 2. Runners same thickness as studs.
- B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
- C. 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.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

- A. ASTM C754, except as otherwise specified.
- B. For fire rated construction: Type and size same as used in fire rating test.
- C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.
- D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.
- E. Tie Wire and Hanger Wire:
 - 1. ASTM A641, soft temper, Class 1 coating.
 - 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- F. Attachments for Wall Furring:
 - 1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
 - 2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.
- G. Power Actuated Fasteners:
 - 1. Fed. Spec. FF-P-395.
 - 2. Fastener length and Class as required to resist twice the imposed loads; style suitable for type of hanger or bracket used.
 - 3. Eye Pin: Type I, Class 4, Style EP.
 - 4. Threaded Stud: Style SC for concrete; Style SS for steel.
 - 5. Drive Pins: Style PC for concrete, Style PS for steel.

6. For applications not specified, 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 407 mm (16 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions
- 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 as shown.
 2. Studs fastened flange to flange shall have 20 ga. 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 mid point, head and to top track and at 900 mm (36 inches) above head.
- H. Fastening Studs:
 1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with either 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. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
3. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
4. 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.
5. 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, heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items 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 600 mm (24-inch) centers for gypsum board anchorage.
- B. 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. //
- C. 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.
- D. 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.

3.6 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 09260
GYPSUM BOARD SYSTEM

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 09100, NON-LOAD BEARING FRAMING SYSTEMS.
- B. Sound deadening board: Section 07210, BUILDING INSULATION.
- C. Acoustical Sealants: Section 07920, SEALANTS AND CAULKING.
- D. Gypsum board ceiling panels: Section 09500, 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.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- 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.
- D. Samples:
 - 1. Cornerbead.
 - 2. Edge trim.
 - 3. Control joints.

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): C11-02
 Terminology Relating to Gypsum and Related
 Building Materials and Systems
- C36-01.....Gypsum Wallboard
- C442-01Gypsum Backing Board and Coreboard
- C475-01.....Joint Compound and Joint Tape for Finishing
 Gypsum Board
- C630-01.....Water Resistant Gypsum Backing Board
- C840-01.....Application and Finishing of Gypsum Board
- C954-00Steel 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
- C1002-01Steel Self-Piercing Tapping Screws for the
 Application of Gypsum Panel Products or Metal
 Plaster Bases to Wood Studs or Steel Studs
- C1047-99 ~~Assessment of Gypsum~~
 Veneer Base
- E84-01Surface Burning Characteristics of Building
 Materials
- C. Underwriters Laboratories Inc. (UL):
 Latest EditionFire Resistance Directory
- D. Inchcape Testing Services (ITS):
 Latest EditionsCertification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

- A. Gypsum Board: ASTM C36, 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.

2.2 SOUND ATTENUATION BATTS

- A. Sound Attenuation Batts: ASTM E413 Sound Transmission Class (STC) mineral fiber, thickness to meet required STC.

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.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

- A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:
 - 1. Two sides of partitions:
 - a. Fire rated partitions.
 - b. Smoke partitions.
 - c. Sound rated partitions.
 - d. Full height partitions shown (FHP).
 - 2. One side of partitions or furring:
 - a. Inside of exterior wall furring or stud construction.
 - b. Room side of room without suspended ceilings.
 - c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
 - 3. Corridor walls, corridor face.
- B. In locations other than those specified, extend gypsum board from floor to heights as follows:
 - 1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
 - 2. At ceiling of suspended gypsum board ceilings.
 - 3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.
- C. Use gypsum boards in maximum practical lengths to minimize number of end joints.

D. Bring gypsum board into contact, but do not force into place.

E. Ceilings:

1. For single-ply construction, use perpendicular application.
2. For two-ply assemblies:
 - a. Use perpendicular application.
 - b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.

F. Walls (Except Shaft Walls):

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. Stagger screws on abutting edges or ends.
3. For single-ply construction, apply gypsum board with long dimension parallel to framing members as required to minimize number of joints.
4. 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.
5. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply application requirements.
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.

G. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:

1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. Follow ASTM E497 for sound rated partitions. STC minimum values as shown.

H. 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.

3.5 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840.
- 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, gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, and sound rated construction Sanding is not required of non decorated surfaces.

3.6 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide smoke tight construction fire protection equivalent to the and STC equivalent to the sound rated construction.

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SECTION 09900
PAINTING

PART 1-GENERAL

1.1 DESCRIPTION

- A. Section specifies field painting.
- B. Section specifies prime coats which may be applied in shop under other sections.
- C. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.

1.2 RELATED WORK

- A. Shop prime painting of steel and ferrous metals: Divisions 5, 8, 10, 11, 15 and 16 sections.
- B. Prefinished flush doors with transparent finishes: Section, 08210 WOOD DOORS.
- C. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09050, INTERIOR EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES.
- D. Multi-color Textured Wall Finish: Section 09836, MULTI-COLOR COATING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data:
Before work is started, or sample panels are prepared, submit manufacturer's literature, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.
- C. Sample Panels:
 - 1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
 - 2. Panels to show color: Composition board, 100 by 250 by 3 mm (4 inch by 10 inch by 1/8 inch).
 - 3. Attach labels to panel stating the following:
 - a. Federal Specification Number or manufacturers name and product number of paints used.

- b. Specification code number specified in Section, 09050 INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES.
 - c. Product type and color.
 - d. Name of project.
- 4. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.
- D. Sample of identity markers if used.
- E. Manufacturers' Certificates indicating compliance with specified requirements:
 - 1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.

1.4 DELIVERY AND STORAGE

- A. Deliver materials to site in manufacturer's sealed container marked to show following:
 - 1. Name of manufacturer.
 - 2. Product type.
 - 3. Batch number.
 - 4. Instructions for use.
 - 5. Safety precautions.
- B. In addition to manufacturer's label, provide a label legibly printed as following:
 - 1. Federal Specification Number, where applicable, and name of material.
 - 2. Surface upon which material is to be applied.
 - 3. If paint or other coating, state coat types; prime, body or finish.
- C. Maintain space for storage, and handling of painting materials and equipment in a neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.
- D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

1.5 MOCK-UP PANEL

- A. Before starting application of water paint mixtures, apply paint as specified to an area, not to exceed 9 m² (100 ft²), selected by Resident Engineer.
- B. Finish and texture approved by Resident Engineer will be used as a standard of quality for remainder of work.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. American Conference Of Governmental Industrial Hygienists (ACGIH):

- ACGIH TLV-BKLT-1992.....Threshold Limit Values (TLV) for Chemical
Substances and Physical Agents and Biological
Exposure Indices (BEIs)
- ACGIH TLV-DOC.....Documentation of Threshold Limit Values and
Biological Exposure Indices, (Sixth Edition)
- C. American National Standards Institute (ANSI): A13.1-96. Scheme for
the Identification of Piping Systems
- D. American Society for Testing and Materials (ASTM):
D260-86..... Boiled Linseed Oil
- E. Commercial Item Description (CID):
A-A-1272Plaster, Gypsum (Spackling Compound)
A-A-1555Water Paint, Powder (Cementitious, White and
Colors) (WPC) (cancelled)
TT-F-322D Filler, Two-Component Type, For Dents, Cracks
- F. Federal Specifications (Fed Spec):
TT-F-332D Filler, Two-Component Type, For Dents, Cracks
- G. Master Painters Institute (MPI):
No. 9-02 Exterior Alkyd Enamel (EO)
No. 45-02 Interior Primer Sealer
No. 50-02 Interior Latex Primer Sealer
No. 51-02 Interior Alkyd, Eggshell
No. 52-02 Interior Latex, MPI Gloss Level 3 (II)
No. 54-02 Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)
No. 94-02 Exterior Alkyd, Semi-Gloss (EO)
No. 139-02 Interior High Performance Latex, MPI Gloss Level 3
(LL)
No. 141-02 Interior High Performance Latex (SG) MPI Gloss
Level 5

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Plastic Tape:
1. Pigmented vinyl plastic film in colors as specified in Section, 09050 or specified.
 2. Pressure sensitive adhesive back.
 3. Widths as shown.
- B. Identity markers options:
1. Pressure sensitive vinyl markers.
 2. Snap-on coil plastic markers.
- C. Exterior Alkyd Enamel (EO) : MPI 9
- D. Interior Low Sheen Latex: MPI 44.

- E. Interior Primer Sealer: MPI 45.
- F. Interior Alkyd, Semi-Gloss (AK) : MPI 47.
- G. Interior Latex Primer Sealer: MPI 50.
- H. Interior Alkyd, Eggshell: MPI 51
- I. Interior Latex, MPI Gloss Level 3 (LE) : MPI 52.
- J. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE) : MPI 54.
- K. Interior High Performance Latex, MPI Gloss Level 3 (LL) : MPI 139.
- L. Interior High Performance Latex (SG), MPI Gloss Level 5: MPI 141.

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.

2.3 REGULATORY REQUIREMENTS

- A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
 - 1. Volatile Organic Compounds (VOC) : VOC content of paint materials shall not exceed local, state or district requirements.
 - 2. Lead-Base Paint:
 - a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
 - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
 - c. For lead-paint removal, see Section 02090, LEAD PAINT REMOVAL.
 - 3. Asbestos: Materials shall not contain asbestos.
 - 4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
 - 5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
 - 1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.

2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each days work.

B. Atmospheric and Surface Conditions:

1. Do not apply coating when air or substrate conditions are:
 - a. Less than 3 degrees C (5 degrees F) above dew point.
 - b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.
2. Maintain interior temperatures until paint dries hard.
3. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
5. Apply only on clean and dry surfaces:

3.2 SURFACE PREPARATION

- A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.

B. General:

1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried. Reinstall after paint has cured.
2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
3. See other sections of specifications for specified surface conditions and prime coat.
4. Clean surfaces for painting with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry.

C. Ferrous Metals:

1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning).
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish

with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.

- a. This includes flat head countersunk screws used for permanent anchors.
 - b. Do not fill screws of item intended for removal such as glazing beads.
4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
 5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

D. Masonry:

1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section MORTAR AND GROUTS. Do not fill weep holes. Finish to match adjacent surfaces.

E. Gypsum Plaster and Gypsum Board:

1. Remove efflorescence, loose and chalking finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A [Plaster, Gypsum (Spackling Compound) finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.3 PAINT PREPARATION

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- D. Mix two component and two part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.

- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.4 APPLICATION

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three coats; prime, body, and finish. When two coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by Resident Engineer.
- E. Finish surfaces to show solid even color, free from runs, lumps, brushmarks, laps, holidays, or other defects.
- F. Apply by brush or roller except as otherwise specified.
- G. Do not spray paint in existing occupied spaces unless approved by Resident Engineer, except in spaces sealed from existing occupied spaces.
 - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
 - 2. In areas, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- I. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.5 PRIME PAINTING

- A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Metals except boilers, incinerator stacks, and engine exhaust pipes:
 - 1. Steel and iron: MPI 79 (Marine Alkyd Metal Primer) finish is specified.
 - 2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer).
 - 3. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel (EO)).
- D. Gypsum Board:
 - 1. Surfaces scheduled to have MPI 52 (Interior Latex, MPI Gloss Level 3 (LE)), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) MPI 53 (Interior Latex, MPI Gloss Level 3 (LE)) MPI 52 (Interior Latex, MPI

Gloss Level 3 (LE) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)).

2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) in shower

E. Concrete Masonry Units except glazed or integrally colored and decorative units:

1. MPI 4 (Block Filler) on interior surfaces.

3.6 EXTERIOR FINISHES

A. Apply following finish coats where specified in Section 09050 INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES.

B. Steel and Ferrous Metal

1. MPI 94 (Exterior Alkyd, Semi-Gloss (EO))

3.7 INTERIOR FINISHES

A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section, 09050 INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES.

B. Metal Work:

1. Apply to exposed surfaces.
2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) unless specified otherwise.
 - b. Machinery: One coat MPI 9 (Exterior Alkyd Enamel (EO)).

C. Gypsum Board:

1. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3 (LL)).

D. Masonry Walls:

1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
2. Two coats of (Interior Latex, MPI Gloss Level 3 (LE))

3.8 REFINISHING EXISTING PAINTED SURFACES

- A. Clean, patch and repair existing surfaces as specified under surface preparation.
- B. Remove and reinstall items as specified under surface preparation.
- C. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.
- D. Patched or Replaced Areas in Surfaces and Components: Apply spot prime and body coats as specified for new work to repaired areas or replaced components.

- E. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.
- F. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.
- G. Sand or dull glossy surfaces prior to painting.
- H. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.9 PAINT COLOR

- A. Color and gloss of finish coats is specified in Section 09050, INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES.
- B. For additional requirements regarding color see Articles, REFINISHING EXISTING PAINTED SURFACE and MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE.
- C. Coat Colors:
 - 1. Color of priming coat: Lighter than body coat.
 - 2. Color of body coat: Lighter than finish coat.
 - 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
 - 1. Paint to match color of casework where casework has a paint finish.
 - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.10 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.
- B. In spaces not scheduled to be finish painted in Section 09050, INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES paint as specified under paragraph H, colors.
- C. Paint various systems specified in Divisions 2, 15, and 16.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Color:

1. Paint items having no color specified in Section 09050, INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES to match surrounding surfaces.
 2. Paint colors as specified in Section 09050, INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES except for following:
 - a. White Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
 - b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
 - c. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conduits containing fire alarm control wiring, and fire alarm equipment.
 - d. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
- I. Apply paint systems on properly prepared and primed surface as follows:
1. Interior Locations:
 - a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:
 - 1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.
 - 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
 - 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
 - b. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 94 (Exterior Alkyd, Semi-gloss (EO)) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.
 2. Other exposed locations:
 - a. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 11 (Exterior Latex Semi-Gloss (AE)).

3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING

- A. Painting and finishing of interior work except as specified under paragraph 3.10 B.
 - 1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09050, INTERIOR EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES.
 - 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
 - 3. Painting of ferrous metal and galvanized metal.
 - 4. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
 - 1. Prefinished items:
 - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
 - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
 - 2. Finished surfaces:
 - a. Hardware except ferrous metal.
 - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
 - 3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
 - 4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - b. Tracks for overhead or coiling doors, shutters, and grilles.
 - 5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., Inchcape Testing Services, Inc., or Factory Mutual Research Corporation.
 - b. Identification plates, instruction plates, performance rating, and nomenclature.
 - 6. Concrete pavements, exterior exposed foundations walls.

7. Face brick.
8. Structural steel encased in concrete, masonry, or other enclosure.
9. Ceilings, walls, columns in interstitial spaces.

3.12 IDENTITY PAINTING SCHEDULE

- A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.
1. Legend may be identified using 2.1 G options or by stencil applications.
 2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12 000 mm (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
 3. Locate Legends clearly visible from operating position.
 4. Use arrow to indicate direction of flow.
 5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings where asterisk appears for High, Medium, and Low Pressure designations as follows:
 - a. High Pressure - 414 kPa (60 psig) and above.
 - b. Medium Pressure - 104 to 413 Kpa (15 to 59 psig).
 - c. Low Pressure - 103 kPa (14 psig) and below.
 - d. Add Fuel oil grade numbers.
 6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
High Pressure Steam		Yellow	Black	H.P. _____*
High Pressure Condensate Return		Yellow	Black	H.P. Ret ____*
Medium Pressure Steam		Yellow	Black	M. P. Stm ____*

Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Vent Line		Yellow	Black	Vent
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Atmospheric Vent		Green	White	ATV
Fire Protection Water				
Sprinkler		Red	White	Auto Spr
Standpipe		Red	White	Stand
Sprinkler		Red	White	Drain

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000.

8. See Sections for methods of identification, legends, and abbreviations of the following:

- a. Medical Gases and vacuum lines: Section 15491, MEDICAL GAS AND VACUUM SYSTEMS.
- b. Conduits containing high voltage feeders over 600 volts: Section 16111, CONDUIT 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 PARTITION" or, "FIRE PARTITION" as applicable.
 3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
 4. Use semigloss paint of color that contrasts with color of substrate.
- C. Identify columns in pipe basements and interstitial space:
1. Apply stenciled number and letters to correspond with grid numbering and lettering shown.
 2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.
 3. Apply on four sides of interior columns and on inside face only of exterior wall columns.
 4. Color:
 - a. Use black on concrete columns.
 - b. Use white or contrasting color on steel columns.

3.13 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.

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APPENDIX

Coordinate the following abbreviations used in SECTION 09900, PAINTING, with other Sections, especially 09050, INTERIOR EXTERIOR FINISHES, MATERIALS AND FINISH SCHEDULES and other COATING SECTIONS listed. Use the same abbreviation and terms consistently.

Paint or coating Abbreviation

Latex Emulsion LE (MPI 53, flat/MPI 52, eggshell/MPI 54,
semigloss

Latex Semigloss SG (MPI 141)

Verify abbreviations used in the following coating Sections and new sections developed in MASTERFORMAT Section 09800 series for conflicts with other abbreviations used for materials and finishes.

Section 09815, HIGH BUILD GLAZED COATING GC

Section 09836, MULTI COLOR COATING MC

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SECTION 10430
EXTERIOR SIGNS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies exterior medical center identification signs, building identification signs, directional signs, directories, information, parking and traffic signs.

Not all sign types are utilized in this project. See drawings for size and type of signs to be furnished under this contract.

1.2 RELATED WORK

A. Electrical: Related Electrical Specification Sections.

1.3 MANUFACTURER'S QUALIFICATIONS

Sign manufacturer regularly and presently manufactures signs similar to those specified as one of their principal products.

1.4 SUBMITTALS

A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.

B. Samples: Submit 2 sets. One set of samples will be retained by Resident Engineer, other returned to Contractor.

1. Sign Panel, 200 mm x 250 mm (8 inches x 10 inches), with letters.
2. Color samples of each color, 150 mm x 150 mm (6 inches x 6 inches. Show anticipated range of color and texture.
3. Sample of typeface, arrow and symbols in a typical full size layout.

C. Manufacturer's Literature: Manufacturer's printed specifications, anchorage details, installation and maintenance instructions.

D. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.

E. Full size layout patterns for dimensional letters.

1.5 DELIVERY AND STORAGE

A. 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.

B. Deliver signs only when the site and mounting services are ready for installation work to proceed.

C. Store products in dry condition inside enclosed facilities.

1.6 APPLICABLE PUBLICATION

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. Council of American Building Officials (CABO)
A17.1-98 . Accessible and Usable Buildings and Facilities

C. American National Standards Institute (ANSI):
N2.1-89 Warning Symbols, Radiation Symbols

D. Americans with Disabilities Act - 1990

E. American Society for Testing and Materials (ASTM):
B209-96 .. Aluminum and Aluminum-Alloy Sheet and Plate

B221-96..... Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

F. Federal Specifications (Fed. Spec.):

MIL-P-8184E Plastic Sheet, Acrylic, Modified.

MIL-P-46144C Plastic Sheet, Polycarbonate

G. Federal Highway Administration

Manuals on Uniform Traffic Control Devices for Street and Highways.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum

1. Sheet and Plate: ASTM B209
2. Extrusions and Tubing: ASTM B221

B. Cast Acrylic Sheet: MIL-P-8184E; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.

C. Polycarbonate: MIL-P-46144C; Type I, class 1.

D. Vinyl: 0.1 mm thick machine cut, having a pressure sensitive adhesive and integral colors.

E. Electrical Signs:

1. General: Furnish and install all lighting, electrical components, fixtures and lamps ready for use in accordance with the sign type drawings, details and specifications.
2. Refer to Electrical Specifications Section, Division 16, to verify line voltages for sign locations that require electrical signs.
3. Quality Control: Installed electrical components and sign installations are to bear the label and certification of Underwriter's Laboratories, Inc., and are to comply with National Electrical Code as well as applicable federal, state and local codes for installation techniques, fabrication methods and general product safety.
4. Ballast and Lighting Fixtures: See Electrical Specifications.

F. Concrete Post Footings: See Section 03301, Cast-in-place Concrete.

G. Steel: See Section 05120, Structural Steel.

2.2 GENERAL

- A. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- B. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown

by these drawings. Resident Engineer to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.

- C. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Contractor shall further warrant: That all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

2.3 SIGN STANDARDS

A. Topography:

1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps as indicated in Sign Message Schedule.
2. Arrow: See graphic standards in drawings.
3. Letter spacing: See graphic standards on drawings.
4. Letter spacing: See graphic standards on drawings.
5. VA Logo and Logotype: See drawings.
6. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings are for layout purposes only; final text for signs is listed in Sign Message Schedule.

B. Project Colors and Finishes: See Section 09050.

2.4 SIGNS TYPES

- A. General: The exterior sign system shall be comprised of sign types families that are identified by a letter and number which identify a particular group of signs. An additional number identifies a specific type of sign within that family.

1. EI designation indicates exterior internally illuminated sign.
 2. EN designation indicates exterior non-illuminated sign.
- B. Text and Graphics:
1. Illuminated Signs:
 - a. Graphics are routed out and backed with 3 mm (0.0125 inch) thick minimum translucent white acrylic diffuser. Diffuser and letter voids are to be mechanically fastened to sign face.
 2. Non-illuminated Signs:
 - a. Surface applied reflective white opaque vinyl graphics.
- C. Illuminated Signs:
1. UL approved cabinet to be constructed from aluminum extrusion system with internal fluorescent lamps 230 mm (9 inches) on center maximum.
 2. Energy saver fluorescent lamps which shall be turned on or and off by photocell.
 3. Energy shut off switch shall be mounted on bottom or side away from traffic thoroughfare.
 4. The sign face and changeable sign strips are to be 2 mm minimum (0.090 inch) to 3 mm (0.125 inch) thick aluminum. Aluminum faces and changeable strips shall be mounted into framed extruded cabinet face to allow for removal from top or side, so that faces can be changed without affecting extruded sign structure.
 5. Changeable strip sign text modules are to be extruded aluminum sliding panels which are retained by a horizontal aluminum channel mounted behind the insert panel joints. Text module heights are 100 mm (4 inches), 150 mm (6 inches) and 200 mm (8 inches).
 6. Contractor shall make the sign operable by making the necessary electrical connections to adjacent junction box located in the general area of sign. Electrical

connection is to run under grade and up through base. No exposed electrical conduit runs shall be allowed.

Coordinate line voltages with site electrical circuit.

D. Post and Panel Signs:

1. Sign shall be constructed of an aluminum extrusion system including the following integral features: water relief channel for proper drainage, integral flanges for attachment of additional structural supports and mounting to posts with minimum 3 mm (0.125 inch) wall thickness. Post caps to be welded or mechanically attached with concealed fasteners.
2. Reveal between the post and sign cabinet is to be extruded aluminum. This extruded connector shall be adjustable to allow for either flush, 12 mm ((0.5 inch) or 25 mm (one inch) reveal between the sign post and cabinet or tube.
3. Sign to be installed with direct burial of posts in concrete or with a base plate mounting. Any electrical connections should be run through the posts.

Spec Writer Note: Delete sign types
and sign families that are not
being used on the project.

E. Illuminated Monument Sign - Sign Type EI01:

1. Sign shall be an illuminated sign cabinet mounted on a masonry base with a reveal between the base and the cabinet.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: concealed hinge for lamp access, water relief channel for proper drainage, ballast bracket channel, enclosed electrical raceway with cover, internal flanges for attachment of additional structural supports and mounting to base and a frame retainer, maximum 25 mm (1 inch) face dimension, to allow for sign face removal.

3. Sign to be installed with a cast-in-place "J" bolt type mounting to masonry base.

F. Illuminated Monument with Stacking Text Modules - Sign Type EI02:

1. Sign shall be an illuminated sign cabinet mounted to a concrete base with a reveal between the base and the cabinet.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: concealed hinge for lamp access, water relief channel for proper drainage, ballast bracket channel, enclosed electrical raceway with cover, internal flanges for attachment of additional structural supports and mounting to base, and inter-changeable side loading sign text modules to allow for individual sign panel removal without the removal of the entire face.
3. Sign to be installed with a cast-in-place "J" bolt type mounting to masonry base.

G. Illuminated Post and Panel Sign - Sign Type EI03:

1. Sign shall be an illuminated sign cabinet mounted to extruded aluminum posts with an adjustable reveal between the posts and the cabinet.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: concealed hinge for lamp access, water relief channel for proper drainage, ballast bracket channel, enclosed electrical raceway with cover, internal flanges for attachment of additional structural supports and mounting to posts, extruded aluminum posts, extruded aluminum reveal which is adjustable and a frame retainer, maximum 25 mm (1 inch) face dimension to allow for sign face removal.

H. Illuminated Post with Stacking Text Modules-Sign Type EI04:

1. Sign shall be an illuminated sign cabinet mounted to extruded aluminum posts with an adjustable reveal between the posts and the cabinet.
 2. Sign shall be constructed of an aluminum extrusion system including the following integral features: concealed hinge for lamp access, water relief channel for proper drainage, ballast bracket channel, enclosed electrical raceway with cover, internal flanges for attachment of additional structural supports and mounting posts, extruded aluminum posts, extruded aluminum reveal which is adjustable in dimension and interchangeable side loading sign text modules to allow for individual sign panel removal without removal of entire face.
- I. Illuminated Wall Panel Sign - Sign Types EI06 and EI08:
1. Sign shall be constructed with an extruded aluminum illuminated sign cabinet configured for wall mounting.
 2. Sign shall be constructed of an aluminum extrusion system including the following integral features: concealed hinge for lamp access, water relief channel for proper drainage, ballast bracket channel, enclosed electrical raceway with cover, internal flanges for attachment of additional structural supports and mounting to wall and a frame retainer (maximum 25 mm (1 inch) face dimension) to allow for sign face removal.
 3. Install sign with mechanical fasteners into wall surface behind sign cabinet, with electrical connection also through cabinet back. No exposed support brackets or electrical conduit runs are allowed.
 4. Sign Contractor shall make the sign operable by making necessary electrical connections to the junction box located behind sign cabinet. Coordinate line voltages and location of junction box with electrical circuit.

J. Halo Illuminated Dimensional Letters - Sign Types EI09.6, EI09.7, EI09.8, EI09.9:

1. Halo illuminated fabricated aluminum letters. Letters shall be fully welded construction, utilizing a minimum of 3 mm (0.125 inch) wall aluminum for letter faces and edges and 6 mm (0.25 inch) acrylic back diffuser.
2. Internal illumination shall be by 13 mm minimum glass luminous tube, with two strokes minimum per letter. Tubing illuminates white.
3. Mechanically fasten to wall surface utilizing stainless steel angle mounting tabs internal to letter. Space letters a minimum of 65 mm (2.5 inches) away from wall surface. Letters are to be mounted to allow for simple removal of fabricated aluminum letter for maintenance and/or replacement of luminous tubing and other electrical components internal to letter.
4. Letters painted with acrylic polyurethane in the specified color and finish. Paint inside of letters high gloss white.

K. Non-illuminated Monument with Stacking Text Modules - Sign Type EN02

1. Sign is a non-illuminated sign cabinet mounted to a masonry base with a reveal between the base and the cabinet.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: water relief channel for proper drainage, internal flanges for attachment of additional structural supports and mounting to base, and interchangeable side loading sign text modules to allow for individual sign panel removal without the removal of the entire face.
3. Sign is to be installed with a cast-in-place "J" bolt type mounting to the concrete base.

L. Non-illuminated Post and Panel Sign - Sign Types EN03, EN07, EN12.1, EN12.2:

1. Sign shall be a non-illuminated sign cabinet mounted to extruded aluminum posts with an adjustable reveal between the posts and the cabinet.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: water relief channel for proper drainage, internal flanges for attachment of additional structural supports and mounting to posts, extruded aluminum posts, extruded aluminum reveal which is adjustable and a frame retainer (maximum 25 mm (1 inch) face dimension) to allow for sign face removal.
3. Weld sign cabinet at mitered corners and provide internal bracing as necessary to insure structural rigidity. Shop weld as much as possible. Grind smooth all exposed welds so surface is consistent with surrounding surface, and accepts paint finish in a like manner.
4. The sign faces are to be 2 mm (0.090 inch) thick aluminum. Aluminum faces shall be mounted into the framed extruded cabinet to allow for removal from the top or side, so faces can be changed without affecting extruded sign structure.

M. Non-illuminated Post and Stacking Bar Sign - Sign Type EN04:

1. Sign shall be aluminum tubes mounted to extruded aluminum posts with an adjustable reveal between the posts and tubes.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: water relief channel for proper drainage, internal flanges for attachment of additional structural supports and mounting to posts, extruded aluminum posts, extruded aluminum reveal which is adjustable and interchangeable aluminum

tube text modules to allow for individual stacking bar removal.

3. The sign text stacking bar modules are extruded aluminum sliding tubes retained by a reveal. The aluminum tube sign text stacking modules shall be mounted to allow for removal from the top, so tubes can be changed without affecting sign structure. Stacking bar (tube) module height is 150 mm (6 inches).

N. Non-illuminated Single Post Sign - Sign Types EN05, EN12.3, EN12.4, EN12.5, EN12.6:

1. Sign shall be constructed of an extruded aluminum square post with an aluminum plate sign panel.
2. Sign panel shall be a 3 mm (0.125 inch) aluminum plate. Panel mechanically fastens to support post with tamper resistant fasteners.
3. Posts shall be aluminum and a minimum 3 mm (0.125 inch) wall thickness. Post caps to be welded or mechanically attached with conceal fasteners.
4. Sign shall be installed with direct burial of post into concrete. If sign is to be installed with a base plate/"J" bolt type mounting, it is noted in the sign message schedule.

O. Non-illuminated Single Post Traffic Regulatory Sign - Sign Type EN10:

1. Sign shall be constructed of an extruded aluminum square post with an aluminum plate sign panel.
2. Sign panel shall be a 3 mm (0.125 inch) aluminum plate with surface applied reflective vinyl traffic regulatory decals. Panel mechanically fastens to support post with tamper resistant fasteners.
3. Posts shall be aluminum and a minimum 3 mm (0.125 inch) wall thickness. Post caps to be welded or mechanically attached with conceal fasteners.

4. Sign to be installed with direct burial of post into concrete. If sign is to be installed with a base plate/"J" bolt type mounting, it is noted in the sign message schedule.
5. Signs shall be reflective traffic control symbols complying to Department of Transportation, Manual for Uniform Traffic Control Devices in color, shape, proportions, text and symbols.

P. Non-illuminated Single Post & Panel Street Sign - Sign Type EN11.1, EN11.2:

1. Sign shall be constructed of an extruded aluminum square post, cast or fabricated aluminum post cap/panel retainers and aluminum plate sign panels.
2. Sign panels are 3 mm (0.125 inch) aluminum plate. Panel mechanically fastens to panel retainers with tamper resistant fasteners.
3. Post caps/panel retainers are either cast or fabricated aluminum with a minimum 3 mm (0.125 inch) wall thickness. Post cap element slides over square sign post and mechanically fastens to post with tamper resistant fasteners.
4. Aluminum post with a minimum 3 mm (0.125 inch) wall thickness.
5. Sign to be installed with direct burial of post in concrete. If sign is to be installed with a base plate/"J" bolt type mounting, it is noted in the sign message schedule.

Q. Non-illuminated Single Post Street Sign - Sign Type EN11.3:

1. Sign shall be constructed of an extruded aluminum square post.
2. Posts shall be extruded aluminum with a minimum 3 mm (0.125 inch) wall thickness.

3. Sign to be installed with direct burial of post in concrete. If sign is to be installed with a base plate/"J" bolt type mounting, it is noted in the sign message schedule.

R. Non-illuminated Wall Panel Sign - Sign Types EN06.1, EN06.2, EN06.3, EN06.4, EN06.5, EN06.6 and EN08:

1. Sign shall be an extruded aluminum illuminated sign panel and frame configured for wall mounting.
2. Sign shall be constructed of an aluminum extrusion system including the following integral features: internal flanges for attachment of additional structural supports and mounting to wall and a frame retainer (maximum 25 mm (1 inch) face dimension) to allow for sign face removal.
3. Weld sign cabinet at mitered corners and provide internal bracing as necessary to insure structural rigidity. Shop weld as much as possible. Grind smooth all exposed welds so that surface is consistent with surrounding surface, and accepts paint finish in a like manner.
4. The sign faces are to be 2 mm (0.090 inch) thick aluminum with surface applied reflective white vinyl graphics. Aluminum face shall be mounted into the extruded cabinet frame to allow for removal from the top or side, so that faces can be changed without affecting extruded sign structure.
5. Sign is to be installed with mechanical fasteners into wall surface behind the sign. No exposed support brackets are allowed.

S. Non-illuminated Wall Panel Sign - Sign Types EN06.7 and EN06.8:

1. Sign shall be constructed with a flat sheet of aluminum for wall mounting.
2. The sign face to be 3 mm (0.125 inch) thick aluminum with surface applied reflective white vinyl graphics.

3. Sign shall be to be installed with mechanical fasteners into wall surface. No exposed support brackets are allowed.

T. Non-Illuminated Cut Out Dimensional Letters - Sign Types
EN09.1, EN09.2, EN09.3, EN09.4:

1. Cut out aluminum letters which are mill cut (vertical sides) out of 9 mm (0.375 inch), 12 mm (0.5 inch) or 19 mm (0.75 inch) plate depending on sign type.
2. Letters to be studded and mounted with a 9 mm (.375 inch) spacers to wall surface using adhesive appropriate to the surface.
3. Letters painted with acrylic polyurethane in specified color and finish.

U. Non-illuminated Fabricated Dimensional Letters - Sign Types
EN09.5, EN09.6, EN09.7, EN09.8, EN09.9:

1. Non-illuminated fabricated aluminum letters. Letters are to have fully welded construction, utilizing a minimum of 2 mm (0.090 inch) wall aluminum for letter faces and 2 mm (0.080 inch) wall aluminum for letter edges.
2. Mechanically fasten to wall surface utilizing aluminum angle mounting tabs internal to letter. Space letters 9 mm (.375 inch) off wall surface.
3. Letters painted with acrylic polyurethane in specified color and finish.

V. Department of Veterans Affairs Seals - Sign Type EN13:

1. Cast bronze Department of Veterans Affairs seal. Contact the Department of Veterans Affairs regarding procurement.

2.5 FABRICATION

- A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 degree C (100 degree F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and

brackets for assembly of units. Use concealed fasteners whenever and wherever possible.

- C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.
- D. Contact surfaces of connected members be true. Assembled so joints will be tight and practically unnoticeable, without use of filling compound.
- E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces be smooth flat and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus .4 mm (0.015 inch). Restore texture to filed or cut areas.
- F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.
- G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.
- H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.
- I. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.
- J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.
- K. Movable parts, including hardware, are be cleaned and adjusted to operate as designed without binding of

deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.

- L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. No signs are to be manufactured until final sign message schedule & location review has been completed by the Resident Engineer & forwarded to contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact Resident Engineer for clarification.
- C. Contractor shall own and be responsible for all signs that are damaged, lost or stolen while materials are on the job site and up until the completion and final acceptance of the job.
- E. Remove or correct signs or installation work Resident Engineer determines as unsafe or as an unsafe condition.
- F. At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces and

landscaping that became soiled or damaged as a result of installation of signs.

- G. Locate signs as shown on the Sign Location Plans.
- H. Certain signs may be installed on glass. A blank glass back up is required to be placed on opposite side of glass exactly behind sign being installed. This blank glass back up is to be the same size as sign being installed.
- I. Contractor will be responsible for verifying that behind each sign location there are no utility lines that will be effected by installation of signs. Any damage during installation of signs to utilities will be the sole responsibility of the Contractor to correct and repair.
- J. Furnish inserts and anchoring devices which must be set in concrete or other material for installation of signs. Provide setting drawings, templates, instructions and directions for installation of anchorage devices which may involve other trades.
- K. At completion of installation turn over to Resident Engineer additional stock of signs and sign components listed in Sign Message Schedule: Individually box or crate by Sign Type or Part Number and labeled accordingly.

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SECTION 10602
RETRACTABLE EXTERIOR PRIVACY SCREENS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers power operated retractable privacy screens.

1.2 RELATED WORK

Electrical: Division 16.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Shop Drawings: Include screen material, extruded aluminum housing details, motors and operators.
- C. Provide layout drawings with detailed erection drawings and specifications. Layout drawings shall indicate location and size of units to be installed at Canopy ceiling, which side of extruded housing screens project from, and attachment methods.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Privacy Screen Material: 16 oz. polyester, waterproof, mildew resistant, and flame retardant. Color to be selected from manufacturer's standard.
- B. Retractable Awning System.
 - 1. Equal to "Eclipse"5.5" Titan Retractable Solar Screen distributed by Queen City Awning, 513-530-0662.
 - 2. Roller Tube: 78mm.
 - 3. Side guides not required for this installation.

2.2 FABRICATION

- A. Manufacturer's standard.
- B. Bottom rails of privacy screens to allow access shall be in two (2) pieces. Associated privacy screen shall be reinforced and split from bottom rails to 7'8" above walking surface.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Erect the privacy screens in accordance with the manufacturers detailed erection drawings.
- B. Secure housing to Manufacturer's standard mounting brackets securely attached to structure above.
- C. Electrician to attaché pigtails supplied with unit to electrical circuits.

3.2 ACCEPTANCE

- A. Repair or replace damaged parts, touch-up abraded paint with matching paint.
- B. Privacy Screen housings shall be level and firm. Adjust hardware/motors to allow Privacy Screens to operate smoothly without binding.

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SECTION 13975
MANUAL DRY STANDPIPE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Design, materials, equipment, installation, inspection and testing of a complete and ready for operation dry standpipe system as required by NFPA 14 and NFPA 13 latest editions.
- B. Modification of the existing standpipe, sprinkler system as indicated on the drawings and as further required by these specifications.
- C. Expansion or revision of the building system fire alarm system to incorporate new system alarms and supervisory devices.
- D. Provide access panels where control or drain valves are located behind plaster or gypsum walls or ceilings.
- E. Painting as per section 09900.

1.2 RELATED WORK

- A. Treatment of penetrations through rated enclosures: Section 07270, FIRESTOPPING SYSTEMS.
- B. Access panels for plaster or gypsum finishes: Section 08305, ACCESS DOORS.
- C. Painting for exposed pipes: Section 09900, PAINTING.
- D. Alarm supervision: Section 13850, FIRE ALARM SYSTEM.
- E. General mechanical requirements and items, which are common to more than one section of Division 15: Section 15050, BASIC METHODS AND REQUIREMENTS (MECHANICAL).

1.3 QUALITY ASSURANCE

- A. Designer's Qualifications: Design work and shop drawings shall be prepared by a licensed engineer practicing in the field of Fire Protection Engineering or a NICET (National Institute for Certification in Engineering Technologies) Level III sprinkler technician.
- B. Installer's Qualifications: The installer shall possess a valid State fire protection contractor's license. The installer shall provide documentation of having successfully completed three projects of similar size and scope.
- C. Materials and Equipment: All equipment and devices shall be of a make and type listed by UL, FM, or other nationally recognized testing laboratory for the specific purpose for which it is used.
- D. Testing: Materials and Testing Certificate as per NFPA 14. Provide certificates for all parts of the system.

1.4 DESIGN CRITERIA

- A. The design, materials, equipment, installation, and testing of the system shall be in accordance with NFPA 14 the latest edition.
- B. For hydraulic calculations, calculated demand shall not fall less than 10 percent below the water supply curve.
- B. Water Supply: Base water supply on a fire pumper truck being able to provide 3785 l/m (1000 gpm) at 1035 kPa (150 psig) and 2650 l/m (700 gpm) at 1380 kPa (200 psig) at the fire department connection.
- C. Size standpipes to provide 100 psig at the most remote connections.
- D. Provide seismic protection for all new and existing systems as required by NFPA 14.

1.5 SUBMITTALS

- A. Submit as one package in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS. Bind submittals in notebooks and binders with an index referencing the appropriate specification section.
- B. Shop Drawings: 1:100 (1/8 in) scale detail working drawings conforming to NFPA 14. Include a site plan showing the fire hydrant nearest to the fire department connection.
- C. Certificates:
 - 1. Designer's and Installer's qualifications and documentation of previous work.
 - 2. Materials and Testing certificates as specified.
- D. Manufacturer's literature and data: All pertinent literature and data for the materials and equipment proposed for the project. Include listing information and installation instructions in data sheets. Clearly identify the item to be used.
- E. Design Calculations:
 - 1. Hydraulic calculations in accordance with NFPA 14 and NFPA 13 the latest edition.
 - 2. AS_BUILT DOCUMENTS.
 - a) Mylar as-built drawing and two blueline copies shall be provided for each drawing. One copy of final CADD drawing files shall be provided on diskettes that are compatible with the VAMC CADD system.
 - b) Four sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.

c) Four sets of operation and maintenance data.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
B16.3-99Malleable Iron Threaded Fittings
- C. Factory Mutual Engineering Corporation (FM):
Approved Guide - 2001
- D. National Fire Protection Association (NFPA): 14-03
.....Installation on Standpipe, Private Hydrant and
Hose Systems

101-03.....Life Safety Code
170-99.....Fire Safety Symbols
- E. Underwriters Laboratories, Inc. (UL):
2002.....Fire Protection Equipment Directory

PART 2 PRODUCTS

2.1 GENERAL

All devices and equipment shall be Underwriters Laboratories listed for their intended purpose.

2.2 PIPING & FITTINGS

- A. Shall be in accordance with NFPA 14. black steel, schedule 10 minimum.
- B. Threaded or flanged fittings shall be ANSI B 16.3 cast iron, class 125 minimum. Threaded fitting are not permitted on pipe with wall thickness less than schedule 40.
- C. Clamp-on fittings with rubber gaskets shall be listed for the piping application.

2.3 VALVES

- A. Listed Indicating Valves:
 - 1. Gate: OS&Y, 1200kPa (175 psig) WOG.
 - 2. Butterfly: Gear operated, indicating type, 1200 kPa (175 psig) WOG.
- B. Check Valves: Swing type, rubber faced or wafer type spring loaded butterfly check valve, 1200 kPa (175 psig) WOG.
- C. Drain Valves: Threaded bronze angle, globe, ball or butterfly, 1000 kPa (150 psig.) WOG equipped with reducer and hose connection with cap or connected to a drain line.
- D. Standpipe Hose Valves: 65 mm (2-1/2 inch) screwed, brass hose angle valve, male hose threads same as local fire protection service, 65 mm (2-1/2 inch) by 40 mm (1-1/2 inch) reducer, with permanently attached polished brass cap and chain.

2.4 FIRE DEPARTMENT SUPPLY CONNECTION

Brass, flush wall type, , or a configuration acceptable to the responding fire department. Connections shall be threaded to match those on the local fire protection service, with polished brass caps and chains. Provide escutcheon with integral raised letters "Dry Standpipe System". Install an automatic ball drip between fire department connection and check valve with drain piping routed to an indirect drain or to the outside.

2.5 IDENTIFICATION SIGNS

Provide for all new and existing sectional valves, riser control valves, drain valves and alarm devises. The signs shall be in accordance with NFPA 14 and attached securely to each item.

SPEC WRITER NOTE: Provide the following paragraph where cabinets are to be installed.

2.6 VALVE SUPERVISORY SWITCHES

- A. Provide each indicating standpipe and control valve with adequate means for mounting a valve supervisory switch.
- B. Mount switch so as not to interfere with normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem is moved no more than one fifth of the distance from its normal position.
- C. The mechanism shall be contained in a weatherproof die cast aluminum housing, which shall provide a 20 mm (3/4 in.) tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
- D. Switch housing to be finished in red baked enamel.
- E. Supervisory switches for ball and butterfly valves may be integral with the valve.
- F. All conduit and wiring connected thereto shall be provided in Section 13850, FIRE ALARM SYSTEM.

2.7 HANGERS AND EARTHQUAKE BRACING

Comply with NFPA 14 and NFPA 13 the latest editions.

2.8 WALL, FLOOR AND CEILING PLATES

Provide chrome plated steel escutcheon plates for exposed piping passing though walls, floors or ceilings.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Installation shall be accomplished by a licensed contractor. Provide a qualified technician, experienced in the installation and operation of

the type of system being installed, to supervise the installation and testing of the system.

- B. Installation of Piping: Accurately cut pipe to measurements established by the installer and work into place without springing or forcing. Conceal piping in all spaces which have finished ceilings. Locate piping in stairways as near to the ceiling as possible to prevent tampering by unauthorized personnel, and to provide a minimum headroom clearance of 2250 mm (seven feet six inches). To prevent obstruction to egress, provide piping clearances be in accordance with NFPA 101.
- C. Face fire department connections in valve cabinets outward in a manner which prevents crimping of the hose.
- D. Drains: Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and as required by NFPA 14.
- E. Valve Supervisory Switches: Provide supervisory switches that are connected to the fire alarm system. Do not provide valve supervisory switches on standpipe hose valves, test or drain valves. See Section 13850 for connections.
- F. Penetrations: Sleeve or core drill concrete and masonry. Provide clearance between pipe and openings as required by NFPA 14 and NFPA 13. Seal penetrations and clearances in fire rated wall and floor assemblies with listed through-penetration firestop materials in accordance with Section 07270, FIRESTOPPING SYSTEMS.
- G. For each fire department supply connection, provide the symbolic sign given in NFPA 170 located 2400 to 3000 mm (8 to 10 feet) above each connection. The sign shall be 450 by 450 mm (18 by 18 inches) with the symbol being at least 350 by 350 mm (14 by 14 inches).
- H. Securely attach identification signs to control valves, drain valves, and test valves.
- I. Interruption of Service: There shall be no interruption of the existing sprinkler protection, water, electric, or fire alarm services without prior permission of the Contracting Officer. Permission shall be requested in writing at least one (1) week prior to the planned interruption. Any interruption shall be limited to 4 hours for final connections or repairs.
- J. Welding: All welding shall conform to the requirements and recommendations of NFPA 14 and NFPA 13 latest editions.

3.2 INSPECTION AND TEST

- A. Hydrostatic Testing: Hydrostatically test the system including the fire department connections, as specified in NFPA 14, NFPA-25 and NFPA 13 latest edition, in the presence of the Authority Having Jurisdiction or his designated representative.
- B. Final Inspection and Testing: Test the system in accordance with NFPA 14, NFPA 25 and NFPA 13 latest editions after all necessary corrections have been accomplished. Advise the Authority Having Jurisdiction who will then schedule the final inspection and test. Furnish all instruments, labor and materials required for the tests and provide the services of the installation foreman or other competent representative of the installer to perform the tests. Correct any deficiencies found and retest the system. Include the operation of all features of the systems under normal conditions in the test.

3.3 WARRANTY

- A. All work performed and materials and equipment furnished under this contract shall be free from defects for a period of one year from date of acceptance by the government.
- B. All new piping and equipment incorporated into the new system shall be hydrostatically tested and warranted as new.

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