SOLICITATION NUMBER
VA244-XX-C-XXXX

PROJECT NO. 542-10-104

SPECIFICATIONS

FOR: RENOVATE BUILDING 14, BOILER PLANT

AT: VA Medical Center
1400 Black Horse Hill Road
Coatesville, PA 19320-2096

100 % Construction Documents Submission

PROJECT MANUAL

PART I of II

VA COATESVILLE BUILDING 14

Project No:542-10-104

1400 Black Horse Hill Road
Coatesville, PA 19320

ISSUED FOR100% CONSTRUCTION DOCUMENTS
April 22, 2017

VA COATESVILLE BUILDING 14

Project No:542-10-104

1400 Black Horse Hill Road
Coatesville, PA 19320

ISSUED FOR 100% CONSTRUCTION DOCUMENTS
April 22, 2017

VA Coatesville	OWNER
Bray Mooney Consulting 410 East 21st Street Chester, PA 19013 610.872.3716	PROJECT MANAGEMENT
William Cook Architecture & Planning 1251 Romansville Road Coatesville, PA 19320 (610)383.4660	ARCHITECT
WZG, Inc. 180 W. Ridge Pike Limerick, PA 19468 214..329.5559	STRUCTURAL ENGINEER
Miller-Remick, LLC 1010 Kings Highway, South Cherry Hill, NJ 08034 856.429.4000	MECHANICAL/ELECTRICAL/ PLUMBINGENGINEER
Mabbett & Associates 5 Alfred Circle Bedford, MA 01730 800.877.6050	CERT. INDUST.HYG.

TABLE OF CONTENTS – PART I

TABLE OF CONTENTS - PART II

---END---

SECTION 00 01 15
LIST OF DRAWING SHEETS

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

"Drawing List – VA PROJECT No. 542-10-104" (WmCA+P #13901**) TWO PAGES**

Drawing No.	Title
A000	**Cover Sheet**
A001	**Existing Features Survey**
A002	**General Notes & Symbols**
A050	**Demolition Floor Plans**
A051	**Demolition Elevations**
A101	**Ground Floor Plan**
A102	**Loft & Roof Plans**
A103	**Reflected Ceiling Plans**
A104	**Enlarged Plans**
A105	**Room Finish & Floor Pattern Plans**
A200	**Building Sections & Elevations**
A201	**Building Sections & Elevations**
A202	**Enlarged Sections**
A301	**Wall Sections**
A401	**Architectural Schedules**
A402	**Casework**
S001	**Structural Notes**
S100	**Demolition Plans & Notes**
S101	**Foundation Plan**
S102	**Framing Plan**
S301	**Sections & Details**
S401	**Typical Details**
SD101	**Site Plan Demolition**
S101	**Site Plan New Work**
M001	**Mechanical Symbols**
MD101	**Mechanical Demolition**
M101	**Mechanical Ground Floor**
M102	**Mechanical Mezzanine**
M501	**Mechanical Details**
M502	**Mechanical Details**
M601	**Mechanical Schedules**
M701	**Controls/Sequence**

Drawing No.	Title
FE101	**Fire Alarm Ground**
FE102	**Fire Alarm Loft**
E001	**Electrical Symbols**
ED101	**Electrical Demolition**
E101	**Electrical Ground Floor**
E102	**Electrical Mezzanine**
E501	**Electrical Schedules**
P001	**Plumbing Notes & Symbols**
PD101	**Plumbing Demolition**
PL101	**Plumbing Plans**
P301	**Riser Diagram, Details & Schedules**

SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

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: Renovate Building 14, Boiler Plant, VA Coatesville 1400 Black Horse Hill Road, Coatesville, Pennsylvania 19320 as required by drawings and specifications.

B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer or with the Contracting Officer Representative (COR) for site visits contained in the construction solicitation and posted on the Federal Business Opportunity website https://www.fbo.gov/

C. Offices of: William Cook Architecture & Planning, 1251 Romansville Road, Coatesville, Pennsylvania 19320, as Architect, 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 COR or his duly authorized representative.

D. Bray Mooney Consulting, 410 East 21st Street, Chester, Pennsylvania 19013 is the Project Manager and is responsible for management of design and construction period services as stated in their contract with the Coatesville VA Medical Center. Any replies to RFIs, submittals, COR questions, CO questions answered by any firm other than Bray Mooney shall first be reviewed by Bray Mooney and the response verified by Bray Mooney before being sent to the COR, CO, or construction contractor.

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

F. All employees of General Contractor and Subcontractors shall comply with the VA security management program and obtain permission of the VA police, be identified by project and employer, obtain the proper background investigation and badge, or be restricted from unauthorized access.

G. Prior to commencing work, General Contractor shall provide proof that an 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.

H. 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 ITEMS

A. ITEM I, BASE BID:

1. The Work includes the following: The scope of work includes Restoration of the Building Exterior clay tile pointing and selective replacement, installation of new Roofing, Gutters & Downspouts, installation new windows and doors, the Demolition of Existing Interior Structures, Construction of new Offices and Staff Support areas, Construction of new Toilet and Shower facilities, renovation of Shop and Work areas. The demolition work required for the project includes removal of such items but is not limited to removal of: interior partitions, floor and ceiling finishes, lighting and electrical fixtures, plumbing, and mechanical systems. Building Mechanical, Electrical, Plumbing and Fire Protection systems are improved significantly throughout the building. The building is currently occupied and will continue to be occupied and fully operational throughout the demolition and construction of the project.
2. The contractor will be responsible for purchasing and installing all equipment including owner supplied equipment.
3. New building utility work may require work on adjacent floors. These floors will require strict adherence of planned and scheduled coordination directives by the COR.
4. This project may require work in regular business hours, work in off hours, including demolition, construction, equipment installation, and testing. Coordinate all work with the COR.

LUMP SUM BASE BID: $ _____

_____

Write bid amount in words

B. ITEM II, ALTERNATE DEDUCTS:

1. **BID ITEM #2 (ALTERNATE #1):** All work described in the Base Bid except deduct:

Power Wash, Prime, and Paint Concrete Wall (As Shown on Drawing 5/A200). Including all work related to Concrete Retaining Wall Repairs which shall include;

- Deduct – Clean, Prime and Paint – Concrete Wall

LUMP SUM BID ITEM #2 (ALTERNATE #1): $ _____

_____

Write bid amount in words

2. **BID ITEM #3 (ALTERNATE #2):** All work described in the Base Bid except deduct:

Hip-Roof Structure at Generator (As Shown on Drawings 5/A200 and 2/A301). Including all work related to Hip-Roof Structure at Generator;

- Deduct – Hip-Roof Structure at Generator
- Retain – Existing Roof Covering

LUMP SUM BID ITEM #3 (ALTERNATE #2): $ _____

_____

Write bid amount in words

3. **BID ITEM #4 (ALTERNATE #3):** All work described in the Base Bid except deduct:

Hip-Roof Structure at Lower Entry (As Shown on Drawings 2/A201 and 2/A301).
Including all work related to Hip-Roof at Lower Entry;

- Deduct – Hip-Roof at Lower Entry
- Retain – Existing Roof Covering

LUMP SUM BID ITEM #4 (ALTERNATE #3): $ _____

_____

Write bid amount in words

4. **BID ITEM #5 (ALTERNATE #4)**: All work described in the Base Bid except deduct:

NEW ENTRY Rm. 200(As Shown on Drawings 1/A102, 4/A200, 1/A201 and 2/A201). Including all work related to Exterior Entrance at Upper Level which shall include;

- Deduct – Excavation and Foundation Walls
- Deduct – CMU, Brick, and Clay Tile Walls
- Deduct – Roof Framing and Roofing
- Retain – Concrete Slab and Crushed Stone Base

LUMP SUM BID ITEM #5(ALTERNATE #4): $ _____

_____

Write bid amount in words

5. **BID ITEM #6 (ALTERNATE #5):** All work described in the Base Bid except deduct:

Insulated Metal Wall Panels in Lieu of Thermoset Resin panels at Office Entrance and Existing Garage Entrance. (As Shown on Drawings 4/A200 and 5/A200).
Including all work related to Exterior Entrance at Office and Existing Garage Entrance which shall include;

- Deduct – Thermoset Resin panels
- Add – Siding – Insulated Metal Panel

LUMP SUM BID ITEM #6 (ALTERNATE #5): $ _____

_____

Write bid amount in words

C. The Government has the right to select any or all deducts.

1.3 FOR CONTRACTOR

A. After award of Contract, 3 sets of specifications and drawings will be furnished by the VA. 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 files located on the Federal Business Opportunity website https://www.fbo.gov/. 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.
3. The General Contractor is responsible for arrangements with the VA, prior to the start of work, for the Superintendent, employees, and sub-contractors to obtain VA issued security badges. The Contractor will be billed for the cost of processing

the badges for each employee at the rate stated in section 1.17 Contractor Personnel Security Requirements and Background Investigations of the contract.

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/escort arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor’s employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

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

D. Document Control:

1. Before starting any work, the General Contractor/Subcontractors 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.
3. 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.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD’s and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in a specified

location following VA standards and procedures using an Engineering Document Management Software (EDMS).

a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

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

1.5 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):

a. E84-2008.....Surface Burning Characteristics of Building Materials

2. National Fire Protection Association (NFPA):

a. 10-2006.....Standard for Portable Fire Extinguishers
b. 30-2007.....Flammable and Combustible Liquids Code
c. 51B-2003.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work
d. 70-2007.....National Electrical Code
e. 241-2004.....Standard for Safeguarding Construction, Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

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

B. Fire Safety Plan: Establish and maintain a fire protection program in Contract 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 Facility Safety Manager for review for compliance with 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 COR 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. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).

E. Temporary Construction Partitions:

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

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

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

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

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 Flammable and Combustible Liquids: Store, dispense and use liquids in accordance

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

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

M. Existing Fire Protection: Do not impair 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 COR. All existing or temporary fire protection systems 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 COR.

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

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

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

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

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

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

1.6 OPERATIONS AND STORAGE AREAS

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

B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

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

(FAR 52.236-10)

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

E. Working space and space available for storing materials shall be as shown on the drawings.

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

G. Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.

H. 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 COR 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 Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, fire and safety requirements.

I. 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 COR. 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.

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

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 COR.

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 COR. 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 COR, 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 COR.
5. In case of a Contract construction emergency, service will be interrupted on approval of COR. 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. Refer to the Drawings for the definition of the Scope of Work. 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.
2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.

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

1.7 ALTERATIONS

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

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of 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 COR.

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 COR and/or Supply Representative, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the Contract work is changed by reason of this subparagraph B, the Contract will be modified accordingly, 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 COR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:

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

D. Protection: Provide the following protective measures:

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

1.8 INFECTION PREVENTION MEASURES

A. Implement the requirements of VAMC’s Infection Control Risk Assessment (ICRA) team and coordinate with the ICRA drawings and specifications. ICRA Group may monitor dust in the vicinity of the construction work and require 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 and as indicated on ICRA drawing. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Resident Engineer 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 areas 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.

Refer to the Infection Control Risk Assessment charts on the pages within this section.

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

3. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by COR. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
4. Do not perform dust-producing tasks within occupied areas without the approval of the COR. For construction in any areas that will remain jointly occupied by the Medical Center and Contractor's workers, the Contractor shall:

    a. Provide dust proof two-hour fire-rated temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant 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 COR and Medical Center.
    b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
    c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm(24" x 36"), shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
    d. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.
    e. The Contractor shall not haul debris through patient-care areas without prior approval of the COR 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.

D. 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 COR.
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** , STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

A. The Contractor shall preserve and protect all structures and

equipment, on or adjacent to the worksite, that are not to be removed and which do not unreasonably interfere with the work required under this Contract.

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

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

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 COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR 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 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 COR's review, as often as requested.

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

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

1.13 USE OF ROADWAYS

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

1.14 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 COR. If the equipment is not installed and maintained in accordance with the following provisions, the COR 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.

1.15 AVAILABILITY AND USE OF UTILITY SERVICES

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

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

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

D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and

damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:

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

   a. Steam is available at no cost to Contractor.

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

1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, 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 COR's discretion) of use of water from Medical Center's system.

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

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

H. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler-burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished by the Contractor at Contractor's expense.

1.16 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.

1.17 MANUALS & 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 COR 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 interrelated systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR 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 COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.18 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. Contractor shall be prepared to receive this equipment from Government and store or place such equipment not less than 90 days before Completion Date of project.

D. 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.

E. 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.

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.

1.19 RELOCATED EQUIPMENT

A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated

by the Equipment Schedule 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 COR.

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

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

E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and installation of existing equipment, required to be relocated.

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.

1.20 CONSTRUCTION SIGN

A. Provide a Construction Sign where directed by the COR. Maintain sign and remove it when directed by the COR.

1.21 SAFETY SIGN

A. Provide a Safety Sign where directed by COR. Maintain sign and remove it when directed by COR.

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

1.22 CONSTRUCTION DIGITAL IMAGES

A. During the construction period through completion, furnish Department of Veterans Affairs with 250 to 300 views of digital images, including one color print of each view and one Compact Disc (CD) per visit containing those views taken on that visit. Digital views shall be taken of exterior and/or interior as selected and directed by COR (RE). Each view shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) and the images will be a minimum of 2272 x 1704 pixels for the 200x250mm (8x 10 inch) prints and 2592 x 1944 pixels for the 400x500 mm (16 x 20 inch) prints, as per these specifications:

1. Normally such images will be taken at monthly intervals. However, the COR may also direct the taking of special digital images at any time prior to completion and acceptance of Contract. If the

number of trips to the site exceeds an average of one per month of the Contract performance period then an adjustment in Contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) of Section 00 72 00, GENERAL CONDITIONS.

2. In event a greater or lesser number of images than specified above are required by the COR, adjustment in Contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).

B. Images shall be taken by a commercial photographer and must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.

C. Prints shall be made on 200 x 250 mm (8 by 10 inch) regular weight matte archival grade photographic paper and produced by a process with a minimum of 300 pixels per inch (PPI). Prints must be printed using the commercial RA4 process (inkjet prints will not be acceptable). Photographs shall have 200 x 200 mm (8 by 8 inch) full picture print with no margin on three sides and a 50 mm (2 inches) margin on the bottom for pre-typed self-adhesive identity label to be added by COR. It is required that the prints are professionally processed so the quality will meet or exceed that of the same size print made with a film camera. Prints must be shipped flat to the COR:

D. Images on CD-ROM shall be recorded in JPEG format at 300 dpi with a minimum of 24 bit color and no reduction in actual picture size. Compressed size of the file shall be no less than 80% or the original with no loss of information. File names shall contain the date the image was taken, the Project number and a unique sequential identifier. The CD-ROM shall also contain an index of all the images contained therein in either a TXT or Microsoft Word format.

E. In case any set of prints are not submitted within five days of date established by COR for taking thereof, the COR may have such images/photographs taken and cost of same will be deducted from any money due to the Contractor.

F. Interior Final Photos: After completion of all work in an area final interior photos will be taken. The camera must allow the colors to be as close as possible to the actual colors. For number and location of views. View shall be taken after final completion of work. The images shall also be provided on a CD to the RE Office.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

PART 4 - UNIT PRICES

4.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

4.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

4.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

4.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. List of Unit Prices: A schedule of unit prices is included in Part 4. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

4.5 SCHEDULE OF UNIT PRICES

Unit Prices

To perform changes in the work at the following unit prices. The unit prices are gross prices, including the contractor's entire mark-up, field or other costs, general conditions, insurance, fringe benefits, overhead and profit.

All work added/deducted, to/from, the contract using the unit prices defined below. Deduct unit prices shall not by less than 85% of the Add unit price for any given unit price item.

#	Item of Work	Deduct Price	Add Price
1.		$_____	$_____
2.		$_____	$_____
3.		$_____	$_____
4.		$_____	$_____

CONSTRUCTION SAFETY STANDARDS

DEPARTMENT OF VETERANS AFFAIRS MEDICAL CENTER
COATESVILLE, PENNSYLVANIA 19320

UPDATED: 01/2017

Thomas S. Carter, PE
DIRECTOR, FACILITIES ENGINEERING SERVICE

ATTACHMENT #1

DEPARTMENT OF VETERANS AFFAIRS MEDICAL CENTER COATESVILLE, PENNSYLVANIA 19320

GUIDELINES

This digest of construction safety and health requirements has been compliance of all Safety, Health and Fire Protection Regulations, which must be observed while working at this health care facility. The source of these regulations is:

1. U.S. Department of Labor Standards - OSHA 29 CFR 1910 (General Industry) 1995 Edition

2. U.S. Department of Labor Standards - OSHA 29 CFR 1926 (Construction Safety) 1995 Edition

3. National Fire Protection Association Codes

4. Department of Veterans Affairs Safety Policies and Procedures

The enforcement of all safety regulations contained within this digest is carried out by the Medical Center's Safety Officer representing the Director, Facilities Engineering Service. The Medical Center's Safety Officer will make inspections of contractor personnel performing work on the station, advising them of mandatory safety procedures. If flagrant violations are observed the Safety Officer can order shutdown of activities until he can contact the Director, Facilities Engineering Service to present his appraisal of the situation. Private contractor construction work at this facility is also subject to inspection by U.S. Department of Labor, Occupational Safety and Health Administration, Philadelphia Office.

Note: Construction Contractor are required to have employees tested for TB, treated as necessary, and provide a letter of certification that their employees are "TB FREE" with their other required documentation prior to the start of construction.

ATTACHMENT #1

STANDARDS

1. ABRASIVE GRINDING

A. All abrasive wheel bench and stand grinders shall be provided with safety guards which cover the spindle ends, nut and flange projections and are strong enough to withstand the effects of a bursting wheel.

B. An adjustable work rest of rigid construction shall be used on floor and bench-mounted grinders, fixed base, off-hand grinding machines with the work rest kept adjusted to a maximum clearance of 1/8 inch between rest and wheel.

C. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that they are free from defects.

2. ACCIDENT RECORD KEEPING REQUIREMENTS

A. Within 48 hours after its occurrence, an employee accident which is fatal to one or more employees or which results in the hospitalization of five or more employees shall be reported by the employer, either orally or in writing, to the nearest OSHA Area Director.

B. Records as prescribed in the record keeping requirements booklet shall be kept for all accidents that result in fatality, hospitalization, lost workdays, medical treatment, job transfer, termination or loss of consciousness.

C. All injuries sustained by contractors while on VA property must be reported to the Safety Office at Extension 2104.

3. AIR TOOLS

A. Pneumatic power tools shall be secured to the hose in a positive manner to prevent accidental disconnection.

B. Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent them from being accidentally expelled.

C. The manufacturer’s safe operating pressure for all hoses, fittings and utilization equipment shall not be exceeded.

4. BELT SANDING MACHINES

A. Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs onto a pulley.

B The unused run of the sanding belt shall be guarded against accidental contact.

5. BOILERS

Boilers provided by the contractor shall be deemed to be in compliance with the requirements of this part when evidence of current and valid certification by an insurance company or regulatory authority attesting to the safe installation, inspection and testing is presented.

6. CHAINS

(See wire ropes, chains, hooks, etc., #63).

7. COMPRESSED AIR, USE OF

Compressed air used for cleaning purposes shall not exceed 35 psi when the nozzle end is obstructed or dead ended and then only with effective chip guarding and personal protective equipment.

8. COMPRESSED GAS CYLINDERS - (OSHA PART 1926.350 Thru 1926.354)

A. Valve protection caps shall be in place when compressed gas cylinders are transported, moved or stored.

B. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.

C. Compressed gas cylinders shall be secured in an upright position at all times, except when cylinders are actually being hoisted or carried.

D. Cylinders shall be kept at a safe distance or shielded from welding or cutting operations. Cylinders shall be kept at a safe distance from radiators or other heat sources or where they can contact an electrical circuit.

E. Oxygen and fuel gas regulators shall be in proper working order while in use.

9. CONCRETE, CONCRETE FORMS AND SHORING

A. All equipment and material used shall comply with ANSI A10.9 “Safety Requirements for Concrete Construction and Masonry Work”.

B. Employees shall not be permitted to work above vertically protruding reinforcing steel, unless it has been protected to eliminate the hazard of impalement.

C. Powered and rotating-type concrete toweling machines that are manually guided shall be equipped with a dead man type operating control.

D. Formwork and shoring shall safely support all loads imposed during concrete placement. Drawings or plans of formwork and shoring systems shall be available at the job site.

10. CONVEYORS

A. Conveyor systems shall be equipped with an audible warning signal which can be sounded immediately before starting up the conveyor.

B. Where conveyors pass over work areas or aisles, guards shall be provided to protect employees from falling material.

C. Conveyors shall be in compliance with ANSI B20.1, “Safety Code for conveyors, cableways and related equipment”.

11. CRANES AND DERRICKS

A. The contractor shall comply with the manufacturer’s specifications and limitations.

B. Rated load capacities, recommended operating speeds and special hazard warnings or instructions shall be posted on all equipment and be visible from the operator’s station.

C. Equipment shall be inspected before each use and all deficiencies corrected before further use.

D. Accessible areas within the swing radius of the revolving superstructure shall be barricaded.

E. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work, or where insulating barriers not a part of or an attachment to the equipment or machinery have been erected to prevent physical contact with the lines, no part of a crane or its load shall be operated within 10 feet of a line rated 50 kV or below; 10 feet + 0.4 inches for each 1 kV over 50 kV for lines rated over 50 kV; or twice the length of the line insulator, but never less than 10 feet.

F. (For rules pertaining to Rigging Equipment, see item #62).

12. DISPOSAL CHUTES

A. Whenever materials are dropped more than 20 feet to any exterior point, an enclosed chute shall be used.

B. When debris is dropped through holes in the floor without the use of chutes, the area where the material is dropped shall be enclosed with barricades not less than 42 inches high and not less than 6 feet back from the projected opening.

13. DRINKING WATER

A. An adequate supply of portable water will be provided in all places of employment.

B. Portable drinking water containers shall be capable of being tightly closed and be equipped with a tap.

C. The common drinking cup is prohibited.

D. Unused disposable cups shall be kept in a sanitary container and a receptacle shall be provided for used cups.

14. ELECTRICAL

A. All electrical work shall be in compliance with the current National Electrical Code, unless otherwise provided by OSHA regulations.

B. The noncurrent-carrying metal parts of fixed, portable and plug-connected equipment shall be grounded. Portable tools and appliances protected by an approved system of double insulation need not be grounded.

C. Extension cords shall be the 3-wire type, shall be protected from damage and shall not be fastened with staples, hung from nails, or suspended from wires. Splices shall have soldered wire connections with insulation equal to the cable. Worn or frayed cords shall not be used.

D. Exposed bulbs on temporary lights shall be guarded to prevent accidental contact. except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use.

E. Receptacles for attachment plugs shall be of the approved, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

F. Each disconnecting means for motors and appliances and each service feeder or branch circuit at the point where it originates shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident.

15. EXCAVATING AND TRENCHING - (OSHA PART 1926.652)

A. Before opening any excavation, efforts shall be made to determine if there are underground utilities in the area and they shall be located and protected during the excavation operations.

B. The walls and faces of all excavations and trenches more than 4 feet deep, in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means.

C. A means of egress such as but not limited to a ladder, stairway or ramp shall be located in every excavation or trench 4 feet (1.22M) or more in depth so as to require no more than 25 feet *7.62M) of lateral travel for employees.

D. In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2 feet or more from the edge of the excavation.

E. Daily inspections of excavations will be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard the employees.

16. EXPLOSIVES AND BLASTING

A. Only authorized and qualified persons shall be permitted to handle and use explosives.

B. Explosive material shall be stored in approved facilities as required by provisions of the Internal Revenue Service regulations published in 26 CFR 181, “Commerce in Explosive”.

C. Smoking and open flames shall not be permitted within 50 feet of explosives storage magazines.

D. Procedures that permit safe and efficient loading shall be established before loading is started.

1.7 EYE AND FACE PROTECTION - (OSHA 1926.102)

A. Eye and face protection shall be provided when machines or operations present potential eye or face injury.

B. Eye and face protective equipment shall meet the requirements of ANSI Z87.1, “Practice for Occupational Eye and Face Protection”.

C. Employees involved in welding operations shall be furnished with filter lenses of the proper shade number.

D. Employees exposed to laser beams shall be furnished suitable laser safety goggles which will protect for the specific wave-length of the laser and be of optical density (O.D.) adequate for the energy involved.

18. FIRE PROTECTION

A. The Medical Center’s fire fighting program is to be followed throughout all phases of the construction and demolition work involved.

B. Fire fighting equipment will be conspicuously located and readily accessible at all times and be maintained in operating condition.

C. Carbon tetrachloride and other toxic vaporizing liquid fire extinguishers are prohibited.

D. All construction employees shall receive fire/safety orientation from their supervisors via the general contractor.

19. FLAGMAN

A. When signs, signals and barricades do not provide the necessary protection on or adjacent to a highway or street, flagmen or other appropriate traffic controls shall be provided.

B. Flagman shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be of reflectorized material.

20. FLAMMABLE AND COMBUSTIBLE LIQUIDS

A. Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.

B. No more than 25 gallons of flammable or combustible liquid shall be stored in a room outside of an approved storage cabinet. No more than 60 gallons of flammable or 120 gallons of combustible liquids shall be stored in any one- storage cabinet. No more than three storage cabinets may be located in a single storage area.

C. Inside storage rooms for flammable and combustible liquids shall be of fire-resistive construction, have self-closing fire doors at all openings, 4-inch sill or depressed floors, a ventilation system that provides at least six air changes within the room per hour and electrical wiring and equipment approved for Class 1, Division 1 locations.

D. Storage in containers outside buildings shall not exceed 1,100 gallons in any one pile or area. The storage area shall be graded to divert possible spills away from buildings or other exposures, or shall be surrounded by a curb or dike. Storage areas shall be located at least 20 feet from any building and shall be free from weeds, debris and other combustible materials.

E. Flammable liquids shall be kept in closed containers when not actually in use.

F. Conspicuous and legible signs prohibiting smoking shall be posted in service and refueling areas.

21. FLOOR OPENINGS, OPEN SIDES, HATCHWAYS, ETC.

A. Floor openings shall be guarded by a standard railing and toeboards or covers. In general, the railing shall be provided on all exposed sides, except at entrances to stairways. Temporary floor openings shall have standard railings.

B. Every open-sided floor or platform, 6 feet or more above adjacent floor or ground level, shall be guarded by a standard railing, or the equivalent, on all open sides except where there is entrance to a ramp, stairway, or fixed ladder.

C. Floor holes, into which persons can accidentally walk, shall be covered with a floor hole cover or standard strength and construction or be guarded by a standard railing with toeboard on all exposed sides.

D. Runways 4 feet or more shall have standard railings on all open sides, except runways more than 18 inches wide used exclusively for special purposes may have the railings on one side omitted where operating conditions necessitate.

22. GASES, VAPORS, FUMES, DUSTS AND MISTS

A. Exposure to toxic gases, vapors, fumes, dusts and mists at a concentration above those specified in the "Threshold Limit Values of Airborne Contaminants" of the ACGIH, shall be avoided.

B. Administrative or engineering controls must be implemented whenever feasible to comply with TLV's.

D. When engineering and administrative controls are not feasible to achieve full compliance, protective equipment or other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed. Any equipment and technical measures used for this purpose must first be approved for each particular use by a competent industrial hygienist or other technically qualified person.

23. GENERAL DUTY CLAUSE

A. Hazardous conditions or practices not covered in an OSHA standard may be covered under Section 5 (a) (1) of the Occupational Safety and Health Act of 1970 which states, "Each employee shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees".

24. GENERAL REQUIREMENTS

A. The contractor shall initiate and maintain such programs as may be necessary to provide for frequent and regular inspections of the job site, materials and equipment.

B. The contractor shall instruct each employee in the recognition and avoidance of unsafe conditions and in the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

C. The contractor shall ensure that all employees are familiar with the requirements set forth in this standard.

25. HAND TOOLS - (OSHA PART 1926.300)

A. Contractors shall not issue or permit the use of unsafe hand tools.

B. Wrenches shall not be used when jaws are sprung to the point that slippage occurs. Impact tools shall be kept free of mushroomed heads. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

C. Electric power operated tools shall either be approved double insulated or be properly grounded.

E. When power-operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.

26. HEAD PROTECTION - (OSHA PART 1926.100)

A. Head protective equipment (helmets) shall be worn in areas where there is a possible danger of head injuries from impact, flying or falling objects, or electrical shock and burns.

B. Helmets for protection against impact and penetration of falling and flying objects shall meet the requirements of ANSI Z89.1.

C. Helmets for protection against electrical shock and burns shall meet the requirements of ANSI Z89.2.

27. HEARING PROTECTION

A. Feasible engineering or administrative controls shall be utilized to protect employees against sound levels in excess of those shown in Table D-2.

B. When engineering or administrative controls fail to reduce sound levels within the limits of Table D-2, ear protective devices shall be provided and used.

C. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

D. In all cases, where the sound levels exceed the values shown in Table D-2 of the Safety and Health Standards, a continuing, effective hearing conservation program shall be administered.

E. Table D-2, Permissible Noise Exposures.

DURATION PER DAY HOURS:	SOUND LEVEL dBA SLOW RESPONSE
8	90
6	92

4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

F. Plain cotton is not an acceptable protective device.

28 HEATING DEVICES, TEMPORARY

A. Fresh air shall be supplied in sufficient quantities to maintain the health and safety of workers.

B. Solid fuel salamanders are prohibited in buildings and on scaffolds.

C. When heaters are used, they shall rest on suitable heat insulating material or at least 1-inch concrete, or equivalent and be located at least 10 feet from any combustible materials.

29. HOISTS, MATERIAL AND PERSONAL

A. The contractor shall comply with the manufacturer's specifications and limitations.

B. Rated load capacities, recommended operating speeds and special hazard warnings or instructions shall be posted on cars and platforms.

C. Material hoisting entrances of material hoists shall be protected by substantial full width gates or bars.

D. Hoisting doors or gates of personnel hoists shall be not less than 6 feet 6 inches high and be protected with mechanical locks, which cannot be operated from the landing side and are accessible only to persons on the car.

E. Solid overhead protective coverings shall be provided on the top of the hoist cage or platform.

30. HOOKS

(See Wire Ropes, Chains, Hooks, etc., #62).

31. HOUSEKEEPING

A. Form and scrap lumber with protruding nails and other debris, shall be kept clear from all work areas.

B. Combustible scrap and debris shall be removed at regular intervals.

C. Containers shall be provided for collection and separation of all refuse. Covers shall be provided on containers used for flammable or harmful substances.

D. Wastes shall be disposed of at frequent intervals.

E. All external industrial waste bins shall be guarded by a fence no less than four feet in height. The length of the fence as such to prevent entry by staff or patients.

32. ILLUMINSION

A. Construction areas, ramps, runways, corridors, offices, shops and storage areas shall be lighted to not less than the minimum illumination intensities listed in Table D-3 while any work is in progress.

B. Table D-3: Minimum Illumination Intensities in Foot-Candles.

Foot Candles:	Area or Operation:
5.....	General construction area lighting.
3.....	General construction areas, concrete placement, excavation and waste areas, access ways, active storage areas, loading platforms, refueling and field maintenance areas.
5.....	Indoors; warehouses, corridors, hallways and exit ways.
5.....	Tunnels, shafts and general underground work areas (Exception: minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking and scaling. Bureau of Mines approved cap lights shall be acceptable for use in tunnel heading).
10.....	General construction plant and shops (e.g. bath plants, screening plants, mechanical and electrical equipment rooms, carpenter shops, rigging lofts and active storerooms, mess halls, indoor toilets, and workrooms).
30.....	First aid stations, infirmaries and offices.

33. JOINTERS

A. Each hand-fed planer and jointer with a horizontal head shall be equipped with a cylindrical cutting head. The opening in the table shall be kept as small as possible.

B. Each hand-fed jointer with a horizontal cutting head shall have an automatic guard which will cover the section of the head on the working side of the fence or gage.

C. A jointer guard shall automatically adjust itself to cover the unused portion of the head and shall remain in contact with the material at all times.

D Each hand-fed jointer with horizontal cutting head shall have a guard, which will cover the section of the head back of the gage or fence.

34. LADDERS

A. The use of ladders with broken or missing rungs or steps, broken or split side rails, or with other faulty or defective construction is prohibited. When ladders with such defects are discovered, they shall immediately be withdrawn from service.

B. Portable ladders shall be placed on a substantial base at a 4-1 pitch, have clear access at top and bottom, extend a minimum of 36 inches above the landing and be secured against movement while in use.

C. Portable metal ladders shall not be used for electrical work or where they may contact electrical conductors.

D. Job-made ladders shall be constructed for this intended use. Cleats shall be inset into side rails 1/2 inch, or filler blocks used. Cleats shall be uniformly spaced, 12 inches, top-to-top.

35. LASERS

A. Only qualified and trained employees shall be assigned to install, adjust and operate laser equipment.

B. Employees shall wear proper eye protection where there is a potential exposure to laser light greater that 0.005 watts (5 milli-watts).

C. Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight, or at change of shifts, the laser shall be turned off.

D. Employees shall not be exposed to light intensities above: Direct staring - 1 micro-watt per square centimeter; incidental observing - 1 milli-watt per square centimeter; diffused reflected light - 2-1/2 watts per square centimeter. Employees shall not be exposed to microwave power densities in excess of 10 milli-watts per square centimeter.

36. LIQUIFIED PETROLEUM GAS

A. Each system shall have containers, valves, connectors, manifold valve assemblies and regulators of an approved type.

B. All cylinders shall meet DOT specifications.

C. Every container and vaporizer shall be provided with one or more approved safety relief valves or devices.

D. Containers shall be placed on firm foundations and secured in an upright position.

E. Portable heaters shall be equipped with an approved automatic device to shut off the flow of gas in the event of flame failure.

F Storage of LPG within buildings is prohibited.

G. Storage locations shall have at least one 20-B:C rated fire extinguisher.

37. MEDICAL SERVICES AND FIRST AID

A. The employer shall ensure the availability of medical personnel for advice and consultation on matters of occupational health.

B. When a medical facility is not reasonably accessible for the treatment of injured employees, a person trained to render first aid shall be available at the work site.

38. MOTOR VEHICLES AND MECHANIZED EQUIPMENT

A. All vehicles in use shall be checked at the beginning of each shift to assure that all parts, equipment and accessories that affect safe operation are in proper operating condition and free from defects. All defects shall be corrected before the vehicle is placed in service.

B. No contractor shall use any motor vehicle, earthmoving, or compacting equipment having an obstructed view to the rear unless:

- The vehicle has a reverse signal alarm distinguishable from the surrounding noise level, or

- The vehicles backed up only when an observer signals that it is safe to do so.

C. Heavy machinery, equipment or parts thereof shall be substantially blocked to prevent falling or shifting before employees are permitted to work under or between them.

39. NOISE

(See hearing protection, #27).

40. PERSONAL PROTECTIVE EQUIPMENT

A. The contractor is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions or where the need is indicated for using such equipment to reduce the hazard to the employees.

B. Lifelines, safety belts and lanyards shall be used only for employee safeguarding.

41. POWDER-ACTUATED TOOLS

A. Only trained employees shall be allowed to operate powder-actuated tools.
B. All powder-actuated tools shall be tested daily using the manufacturers recommended procedure to insure all safety devices are in proper working condition. Any tool found not in proper working order shall be removed from service until repaired.

C. Tools shall not be loaded until immediately before use.

42. POWER TRANSMISSION AND DISTRIBUTION

A. Existing conditions shall be determined before starting work by an investigation or a test.

B. Electric equipment and lines shall be considered energized until determined otherwise by testing or until grounding.

C. Operating voltage of equipment and lines shall be determined before working on or near energized parts.

D. Rubber protective equipment shall comply with the provisions of the ANSI series and shall be visually inspected before use.

43. POWER TRANSMISSION, MECHANICAL

A. Belts, gears, pulleys, sprockets, spindles, drums, flywheels, chains or other reciprocating, rotating, or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise constitute a hazard.

B. Guarding shall meet the requirement of ANSI B15.1, “Safety Code for Mechanical Power Transmission Apparatus”.

44. RADIATION, IONIZING

A. Pertinent Provisions of the Atomic Energy Commission’s Standards for Protection Against Radiation (10 CFR Part 20), relating to protection against occupational radiation exposure, shall apply.

B. Persons handling radioactive materials or x-rays shall be specially trained or licensed if required.

45. RAILINGS

A. A standard railing shall consist of top rail, intermediate rail and posts and have a vertical height of approximately 42 inches from upper surface of top rail to the floor, platform, etc.

B. The top rail of a railing shall be smooth-surfaced, with a strength to withstand at least 200 pounds. The intermediate rail shall be approximately halfway between the top rail and floor.

C. A stair railing shall be of construction similar to a standard railing, but the vertical height shall be not more than 34 inches nor less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

D. (See toeboards, #58).

46. RESPIRATORY PROTECTION

A. In emergencies, or when feasible engineering or administrative controls are not effective in controlling toxic substances, appropriate respiratory protective equipment shall be provided by the employer and shall be used.

B. Respiratory protective devices shall be approved by the National Institute for Occupational Safety and Health (NIOSH) or acceptable to the U.S. Department of Labor for the specific containment to which the employee is exposed.

C. Respiratory protective devices shall be appropriate for the hazardous material involved and the extent and nature of the work performed.

D Employees required to use respiratory protective devices shall be instructed in their use.

E. Respiratory protective equipment shall be inspected regularly and maintained in good condition.

47. ROLLOVER PROTECTIVE STRUCTURES (ROPS)

A. Rollover protective structures (ROPS) applies to the following types of materials handling equipment: To all rubber-tired, self-propelled scrapes, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler-type loaders and motor graders, with or without attachments that are used in construction work. This requirement does not apply to side-boom pipe-laying tractors.

B. Above equipment manufactured on or after 9/1/72 shall have ROPS.

C. Above equipment manufactured on or after 1/1/72 shall have ROPS by 4/1/73.

D Above equipment manufactured between 7/1/71 and 12/31/71 shall have ROPS by 7/1/73

F. Above equipment manufactured between 7/1/70 and 6/30/71 shall have ROPS by 1/1/74

F. Above equipment manufactured between 7/1/69 and 6/30/70 shall have ROPS by 7/1/74.

G. Above equipment manufactured before 7/1/69 are not required to have ROPS as of this printing.

48. SAFETY NETS

A. Safety nets shall be provided when workplaces are more than 25 feet above the surface where the use of ladders, scaffolds cath platforms, temporary floors, safety lines, or safety belts are impractical.

B. Where nets are required, operations shall not be undertaken until the nets are in place and have been tested.

49. SAWS, BANDS

A. All portions of band saw blades shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table.

B. Band saw wheels shall be fully encased.

50. SAWS, PORTABLE CIRCULAR

A. All portable, power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work and shall automatically return to the covering position when the blade is removed from the work.

B. (See #25 of this digest).

51. SAWS, RADIAL

A. Radial saws shall have an upper guard, which completely encloses the upper half of the saw blade. The sides of the lower exposed portion of the blade shall be guarded by a device that will automatically adjust to the thickness of and remain in contact with the material being cut.

B. Radial saws used for rippling shall have non-kickback fingers or dogs.

C. Radial saws shall be installed so that the cutting head will return to the starting position when released by the operator.

52. SAWS, SWING OR SLIDING CUT-OFF

A. All swing or sliding cut-off saws shall be provided with a hood that will completely enclose the upper half of the saw.

B. Limit stops shall be provided to prevent swing or sliding type cut-off saws from extending beyond the front or back edges of the table.

C Each swing or sliding cut-off saw shall be provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel.

D. Inverted sawing of sliding cut-off saws shall be provided with a hood that will cover the part of the saw that protrudes above the top of the table or material being cut.

53. SAWS, TABLE

A. Circular table saws shall have a hood over the portion of the saw above the table, so mounted that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut.

B. Circular table saws shall have a spreader aligned with the blade, spaced no more than 1/2 inch behind the largest blade mounted in the saw. This provision does not apply when grooving, dadoing, or rabbiting.

C. Circular table saws used for ripping shall have non-kickback finger or dogs.

D. Feed rolls and blades of self-feed circular saws shall be protected by a hood or guard to prevent the hands of the operator from coming in contact with the in-running rolls at any time.

54. SCAFFOLDS - (OSHA PART 1926.451)

A. Scaffolds shall be erected on sound, rigid footing, capable of carrying the maximum intended load.

B. Scaffolds and their components shall be capable of supporting, without failure, at least 4 times the maximum intended load.

C. Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor, except needle beam scaffolds and floats. Scaffolds 4 feet to 10 feet in height, having a minimum dimension in either direction of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.

D. There shall be a screen with maximum 1/2 inch openings between the toeboard and the mid-rail, where persons are required to work or pass under the scaffold.

E. All planking shall be scaffold grade as recognized by grading rules for the species of wood used. The maximum permissible spans for 2 x 10 inches or wider planks are shown in the following table:

MATERIAL

	FULL THICKNESS UNDRESSED LUMBER			NORMAL THICKNESS LUMBER	
Working load (p.s.f.).....	25	50	75	25	50
Permissible span (ft.).....	10	8	6	8	6

The maximum permissible span for 1-1/4 x 9 inch or wider plank of full thickness is 4 feet, with medium loading of 50 p.s.f.

F. Scaffold planking shall be overlapped a minimum of 12 inches or secured from movement.

G. Scaffold planks shall extend over their end supports not less than 6 inches, nor more than 12 inches.

H. All scaffolding and accessories having any defective parts shall be immediately replaced or repaired.

55. STAIRS

A. Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails.

B. On all structures 20 feet or over in height, stairways, ladders, or ramps shall be provided.

C. Rise height and tread width shall be uniform throughout any flight of stairs.

D. Hollow pan-type stairs shall be filled to the level of the nosing with solid material.

56. STEEL ERECTION

A. Permanent floors shall be installed so there is not more than eight stories between the erection floor and the upper-most permanent floor, except when structural integrity is maintained by the design.

B. During skeleton steel erection, a tightly planked temporary floor shall be maintained within two stories or 30 feet, whichever is less - that portion of each tier of beams on which any work is being performed.

C. During skeleton steel erection, where the requirements of the preceding paragraph cannot be met and where scaffolds are not used, safety nets shall be installed and maintained whenever the potential fall distance exceeds two stories or 25 feet.

D. A safety railing of ½ inch wire rope or equivalent shall be installed around the perimeter of all temporarily floored buildings, approximately 42 inches high, during structural steel assembly.

E. When placing structural members, the load line shall not be released until the member is secured by at least two bolts, or the equivalent, at each connection drawn up wrench tight.

57. STORAGE

A. All materials stored in tiers shall be secured to prevent sliding, falling or collapse.

B. Aisles and passageways shall be kept clean and in good repair.

C. Storage of materials shall not obstruct exits.

D. Materials shall be stored with due regard to their fire characteristics.

G. Weeds and grass in outside storage areas shall be kept under control.

H. Storage of flammable liquids inside buildings is not permitted.

I. Storage of flammable liquids inside buildings is not permitted.

J. All tools must be locked up when not in the immediate care of your employees, and at the end of each workday.

58. TOEBOARDS - (Floor and Wall Openings and Stairways).

A. Railings protecting floor openings, platforms, scaffolds, etc., shall be equipped with toeboards wherever, beneath the open side, persons can pass, there is moving machinery, or there is equipment with which falling material could cause a hazard.

C. A standard toeboard shall be at least 4 inches in height and may be of any substantial material either solid or open, with openings not to exceed 1 inch in greatest dimension.

59. TOILETS

A. Toilets shall be provided according to the following; 20 or fewer persons - one facility; 20 or more persons - one toilet seat and one urinal per 40 persons; 200 or more persons - one toilet seat and one urinal per 50 workers.

B. This requirement does not apply to mobile crews having transportation readily available to nearby toilet facilities.

60. WASHING FACILITIES

A. The employer shall provide adequate washing facilities for employees engaged in the application of harmful substances or in operations where harmful contaminants are used.

B. Washing facilities shall be in close proximity to the work-site and shall be equipped to remove all harmful substances.

61. WELDING, CUTTING AND HEATING

A. Whenever any welding, burning, heating or cutting operation is to be performed, the contractor must secure a permit from the Fire Department. Requests for permits should be made by the contractor's authorized supervisory representative. Upon completion of the above operation, the permit shall be returned to the Fire Department.

B. Contractors shall instruct employees in the safe use of welding equipment.

C. Proper precautions (isolating welding and cutting, removing fire hazards from the vicinity, providing a fire watch, etc.) for fire prevention shall be taken in areas where welding or other "Hot Work" is being done. No welding, cutting or heating shall be done where the application of flammable paints, or the presence of other flammable paints, or the presence of other flammable compounds, or heavy dust concentrations creates a fire hazard.

D. Welding and cutting operations shall be shielded by non-combustible, or flame-proof shields.

E. When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be placed or protected so that they cannot make electrical contact with employees or conducting objects.

F. All arc welding and cutting cables shall be completely insulated. There shall be no repairs or splices within 10 feet of the electrode holder, except where splices are insulated equal to the cable. Defective cable shall be repaired or replaced.

G. Fuel gas and oxygen hose shall be easily distinguishable and shall not be interchangeable. Hoses shall be inspected at the beginning of each shift and shall be repaired or replaced if defective.

H. Mechanical ventilation or airline respirators shall be provided when welding, cutting or heating:

** zinc-, lead-, cadmium-, mercury-, or beryllium-bearing, based or coated materials in

enclosed spaces.

** stainless steel with inert equipment.

** in confined spaces.

** where an unusual condition can cause an unsafe accumulation of contaminants.

I. Proper eye protective equipment to prevent exposure of personnel shall be provided (See Item #17c).

J. (See Compressed Gas Cylinders, #8).

This Medical Center is equipped with sophisticated Smoke Detectors directly tied into our Fire Alarm System and the on-site Fire Department.

These on-site units can be activated very easily with any products of combustion and therefore can create an actual ALARM condition. Prior notification of all heat and smoke producing operations will enable us to shut down that particular FIRE ZONE until the contractors are finished with their work.

62. WIRE ROPES, CHAINS, ROPES

A. Wire ropes, chains, ropes and other rigging equipment shall be inspected prior to use and as necessary to assure their safety. Defective gear shall be removed from service.

B. Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments.

C. When U-bolts are used for eye splices, the U-bolt shall be applied so that the “U” section is in contact with the dead end of the rope.

63. WOODWORKING MACHINERY

A. All fixed power-driven woodworking tools shall be provided with a disconnect switch that can be either locked or tagged in the off position.

B. All woodworking tools and machinery shall meet applicable requirements of ANSI 01.1, “Safety Code for Woodworking Machinery”.

64. SMOKING POLICY

A. Smoking is <u>not</u> permitted in any building.

B. Smoking is permitted outside and in the smoking huts of our grounds.

65. DISCOVERY OF FIRE

A. In the event a fire is discovered the following steps will be carried out:

RESCUE - Remove anyone in danger from the area.

ALARM - Turn in the alarm.

CONTAIN - Close doors prevent spread

EXTINGUISH - Only if it is safe.

B. All contractor personnel will familiarize themselves with all fire equipment and fire alarm pull box station locations.

C. Dial 4911 and give location and type of fire.

D. Evacuation plans are posted on each floor in the corridors for your use in the event of a fire. When the fire alarm sounds in the building where workmen are located, they must evacuate the building and wait for all clear signal from Fire Department.

E. In the event of a fire **DO NOT** use elevators - use stairwell exits for means of escape.

66. CARDIAC ARREST

In the event a contractor's employee suffers an apparent heart attack a fellow employee should go to the nearest phone, dial "911" report that there is a possible cardiac arrest and give the exact location.

Reference: 29 CFR1910.1926 OSHA Safety and Health Standard

67. CONFINED SPACE ENTRY - (OSHA 1910.146)

Any work which requires entry into a confined space, such as manholes, shall conform to OSHA 1910.146, Confined Space Entry, and this Medical Center's Confined Sjpace Entry Program. Contractor will be informed of the hazards associated with such spaces by the VA Engineering Staff, and will supply the VA with evidence of an appropriate confined space program and worker training in Confined Space Entry. Contractor will supply all equipment necessary to work safely in a confined space. Contractor will coordinate entry into such spaces with VA Safety Staff.

68. LOCK OUT/TAG OUT HAZARDOUS ENERGY - (OSHA 1910.147)

All equipment shall be locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy isolating device where it is locked (or tagged) out.

If more than one crew, department, etc is involved, one authorized employee will coordinate the lock/out tag/out to ensure that all control measures are applied and there is continuing of protection for the group.

DEPT. OF VETERANS AFFAIRS (VA)

CUTTING AND WELDING PERMIT

Date:_____ Bldg. #:_____ Floor/Area:_____

Welder's Name:_____ Shop/Company:_____

Nature of
Job:_____
_____
_____

Is Fire Watch required:_____ Fire Watcher:_____

The location has been examined. The proper precautions have been taken.
Permission is granted for this work. (See precautions on reverse side)

Permit Expires:_____

SIGNED:_____
(Authorizing Fire Dept. Official)

Time Work Started:_____

Time Work Finished:_____

FINAL CHECK-UP

The work area was inspected 30 minutes after the work was completed and was found fire safe. The work area is to include all adjacent areas (including floors above and below), to which any fire or heat might spread.

SIGNED: _____
(Supervisor of Fire Watcher)

ATTACHMENT #2

ATTENTION

BEFORE APPROVING ANY CUTTING OR WELDING PERMIT, THE FIRE DEPARTMENT REPRESENTATIVE OR HIS APPOINTEE SHALL INSPECT THE WORK AREA AND CONFIRM THAT THE PROPER PRECAUTIONS HAVE BEEN TAKEN.

NECESSARY PRECAUTIONS

	YES	NO
1. Cutting and welding equipment is in good condition.	____	____
2. Sprinklers are in service.	____	____
3. Floor swept clean within 35 ft of combustibles.	____	____
4. Combustible floors wet down or shielded within 35 ft.	____	____
5. All combustible or flammable liquids removed from the area.	____	____
6. All wall and floor openings are covered and protected from open flame.	____	____
7. Enclosed equipment cleaned of all combustibles.	____	____
8. Enclosed containers purged of flammable vapors.	____	____
9. Proper fire extinguisher provided in the work area.	____	____
10.Personnel instructed in proper operation of fire alarm.	____	____
11.Was fire watch provided?	____	____
12. Proper utilities secured such as LP gas, oxygen, natural gas, etc.?	____	____
13.Proper fire alarm equipment secured?	____	____
14.Final check up completed 30 minutes after work was completed?	____	____

I HAVE BEEN INFORMED AND UNDERSTAND THE PROVISIONS OF THIS PERMIT. I UNDERSTAND THIS PERMIT CAN BE REVOKED AT ANY TIME IF I, OR MY EMPLOYEES, FAIL TO FOLLOW THE PRECAUTIONS OUTLINED ABOVE.

SIGNED: _____
(Supervisor's Signature & Date)

DEMOLITION FOR CONSTRUCTION PROJECTS IN
VA MEDICAL CENTER BUILDINGS:

a. The contractor shall provide plastic barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust.

b. The contractor shall utilize HEPA (High Efficiency Particulate Air) equipped air filtration units rated at 99% capture of 0.5 microns including pollen, mold spores and dust particles. The contractor shall insure that continuous negative air pressures are maintained for the duration of the demolition of this project unless otherwise authorized by the resident engineer in writing.

c. The contractor shall compartmentize by the demolition are creating a barrier reaching from floor to ceiling before any demolition is started in any Medical Center Buildings. Surround the affected area entirely and seal with duct tape at the ceiling, floor and sides.

d. The contractor shall use non-combustible systems or devices to seal existing penetrations of pipe, plastic pipe or conduits, unenclosed cables, or other non – metallic materials in Medical Center Buildings and penetrations that occur from demolition in those buildings.

e. The contractor shall broom clean at the end of each workday and remove debris as they are created. The contractor shall transport the debris outside the construction area in containers with tightly fitting lids that shall be approved by the resident engineer.

f. Medical Center staff at the pre-construction meeting will complete an Pre-Construction Risk Assessment (PCRA).

Pre-Construction Risk Assessment	
Infection Control / Safety Construction Permit	
Location of Construction: Bldg. # 14, Boiler Plant	**Project Start Date: TBD**
Project Coordinator: Thomas G. Stepsis	**Estimated Duration: TBD**
Contractor Performing Work: TBD	**Permit Expiration Date: TBD**
Supervisor: Nicholas Girken	**Telephone: 610-384-7711, Ext: 3217**

Description of project: **542-10-104,** This project is for the total renovation of specific interior and exterior areas. In the Boiler Plant Operations areas located on the First Floor and Loft area; Construct new addition to relocate the Control Room and administration offices, Toilet / Shower room, Break Area. Renovate the existing Shop areas, Chemical Testing area and Catwalks. Exterior work shall include all necessary repairs to the existing masonry walls, provide a coating system, evaluate and determine a corrective solution to existing water penetration problem over the former coal bins that have been converted to work areas.
The project includes all the necessary demolition and new construction of walls, doors / frames, plumbing fixtures, electrical fixtures, architectural finishes and new HVAC systems.
The consultant shall incorporate into the design; workbenches, counters, cabinets, shelving, and fixtures that are required to comply with project requirements. Interior painting of all previously painted surfaces throughout the Boiler Plant.

CONSTRUCTION ACTIVITIES

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

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

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

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

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

ENVIRONMENT

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

UTILITY FAILURES

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

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

ADDITIONAL SAFETY CONCERNS

Yes	No	
☐	☐	Will construction affect exit routes from occupied areas adjacent to construction site?
☐	☐	Will project affect traffic patterns in area?
☐	☐	**The following must be completed prior to any construction activities.**
		• Separation wall must be constructed prior to project beginning. • Fire protection systems must remain intact. • Provide extra fire extinguishers in work areas. • Maintain exit lights in work area. • Maintain negative air in construction area (24/7) through duration of project. • There cannot be any return air from within the construction area to the rest of the building. • Redirect exiting not to go through construction area. • Put signs on doors into construction area "Construction Area – Do Not Enter". • Maintain daily logs and keep a current Hot Work Permit. • Place tacky mats at doors interior and exterior exiting construction area. • All debris removal must be by covered cart. • Maintain clean and orderly work area. • How will this project affect the departments above, below and adjacent to this project?

AIR QUALITY AND INFECTION CONTROL

The construction activity types are defined by the amount of dust that is generated, the duration of the activity, and the amount of shared HVAC systems. Contact CVAMC's Safety Office and Infection Preventionist if any activity is questionable under these guidelines.

Yes	No	Will dust be generated during this project?
☐	☐	***If yes, explain location of and plan for interim dust barriers or attach floor plan with barriers clearly marked.*** ***DUST BARRIERS, ICRA WALLS WILL BE IN PLACEAND MAINTAINED FOR THE DURATION OF THE PROJECT***
☐	☐	Will debris removal be necessary? ***If yes, explain plan for debris removal and control.*** ***DEBRIS CARTS AND DUMPSTERS WILL BE USED AND COVERED***
☐	☐	Negative airflow ventilation and filtration in place and assessed for effectiveness.
☐	☐	Exhaust fans in place and functioning.
☐	☐	Is supply duct to area closed and HEPA filtration unit in place and functioning in adjacent patient care area?
☐	☐	Will work be done in a sterile area? ***If so, how are you going to maintain sterile atmosphere in work area and access to and from work area?***
Type A		**Inspections and Non-Invasive Activities or Small scale, Short duration Activities**
Yes	No	
☐	☐	Removal of ceiling tiles for visual inspection (e.g. 1 tile per 50 square feet)
☐	☐	Painting (but not sanding)
☐	☐	Wall covering—Describe work to be done:
☐	☐	Electrical trim work. Describe:
☐	☐	Minor plumbing. Describe:
Type B		**Small scale, short duration activities that create minimal dust.**
Yes	No	
☐	☐	Installation of telephone and computer cabling
☐	☐	Access to chase spaces
☐	☐	Cutting of walls or ceiling where dust migration can be controlled.

Type C		Any work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies.
Yes	No	
☐	☐	Sanding of walls for painting or wall covering
☐	☐	Removal of x❑floor coverings ❑ceiling tile ❑casework (>50% of surface area) Describe:% Describe:
☐	☐	New wall construction
☐	☐	Minor ductwork or electrical work above ceilings
☐	☐	Major cabling activities
☐	☐	Activity cannot be completed within a single work shift
Type D		**Major Demolition and Construction Projects.**
Yes	No	
☐	☐	Will require heavy demolition or removal of a complete ceiling system
☐	☐	New construction
☐	☐	Activities which require consecutive work shifts

Group 1 - Lowest	Group 2 - Medium	Group 3 - High	Group 4 - Highest
1.Office 2.Hallways 3.Utility Areas	1. Bldg. #69 Therapy Areas 2. Respiratory Therapy / EKG 3. Outpatient Clinics 4. CBOC's 5. Mental Health Units CLC's (1B, 59B, 138A, 138B, 6. 138E/H) 7. Dining Areas (Canteen, 139)	1. Pharmacy Bldg.#2 2. Radiology / CT Scanner Bldg. #3 3. Urgent Care Bldg. #3 4. Laboratories Bldg. #3	1.SPS Bldg. #4 2.Respiratory Isolation Rooms1B 3.Urgent Care Bldg. #3

Contact the Infection Preventionist or Safety Office for risk assessment of any area not listed above.

CONSTRUCTION ACTIVITY (from previous page) *Check type of activity*		**INFECTION CONTROL RISK GROUP** (see above) *Check risk group*	
☐	TYPE A: Inspection, non-invasive activity	☐	GROUP 1: Lowest Risk
☐	TYPE B: Small scale, short duration projects	☐	GROUP 2: Medium Risk
☐	TYPE C: Activity generates moderate to high levels of dust, requiring >1 work shift for completion	☐	GROUP 3: High Risk
☐	TYPE D: Major duration and construction activities Requiring consecutive work shifts	☐	GROUP 4: Highest Risk

CLASSIFICATION OF REQUIRED PREVENTIVE MEASURES

CONSTRUCTION ACTIVITY-INFECTION CONTROL RISK GROUP	**TYPE "A"**	**TYPE "B"**	**TYPE "C"**	**TYPE "D"**
Group I	**I**	**II**	**II**	**III/IV**
Group 2	**I**	**II**	**III**	**IV**
Group 3	**I**	**II**	**III/IV**	**IV**
Group 4	**III**	**III/IV**	**III/IV**	**IV**

An Infection Control - Safety Construction Permit is required for Class III or higher projects. Refer to Construction Activity/Risk Group Matrix (above).

CLASS I	1. Execute work by methods to minimize raising dust from construction operations.	2. Immediately replace any ceiling tile displaced for visual inspection.
CLASS II	1. Provide active means to prevent air-borne dust from dispersing into atmosphere 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Wipe surfaces with disinfectant.	6. Contain construction waste before and during transport in tightly covered containers. 7. Wet mop and/or vacuum with HEPA filtered vacuum before Leaving work area. 8. Place dust mat at entrance and exit of work area as needed. 9. Remove or isolate HVAC system in areas where work is being performed.

CLASS III	**1.** Obtain infection control permit before construction begins. **2.** Isolate HVAC system in area where work is being done to Prevent contamination of the duct system. **3.** Complete all critical barriers before construction begins. **4.** Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. ***5.*** Contain construction waste before and during transport in Tightly covered containers. **6.** Seal holes, pipes, conduits, etc. appropriately.	**7.** All personnel entering work site are required to wear shoe cover **8.** Contain construction waste before and during transport in tightly covered containers. Cover transport receptacles or carts. Tape covering. **9.** Do not remove barriers from work area until completed project is inspected by Safety and Epidemiology Depts. and thoroughly cleaned.
Class IV	1 Obtain infection control permit before construction begins. 2. Isolate HVAC system in area where work is being done to Prevent contamination of duct system. 3. Complete all critical barriers or implement control cube method before construction begins. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Seal holes, pipes, conduits, and punctures appropriately. 6. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site and debris associated with construction.	***After work is completed*** ***10.*** Vacuum work area with HEPA filtered vacuums. **11.** Wet mop with disinfectant. **12.** Remove barrier materials carefully to minimize spreading of dirt. **13.** Remove isolation of HVAC system.

Additional concerns for all classes:

1. Signature of record all onsite construction workers for review of fire and life safety procedures at Coatesville VAMC..
2. Review of Infection Prevention Training and Construction Safety Check List.
3. Maintain manpower and equipment including dust mops, wet mops, brooms, buckets, and clean wiping rags for cleaning fine dust from floors within the work area (when appropriate) and adjacent occupied areas.
4. Contain work areas outside of construction barriers, including spaces above ceilings, with full height polyethylene sheet barrier that will be extended to the deck of the space and will be tightly taped.
5. Clean up dust tracked outside of construction area immediately.
6. Temporary construction barriers and closures above ceiling must be sealed as described in #4 above.
7. Removal of debris must be in covered containers.
8. Intermediate jobs that create a moderate amount of dust inside room and is made negative by use of HEPA-equipped unit with minimum 10 ACH, and all air discharged outside, HEPA unit must run 2 hours after completion of job and Housekeeping must clean room before unit is removed from room. All work and use of HEPA unit must be documented and Copy forward to Infection Prevention and Control and Safety. NOTE: all duct vents and Fan Coil Units to be sealed off during construction.
9. All water lines inactivated for greater than 72 hours must be thoroughly flushed. New piping will be flushed and disinfected prior to use.

Additional Requirements or Concerns:

This Project is *Choose an Construction Activity TYPE* , *Choose an Infection Risk Group*, *Choose an Infection Control Class*

- Submit Emergency Procedures to be posted.
- Post PCRA and Appropriate Construction Signage for Limited Access and Proper PPE in Work Area.
- Contractor to Notify VAMC Coatesville CO, COR, VA Police and Safety Office if a Federal or State Regulator Arrive onsite to Inspect Jobsite.

- TB risk assessment: for 2016 probability / severity is a 3, which requires continuing evaluation including the annual risk assessment for VMAC Coatesville (CY 2016) places the facility in what the CDC defines as medium risk. Based on the number of infectious TB patients hospitalized in the last year (<6) and TST/ QuantiFeron conversion data among healthcare workers the risk is low for transmission. The risk of tuberculosis transmission within the facility will be assessed annually and as needed. Contract employees working in an area where there is known TB or those working on local exhaust ventilation (or within 25 feet of labeled biohazard exhaust vent) airborne isolation in Urgent Care or on 1B will be required to provide proof of TB testing in accordance with VHA Directive 2011-036.
- Dumpsters shall have 6' high chain link enclosures.
- No eating, Drinking or Smoking on the jobsite.

Permit Request By Thomas G.Stepsis	Safety Approval Thomas Yaw	Infection Preventionist Approval Janice Myers
Date: 1/6/2017	Date: Click here to enter a date.	Date: Click here to enter a date.

SECTION 01 32 16.17
PROJECT SCHEDULES AND LIQUIDATED DAMAGES

PART 1- GENERAL

1.1 DESCRIPTION:

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

1.2 CONTRACTOR'S REPRESENTATIVE:

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

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

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

1.3 CONTRACTOR'S CONSULTANT:

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

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

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

1.4 COMPUTER PRODUCED SCHEDULES

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

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

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

1.5 THE INTERIM AND FINAL PROJECT SCHEDULE SUBMITTAL

A. Interim Schedule Submittal: Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file

in the previously approved CPM schedule program. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start and start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer’s written approval before incorporating them into the Project Schedule. The Contracting Officer’s separate approval of the interim schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working interim Project Schedule shall reflect the Contractor's approach to scheduling the complete project and shall include at a minimum, the following activities:

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

B. The interim schedule shall describe the activities to be accomplished and their interdependencies. All work activities (including design), other than procurement activities, shall be cost loaded as specified and will be the basis for progress payments during the period prior to acceptance of the schedule. The interim schedule in its original form

shall contain no contract changes or delays which may have been incurred during the interim schedule development period and shall reflect the Contractors schedule as submitted with his RFP solicitation package, or as negotiated prior to Notice to Proceed. All CPM data supporting any time extension requests, in accordance with Article ADJUSTMENT OF CONTRACT COMPLETION, will be derived from the approved final schedule.

C. Final Diagram Submittal: Within 45 calendar days prior to the start of construction, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer’s written approval before incorporating them into the network diagram. The Contracting Officer’s separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final schedule development period and shall reflect the Contractors as bid schedule. These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a

result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

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

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

F. The Complete Project Schedule shall contain approximately 90 work activities/events.

1.6 WORK ACTIVITY/EVENT COST DATA

A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 – 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).

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

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

1.7 PROJECT SCHEDULE REQUIREMENTS

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

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

indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.

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

B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
2. The planned number of shifts per day.
3. The number of hours per shift.

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

C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COTR’s approval of the Project Schedule.

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

1.8 PAYMENT TO THE CONTRACTOR:

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

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

1.9 PAYMENT AND PROGRESS REPORTING

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

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

7. Activity/event duration and percent complete shall be updated independently.

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

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

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

will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

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

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

1.11 CHANGES TO THE SCHEDULE

A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes for any of the following reasons:
   1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
   2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
   3. The schedule does not represent the actual prosecution and progress of the project.

4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.

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

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

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

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

1.12 ADJUSTMENT OF CONTRACT COMPLETION

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

B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and

predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.

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

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

1.13 LIQUIDATED DAMAGES FORMULATION

1. Estimated liquidated damages for VISN 4 Contracting, Engineering, and Legal reviews are as follows:

Civilian rates were based on General Schedule Locality Pay Tables effective 01 Jan 2010 computes for a GS-11 at Step 10 ($35.87), GS-12- at Step 1 ($33.08) and GS-13 at Step 5 ($43.27).

a. Day of inexcusable delay:

Classification	Grade	Rate	Hours	Total
Contracting Officer	GS-13	$57.55	1 Hour	$57.45
Contract Administrator	GS-12	$48.40	2 Hours	$96.80
Legal Officer	N/A	N/A	N/A	N/A
TOTAL				$154.35

2. Estimated Damages for Facility Engineering (COR).

Classification	Grade	Rate	Hours	Total
Construction Manager	GS-13	$57.55	1 Hour	$57.55
Project Engineer	GS-11	$40.38	1 Hour	$40.38
Vehicle	N/A	N/A	N/A	N/A
TOTAL				$97.93

3. The Contractor shall pay liquidated damages to the Government in the amount of **$252.28** for each calendar day of delay until the work is completed or accepted. The aforementioned costs were derived based upon historical trends associated with the time required of the parties to perform the additional contract administration which has not been completed by the Contractor within the specified time. The purpose of Liquidated Damages is compensatory only. The government retains the right to seek actual damages so far as they are distinguishable and separate from the Contractor failing to complete the work within the time specified in the contract.

4. The formulation of Liquidated Damages as detailed above are in accordance with Federal Acquisition Regulation 36.206, and will be assessed for each calendar day required to complete the construction work on this project past the scheduled completion date.

---END---

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

PART 1 - GENERAL

1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.

1.2 For the purposes of this contract, samples (including laboratory samples to be tested), Submit for approval, all of the items specifically mentioned under the separate sections of the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.

1.3 Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:

A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;

B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;

C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.

1.4 Submit within 15 days of award of contract the schedule for all Submittals. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in contract time for completion.

1.5 Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by COR on behalf of the Contracting Officer.

1.6 Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.

1.7 The Government reserves the right to require additional submittals and mock-ups, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefore by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

1.8 Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.

1.9 Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.

A. Submit samples required for finishes, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.

B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center , name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by

specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.

1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center , name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.

C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Contractor, in a commercial laboratory approved by Contracting Officer.

1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
4. Contractor shall send a copy of transmittal letter to both COR and to Architect-Engineer simultaneously with submission of material to a commercial testing laboratory.
5. Contractor shall forward a copy of transmittal letter to COR simultaneously with submission to a commercial testing laboratory.
6. Laboratory test reports shall be sent directly to COR for appropriate action.
7. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
8. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.

D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.

E. Approved samples will be kept on file by the COR at the site until completion of contract, at which time such samples will be delivered

to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.

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

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

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

William Cook Architecture & Planning
1251 Romansville Road
Coatesville, Pennsylvania 19320

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

1.12 Samples (except laboratory samples) for approval shall be sent to Architect-Engineer, in care of COR, VA Medical Center, 1400 Black Horse Hill Road, Coatesville, Pennsylvania 19320

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

- - - E N D - - -

SUBMITTAL REGISTER

PROJECT:

NTP DATE:

TENTATIVE COMPLETION DATE:

CONTRACTOR:

DATE: 5/7/2017

DELIVERY LEGEND	
E	ELECTRONIC
M	MAILED
H	HAND DELIVERED

					TYPE OF SUBMITTAL							A/E REVIEW		ACTION					GOVERNMENT REVIEW		ACTION				COPIES TO			
	DATE SENT	SUBMITTAL ID NUMBER	SPECIFICATION NUMBER	DESCRIPTION OF SUBMITTAL	SHOP DRAWING	SAMPLE	GUARANTEE	MFR'S DATA	CERTIFICATE	TEST REPORT	OTHER AS NOTED	DATE RECEIVED	DATE FORWARDED	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	N OT APPROVED	# COPIES	DATE RECEIVED	DATE RETURNED	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	N OT APPROVED	CONTRACTOR	OWNER	FIELD	FILE
1	3/14/2016	001	08 11 13	HOLLOW METAL DOORS & FRAMES	X							3/14/2016	3/24/2016			X		E	3/24/2016	4/3/2016			X		X			X
2	4/13/2016	002	08 11 13.1R	HOLLOW METAL DOORS & FRAMES	X							4/13/2016	4/18/2016	X				E	4/18/2016	4/25/2016	X				X			X

SUBMITTAL REGISTER

PROJECT:

NTP DATE:

TENTATIVE COMPLETION DATE:

CONTRACTOR:

DATE: 5/7/2017

DELIVERY LEGEND	
E	ELECTRONIC
M	MAILED
H	HAND DELIVERED

					TYPE OF SUBMITTAL							A/E REVIEW		ACTION					GOVERNMENT REVIEW		ACTION				COPIES TO			
	DATE SENT	SUBMITTAL ID NUMBER	SPECIFICATION NUMBER	DESCRIPTION OF SUBMITTAL	SHOP DRAWING	SAMPLE	GUARANTEE	MFR'S DATA	CERTIFICATE	TEST REPORT	OTHER AS NOTED	DATE RECEIVED	DATE FORWARDED	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	N OT APPROVED	# COPIES	DATE RECEIVED	DATE RETURNED	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	N OT APPROVED	CONTRACTOR	OWNER	FIELD	FILE

SUBMITTAL REGISTER

PROJECT:

NTP DATE:

TENTATIVE COMPLETION DATE:

CONTRACTOR:

DATE: 5/7/2017

DELIVERY LEGEND	
E	ELECTRONIC
M	MAILED
H	HAND DELIVERED

					TYPE OF SUBMITTAL							A/E REVIEW		ACTION					GOVERNMENT REVIEW		ACTION				COPIES TO			
	DATE SENT	SUBMITTAL ID NUMBER	SPECIFICATION NUMBER	DESCRIPTION OF SUBMITTAL	SHOP DRAWING	SAMPLE	GUARANTEE	MFR'S DATA	CERTIFICATE	TEST REPORT	OTHER AS NOTED	DATE RECEIVED	DATE FORWARDED	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	N OT APPROVED	# COPIES	DATE RECEIVED	DATE RETURNED	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	N OT APPROVED	CONTRACTOR	OWNER	FIELD	FILE

SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

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

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

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

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

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

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

DEPARTMENT OF VETERANS AFFAIRS

Office of Construction & Facilities Management

Facilities Quality Service (00CFM1A)

811 Vermont Ave, NW – Room 462

Washington, DC 20420

Telephone Number: (202) 565-5214

Between: 9:00am – 3:00pm

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

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

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

AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
AITC	American Institute of Timber Construction http://www.aitc-glulam.org
AMCA	Air Movement and Control Association, Inc. http://www.amca.org
ANLA	American Nursery & Landscape Association http://www.anla.org
ANSI	American National Standards Institute, Inc. http://www.ansi.org
APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ASAE	American Society of Agricultural Engineers http://www.asae.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers

http://www.ashrae.org

ASME American Society of Mechanical Engineers

http://www.asme.org

ASSE American Society of Sanitary Engineering

http://www.asse-plumbing.org

ASTM American Society for Testing and Materials

http://www.astm.org

AWI Architectural Woodwork Institute

http://www.awinet.org

AWS American Welding Society

http://www.aws.org

AWWA American Water Works Association

http://www.awwa.org

BHMA Builders Hardware Manufacturers Association

http://www.buildershardware.com

BIA Brick Institute of America

http://www.bia.org

CAGI Compressed Air and Gas Institute

http://www.cagi.org

CGA Compressed Gas Association, Inc.

http://www.cganet.com

CI The Chlorine Institute, Inc.

http://www.chlorineinstitute.org

CISCA Ceilings and Interior Systems Construction Association

http://www.cisca.org

CISPI Cast Iron Soil Pipe Institute

http://www.cispi.org

CLFMI Chain Link Fence Manufacturers Institute

http://www.chainlinkinfo.org

CPMB Concrete Plant Manufacturers Bureau

http://www.cpmb.org

CRA California Redwood Association

http://www.calredwood.org

CRSI Concrete Reinforcing Steel Institute

http://www.crsi.org

CTI Cooling Technology Institute

http://www.cti.org

DHI Door and Hardware Institute

http://www.dhi.org

EGSA Electrical Generating Systems Association

http://www.egsa.org

EEI Edison Electric Institute

http://www.eei.org

EPA Environmental Protection Agency

http://www.epa.gov

ETL ETL Testing Laboratories, Inc.

http://www.et1.com

FAA Federal Aviation Administration

http://www.faa.gov

FCC Federal Communications Commission

http://www.fcc.gov

FPS The Forest Products Society

http://www.forestprod.org

GANA Glass Association of North America

http://www.cssinfo.com/info/gana.html/

FM Factory Mutual Insurance

http://www.fmglobal.com

GA Gypsum Association

http://www.gypsum.org

GSA General Services Administration

http://www.gsa.gov

HI Hydraulic Institute

http://www.pumps.org

HPVA Hardwood Plywood & Veneer Association

http://www.hpva.org

ICBO International Conference of Building Officials

http://www.icbo.org

ICEA Insulated Cable Engineers Association Inc.

http://www.icea.net

ICAC Institute of Clean Air Companies

http://www.icac.com

IEEE Institute of Electrical and Electronics Engineers

http://www.ieee.org\

IMSA International Municipal Signal Association

http://www.imsasafety.org

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association

http://www.mbma.com

MSS Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

http://www.mss-hq.com

NAAMM National Association of Architectural Metal Manufacturers

http://www.naamm.org

NAPHCC Plumbing-Heating-Cooling Contractors Association

http://www.phccweb.org.org

NBS National Bureau of Standards

See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors

http://www.nationboard.org

NEC National Electric Code

See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association

http://www.nema.org

NFPA National Fire Protection Association

http://www.nfpa.org

NHLA National Hardwood Lumber Association

http://www.natlhardwood.org

NIH National Institute of Health

http://www.nih.gov

NIST National Institute of Standards and Technology

http://www.nist.gov

NLMA Northeastern Lumber Manufacturers Association, Inc.

http://www.nelma.org

NPA National Particleboard Association

18928 Premiere Court

Gaithersburg, MD 20879

(301) 670-0604

NSF National Sanitation Foundation

http://www.nsf.org

NWWDA Window and Door Manufacturers Association

http://www.nwwda.org

OSHA Occupational Safety and Health Administration

	Department of Labor
	http://www.osha.gov
PCA	Portland Cement Association
	http://www.portcement.org
PCI	Precast Prestressed Concrete Institute
	http://www.pci.org
PPI	The Plastic Pipe Institute
	http://www.plasticpipe.org
PEI	Porcelain Enamel Institute, Inc.
	http://www.porcelainenamel.com
PTI	Post-Tensioning Institute
	http://www.post-tensioning.org
RFCI	The Resilient Floor Covering Institute
	http://www.rfci.com
RIS	Redwood Inspection Service
	See - CRA
RMA	Rubber Manufacturers Association, Inc.
	http://www.rma.org
SCMA	Southern Cypress Manufacturers Association
	http://www.cypressinfo.org
SDI	Steel Door Institute
	http://www.steeldoor.org
IGMA	Insulating Glass Manufacturers Alliance
	http://www.igmaonline.org
SJI	Steel Joist Institute
	http://www.steeljoist.org
SMACNA	Sheet Metal and Air-Conditioning Contractors
	National Association, Inc.

http://www.smacna.org

SSPC The Society for Protective Coatings

http://www.sspc.org

STI Steel Tank Institute

http://www.steeltank.com

SWI Steel Window Institute

http://www.steelwindows.com

TCA Tile Council of America, Inc.

http://www.tileusa.com

TEMA Tubular Exchange Manufacturers Association

http://www.tema.org

TPI Truss Plate Institute, Inc.

583 D'Onofrio Drive; Suite 200

Madison, WI 53719

(608) 833-5900

UBC The Uniform Building Code

See ICBO

UL Underwriters' Laboratories Incorporated

http://www.ul.com

ULC Underwriters' Laboratories of Canada

http://www.ulc.ca

WCLIB West Coast Lumber Inspection Bureau

6980 SW Varns Road, P.O. Box 23145

Portland, OR 97223

(503) 639-0651

WRCLA Western Red Cedar Lumber Association

P.O. Box 120786

New Brighton, MN 55112

(612) 633-4334

WWPA Western Wood Products Association

http://www.wwpa.org

- - - E N D - - -

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

1.1 DESCRIPTION

A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.

B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:

1. Adversely effect human health or welfare,
2. Unfavorably alter ecological balances of importance to human life,
3. Effect other species of importance to humankind, or;
4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

C. Definitions of Pollutants:

1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
7. Sanitary Wastes:

   a. Sewage: Domestic sanitary sewage and human and animal waste.
   b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

A. Establish and maintain quality control for the environmental protection of all items set forth herein.

B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 REFERENCES

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

B. National Archives and Records Administration (NARA):

1. 33 CFR 328 Definitions

1.4 SUBMITTALS

A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:

1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the COR to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the COR and the Contracting Officer for Name(s) and qualifications of person(s) responsible for training the limited to, the following:

   a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
   b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
   c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
   d. Description of the Contractor's environmental protection personnel training program.
   e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
   f. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
   g. Permits, licenses, and the location of the solid waste disposal area.

h. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as Work Area Plan showing the proposed activity in each portion of the Conservation Service and the Department of Veterans Affairs.
i. Environmental Monitoring Plans for the job site including land, water, air, and noise.
j. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.

B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.

B. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Delaware and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.

C. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the COR. Maintain noise-produced work at or below

the decibel levels and within the time periods specified.

1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m. unless otherwise permitted by local ordinance or the COR or as directed by the COTR. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	60
Less than 30 seconds of any hour	75
Less than three minutes of any hour	70

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

   a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):
      PUMPS 65

   b. Provide soundproof housings or enclosures for noise-producing machinery.
   c. Use efficient silencers on equipment air intakes.
   d. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
   e. Line hoppers and storage bins with sound deadening material.
   f. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the COR noting any problems and the alternatives for mitigating actions.

D. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

E. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the COR. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

- - - E N D - - -

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 02 Section "Demolition" for demolition of selected portions of the building.
2. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and

those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching procedures before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Conveying systems.
    i. Electrical wiring systems.
    j. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Equipment supports.
    e. Piping, ductwork, vessels, and equipment.
    f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

C. Roofing Material, Flashing, and Roof Specialties Material: Selection should be on the compatibility with the existing Roofing System components and approved by the existing roofing manufacturer so they are in compliance with the existing warranty.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Cutting of Existing Roofing System due to the installation of HVAC equipment, must be performed in accordance with

manufacturer's instructions. Installation of the HVAC equipment must provide access for the repair of the roofing materials and flashing. Coordinate work with HVAC Contractor.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
6. Elevated Concrete Slabs: Install a new concrete slab into an existing elevated concrete slab by continuously welding metal deck (with the same size, profile, and gauge as existing metal deck) to the existing metal deck with a minimum 3" overlap. New slab to be doweled into existing concrete slab with #4 dowels @ 24" O.C., all sides, with 6" minimum embedment and minimum (2) dowels per side. Epoxy the dowels into the existing slab.
7. Ceilings: In any area where new architectural, mechanical, electrical, or plumbing, work is indicated and any existing ceilings are to remain the contractor must patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

8. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

E. Roofing Repair Guidelines:

1. Only trained roof installer familiar with the products being used should perform the installation of roofing materials, flashing and manufacture roof specialties.
2. Adequate provisions should be made for the proper flashing of HVAC and electrical equipment including their service piping and conduits.
3. Perform all roof top work in accordance with NRCA and manufacturer details and instructions.
4. Install flashing to conform to standards set forth in the SMACNA Architectural Sheet Metal Manual and NRCA Manual. All roof top work (Removal of existing roofing, installation of roofing materials, flashing, equipment, etc.) should be performed in the same day.
5. All work should be performed in a way that it doesn’t void the existing warranty. After work is completed the contractor must arrange for a final inspection with the manufacturer to verify work was done per their instruction.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials

3.4 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

---END---

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

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

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

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

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

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

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

1.2 RELATED WORK

A. Section 02 41 00, DEMOLITION.

B. Section 01 00 00, GENERAL REQUIREMENTS.

C. Lead Paint: see specification for lead based paint removal and disposal.

1.3 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:

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

B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction. To greatest extent possible continue use of single mixed debris recycling facility within a 25 mile radius of the medical center.

C. Contractor shall develop and implement procedures to reuse and recycle new materials to a minimum of 50 percent.

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

E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website http:www.wbdg.org provides a Construction Waste Management Database that Contractor shall provide on-site instructions and supervision of separation, handling, construction projects.

F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.

H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.

B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.

C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.

D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.

E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.

G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.

H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.

I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.

1. On-site Recycling – Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
2. Off-site Recycling – Materials hauled to a location and used in an altered form in the manufacture of new products.

M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.

N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.

O. Return: To give back reusable items or unused products to vendors for credit.

P. Salvage: To remove waste materials from the site for resale or re-use by a third party.

Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.

R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:

B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:

1. Procedures to be used for debris management.
2. Techniques to be used to minimize waste generation.
3. Analysis of the estimated job site waste to be generated:

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

4. Detailed description of the Means/Methods to be used for material handling.

    a. On site: Material separation, storage, protection where applicable.
    b. Off site: Transportation means and destination. Include list of materials.

        1) Description of materials to be site-separated and self-hauled to designated facilities.

2) Description of mixed materials to be collected by designated waste haulers and removed from the site.

c. The names and locations of mixed debris reuse and recycling facilities or sites.
d. The names and locations of trash disposal landfill facilities or sites.
e. Documentation that the facilities or sites are approved to receive the materials.

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

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

1.6 APPLICABLE PUBLICATIONS

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

1. U.S. Green Building Council (USGBC): LEED Green Building Rating System for New Construction
2. Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance, October 5, 2009

1.7 RECORDS

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

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

PART 3 - EXECUTION

3.1 COLLECTION

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

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

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

3.2 DISPOSAL

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

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

3.3 REPORT

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

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

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

---END---

SECTION 02 21 00
SITE SURVEYS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the gathering of research documents, performance of a topographic survey and preparation of a topographic survey map.

1.2 DEFINITIONS

A. Professional Land Surveyor: One who possesses a valid state license as a "Professional Land Surveyor" from the state in which they practice.

B. Professional Civil Engineer: One who possesses a valid state license as a "Professional Civil Engineer" from the state in which they practice. For this section, the term "surveyor" shall also include Professional Civil Engineers authorized to practice Land Surveying under the laws of the state in which they practice.

PART 2 - EXECUTION

A. The surveyor shall research available public records for all mapping, monumentation, plats, governmental surveys etc. that may pertain to the subject property. Research all applicable public utilities for substructure data such as sewers, storm drains, water lines, electrical conduits etc.

B. The survey shall be performed on the ground in accordance with the current "Accuracy Standards for Land Title Surveys" as adopted, from time to time, by the American Congress on Surveying and Mapping, the National Society of Professional Surveyors, and the American Land Title Association.

C. The surveyor, when applicable, shall consult with the project Architect to determine scale of plat or map and size of drawings.

D. The surveyor shall furnish two sets of prints of the plat or map of survey and an electronic CADD file. If the plat or map of survey consists of more than one sheet, the sheets shall be numbered, the total number of sheets indicated and the match lines be shown on each sheet.

E. On the plat or map, the survey boundary shall be drawn to a convenient scale, or the scale designated by the Architect, with the scale clearly indicated. A graphic scale, shown in feet or meters or both, shall be included. A north arrow shall be shown and when practicable, the plat or map of survey shall be oriented so that north is at the top of the drawing. Symbols or abbreviations used shall be identified on the face of the plat or map by use of a legend or other means. Supplementary or

exaggerated diagrams shall be presented accurately on the plat or map where dimensional data is too small to be shown clearly at full scale. The plat or map shall be 30 by 42 inches.

F. The survey shall contain the following applicable information:

1. The name, address, telephone number, and signature of the Professional Land Surveyor who made the survey, his or her official seal and registration number, the date the survey was completed and the dates of all revisions.
2. The survey drawing(s) submitted shall bear the following certification adjacent to the Engineer's official seal:

   "I hereby certify that all information indicated on this drawing was obtained or verified by actual measurements in the field and that every effort has been made to furnish complete and accurate information."
3. Vicinity map showing the property surveyed in reference to nearby highways or major street intersections.
4. Flood zone designation (with proper annotation based on Federal Flood Insurance Rate Maps or the state or local equivalent, by scaled map location and graphic plotting only).
5. Land area as defined by the boundaries of the legal description of the surveyed premises.
6. All data necessary to indicate the mathematical dimensions and relationships of the boundary represented by bearings and distances, and the length and radius of each curve, together with elements necessary to mathematically define each curve. The point of beginning of the surveyor's description and the basis of bearings shall also be shown.
7. When record bearings or angles or distances differ from measured bearings, angles or distances, both record and measured bearings, angles, and distances shall be clearly indicated. If the record description fails to form a mathematically closed figure, the surveyor shall so indicate.
8. Measured and record distances from corners of parcels surveyed to the nearest right-of-way lines of streets in urban or suburban areas, together with recovered lot corners and evidence of lot corners, shall be noted. The distances to the nearest intersecting street shall be indicated and verified. Names and widths of streets and highways abutting the property surveyed and widths of rights of way shall be given. Observable evidence of access (or lack thereof) to such abutting

streets or highways shall be indicated. Observable evidence of private roads shall be so indicated. Streets abutting the premises, which have been described in Record Documents, but not physically opened, shall be shown and so noted.

9. The identifying titles of all recorded plats, filed maps, right of way maps, or similar documents which the survey represents, wholly or in part, with their appropriate recording data. The survey shall indicate platted setback or building restriction lines which have been recorded in subdivision plats or which appear in a Record Document which has been delivered to the surveyor. Contiguity, gores, and overlaps along the exterior boundaries of the survey premises, where ascertainable from field evidence or Record Documents, or interior to those exterior boundaries, shall be clearly indicated or noted. Where only a part of a recorded lot or parcel is included in the survey, the balance of the lot or parcel shall be indicated.
10. All evidence of found monuments shall be shown and noted. All evidence of monuments found beyond the surveyed premises on which establishment of the corners of the survey premises are dependent, and their application related to the survey shall be indicated.
11. The character of any and all evidence of possession shall be stated and the location of such evidence carefully given in relation to both the measured boundary lines and those established by the record. An absence of notation on the survey shall be presumptive of no observable evidence of possession. The term "possession" does not imply "ownership".
12. The location of all buildings upon the plot or parcel shall be shown and their locations defined by measurements perpendicular to the boundaries. If there are no buildings, so state. Proper street numbers shall be shown where available.
13. All easements evidenced by a Record Document which have been delivered to the surveyor shall be shown, both those burdening and those benefiting the property surveyed, indicating recording information. If such an easement cannot be located, a note to this affect shall be included. Observable evidence of easements and/or servitudes of all kinds, such as those created by roads, rights-of-ways, water courses, drains, telephone, telegraph, or electric lines, water, sewer, oil or gas pipelines on or across the surveyed property and on adjoining properties if they appear to affect the surveyed property, shall be

located and noted. Surface indications, if any, or of underground easements and/or servitudes shall also be shown.

14. The character and location of all walls, buildings, fences, and other visible improvements within five feet of each side of the boundary lines shall be noted. Without expressing a legal opinion, physical evidence of all encroaching structural appurtenances and projections, such as fire escapes, bay windows, windows and doors that open out, flue pipes, stoops, eaves, cornices, areaways, stoops, trip, etc., by or on adjoining property or on abutting streets, on any easement or over setback lines shown by Record Documents shall be indicated with the extent of such encroachment or projection.
15. Driveways and alleys on or crossing the property must be shown. Where there is evidence of use by other than the occupants of the property, the surveyor must so indicate on the plat or map. Where driveways or alleys on adjoining properties encroach, in whole or in part, on the property being surveyed, the surveyor must so indicate on the plat or map with appropriate measurements.
16. Location, alignment and dimensions of all roads, curbs, walks, parking and paved areas abutting the subject land. Indicate road centerlines with true bearings and lengths by 50 foot stationing. Describe curves by designating the points of curvature and tangency by station. Include all curve data as well a location of radius and vertex points. Elevations on 50' centers on centerline of roads, edges of roads and top and bottom of curbs.
17. As accurately as the evidence permits, the location of cemeteries and burial grounds disclosed in the process of researching title to the premises or observed in the process of performing the field work for the survey, shall be shown.
18. Ponds, lakes, springs, or rivers bordering on or running through the premises being surveyed shall be shown. When a property surveyed contains a natural water boundary, the surveyor shall measure the location of the boundary according to appropriate surveying methods and note on the plat or map the date of the measurement and the caveat that the boundary is subject to change due to natural causes and that it may or may not represent the actual location of the limit of title. When the surveyor is aware of changes in such boundaries, the extent of those changes shall be identified.
19. Contours at a minimum interval of //1 foot//. Modify between //--// if not applicable to project. Base vertical control on the permanent (not

assumed) National Geodetic Survey (NGS) or VA Medical Center Bench Mark. Note location, description and datum.

20. Identify and show if possible, setback, height, and floor space area restrictions of record or disclosed by applicable zoning or building codes (in addition to those recorded in subdivision maps). If none, so state.
21. Exterior dimensions of all buildings at ground level. Show square footage of exterior footprint of all buildings at ground level and gross floor area of all buildings.
22. Measured height of all buildings above grade at a defined location. If no defined location is provided, the point of measurement shall be shown.
23. Elevations at each entrance to buildings, service docks, building corners, steps, ramps and grade slabs.
24. Substantial, visible improvements (in addition to buildings) such as signs, parking areas, swimming pools, etc.
25. Parking areas and, if striped, the striping and the type (eg. handicapped, motorcycle, regular, etc.) and number of parking spaces.
26. Indication of access to a public way such as curb cuts and driveways.
27. Locate sub-surface utilities accurately with latest technological means acceptable to COR. Location of utilities existing on or serving the surveyed property as determined by observed evidence together with plans and markings provided by utility companies, and other appropriate sources (with references as to the source of information. Locate and show all fire hydrants located within 500 feet of the subject property.
28. Railroad tracks and sidings.
29. Manholes, catch basins, valve vaults or other surface indications of subterranean uses.
30. Wires and cables (including their function) crossing the survey premises, all poles on or within ten feet of the surveyed premises, and the dimensions of all cross-wires or overhangs affecting the surveyed premises.
31. Utility company installations on the surveyed premises.
32. Names of adjoining owners of platted lands.
33. Observable evidence of earth moving work, building construction or building additions within recent months.
34. Any changes in street right-of-way lines either completed or proposed, and available from the controlling jurisdiction. Observable evidence of recent street or sidewalk construction or repairs.

35. Observable evidence of site use as a solid waste dump, sump or sanitary landfill.
36. All trees with a minimum diameter of 6" measured at 48" above the base of the tree. Perimeter outline only of thickly wooded areas with description of predominant vegetation.

- - - E N D - - -

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 00, EARTH MOVING

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

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

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

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

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

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

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

I. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

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

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

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

D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide

overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.

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

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

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

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

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

J. The work shall not interfere with the continual operation of the Boiler Plant or maintenance of the operation at any time.

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.

1.5 CONDITIONS:

A. The contractor shall provide plastic barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust.

B. The contractor shall utilize HEPA (High Efficiency Particulate Air) equipped air filtration units rated at 99% capture of 0.5 microns including pollen, mold spores and dust particles. The contractor shall insure that continuous negative air pressures are maintained for the duration of the demolition of this project unless otherwise authorized by the resident engineer in writing.

C. The contractor shall compartmentize the demolition by creating a barrier reaching from floor to ceiling before any demolition is started in any Medical Center Buildings. Surround the affected area entirely and seal with duct tape at the ceiling, floor and sides.

D. The contractor shall use non-combustible systems or devices to seal existing penetrations of pipe, plastic pipe or conduits, unenclosed cables, or other non – metallic materials in Medical Center Buildings and penetrations that occur from demolition in those buildings.

E. The contractor shall broom clean at the end of each workday and remove debris as they are created. The contractor shall transport the debris outside the construction area in containers with tightly fitting lids that shall be approved by the resident engineer.

F. Medical Center staff at the pre-construction meeting will complete an Pre-Construction Risk Assessment (PCRA).

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, modifications to the Existing Structure, and new additions.

B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

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 03 30 53
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

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

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

1.3 TOLERANCES:

A. ACI 117.

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

1.4 REGULATORY REQUIREMENTS:

A. ACI SP-66 ACI Detailing Manual

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Concrete Mix Design.

C. Shop Drawings: Formwork, Reinforcing steel: Complete shop drawings.

D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.

1.6 APPLICABLE PUBLICATIONS:

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

B. American Concrete Institute (ACI):

117R-06 ..... Tolerances for Concrete Construction and Materials

211.1-91(R2002) ..... Proportions for Normal, Heavyweight, and Mass Concrete

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

301-05 ..... Specification for Structural Concrete

305R-06 ..... Hot Weather Concreting

306R-2002 ..... Cold Weather Concreting

SP-66-04 ..... ACI Detailing Manual

318/318R-05 ..... Building Code Requirements for Reinforced Concrete

347R-04 ..... Guide to Formwork for Concrete

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

A185-07 ..... Steel Welded Wire, Fabric, Plain for Concrete Reinforcement

A615/A615M-08 ..... Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

A996/A996M-06 ..... Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

C31/C31M-08 ..... Making and Curing Concrete Test Specimens in the Field

C33-07 ..... Concrete Aggregates

C39/C39M-05 ..... Compressive Strength of Cylindrical Concrete Specimens

C94/C94M-07 ..... Ready-Mixed Concrete

C143/C143M-05 ..... Standard Test Method for Slump of Hydraulic Cement Concrete

C150-07 ..... Portland Cement

C171-07 ..... Sheet Material for Curing Concrete

C172-07 ..... Sampling Freshly Mixed Concrete

C173-07.Air Content of Freshly Mixed Concrete by the Volumetric Method

C192/C192M-07 ..... Making and Curing Concrete Test Specimens in the Laboratory

C231-08 ..... Air Content of Freshly Mixed Concrete by the Pressure Method

C260-06 ..... Air-Entraining Admixtures for Concrete

C330-05 ..... Lightweight Aggregates for Structural Concrete

C494/C494M-08 ..... Chemical Admixtures for Concrete

C618-08 ..... Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

D1751-04.Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D4397-02 ..... Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

E1155-96(2008) ..... Determining F_F Floor Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 FORMS:

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

2.2 MATERIALS:

A. Portland Cement: ASTM C150, Type I or II.

B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.

C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 300 mm (12 inches) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.

D. Fine Aggregate: ASTM C33.

E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1

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

G. Air-Entraining Admixture: ASTM C260.

H. Chemical Admixtures: ASTM C494.

I. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).

J. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.

K. Welded Wire Fabric: ASTM A185.

L. Expansion Joint Filler: ASTM D1751.

M. Sheet Materials for Curing Concrete: ASTM C171.

N. Abrasive Aggregates: Aluminum oxide grains or emery grits.

O.

P. Liquid Densifier/Sealer: 100 percent active colorless aqueous siliconate solution.

Q. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied in accordance with manufacturer's recommendations. Grout shall show no settlement or vertical drying shrinkage at 3 days or thereafter based on initial measurement made at time of placement, and produce a compressive strength of at least 18mpa (2500 psi) at 3 days and 35mpa (5000 psi) at 28 days.

2.3 CONCRETE MIXES:

A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.

B. Compressive strength at 28 days shall be not less than 25mpa, 3000 psi

C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.

D. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.

E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

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

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f’c.
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.

F. Air-entrainment is required for all exterior concrete and as required for Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS. 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 BATCHING & MIXING:

A. Store, batch, and mix materials as specified in ASTM C94.
   1. Job-Mixed: Concrete mixed at job site shall be mixed in a batch mixer in manner specified for stationary mixers in ASTM C94.
   2. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.

PART 3 - EXECUTION

3.1 FORMWORK:

A. Installation conform to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection, all dead and live loads to which they may be subjected.
B. Treating and Wetting: Treat or wet contact forms as follows:
   1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.
   2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather cool metal forms by thoroughly wetting with cool water just before placing concrete.
   3. Use sealer on reused plywood forms as specified for new material.
C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications and required to be in their final position at time

concrete is placed shall be properly located, accurately positioned and built into construction, and maintained securely in place.

D. Construction Tolerances:

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

3.2 REINFORCEMENT:

Details of concrete reinforcement, unless otherwise shown, minimally in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.3 VAPOR BARRIER:

Except where membrane waterproofing is required, place interior concrete slabs on a continuous vapor barrier.

A. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
B. Lap joints 150 mm (8 inches) and seal with a compatible pressure-sensitive tape.
C. Patch punctures and tears.

3.4 PLACING CONCRETE:

A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of Resident Engineer before placing concrete. Provide screeds at required elevations for concrete slabs.
B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, and loose particles.
C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or

cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.

D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.

E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from Resident Engineer.

3.5 PROTECTION AND CURING:

Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

3.6 FORM REMOVAL:

Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.

3.7 SURFACE PREPARATION:

Immediately after forms have been removed and work has been examined and approved by Resident Engineer, remove loose materials, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.

3.8 FINISHES:

A. Vertical and Overhead Surface Finishes:

1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, above suspended ceilings in manholes, and other unfinished areas exposed or concealed will not require additional finishing.
2. Interior and Exterior Exposed Areas (to be painted): Fins, burrs and similar projections on surface shall be knocked off flush by mechanical means approved by Resident Engineer and rubbed lightly with

a fine abrasive stone or hone. Use an ample amount of water during rubbing without working up a lather of mortar or changing texture of concrete.

3. Interior and Exterior Exposed Areas (finished): Finished areas, unless otherwise shown, shall be given a grout finish of uniform color and shall have a smooth finish treated as follows:
   a. After concrete has hardened and laitance, fins and burrs have been removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone or stone.
   b. Apply grout composed of 1 part portland cement and 1 part clean, fine sand (smaller than 600 micro-m (No. 30) sieve). Work grout into surface of concrete with cork floats or fiber brushes until all pits and honeycomb are filled.
   c. After grout has hardened, but still plastic, remove surplus grout with a sponge rubber float and by rubbing with clean burlap.
   d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish for any area in same day. Confine limits of finished areas to natural breaks in wall surface. Do not leave grout on concrete surface overnight.

B. Slab Finishes:
   1. Scratch Finish: Slab surfaces to receive a bonded applied cementitious application shall all be thoroughly raked or wire broomed after partial setting (within 2 hours after placing) to roughen surface to insure a permanent bond between base slab and applied cementitious materials.
   2. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.
   3. Float Finish: Ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, shall be screened and floated to a smooth dense finish. After first floating, while surface is still soft, surfaces shall be checked for alignment using a straightedge or template. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.

4. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, future floor roof and all monolithic concrete floor slabs exposed in finished work and for which no other finish is shown or specified shall be steel troweled. Final steel troweling to secure a smooth, dense surface shall be delayed as long as possible, generally when the surface can no longer be dented with finger. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure on trowel to compact cement paste and form a dense, smooth surface. Finished surface shall be free of trowel marks, uniform in texture and appearance.
5. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after the surfaces have been floated.
6. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

Slab on grade & Shored suspended slabs		Unshored suspended slabs	
Specified overall value	F_F 25/F_L 20	Specified overall value	F_F 25
Minimum local value	F_F 17/F_L 15	Minimum local value	F_F 17

3.9 SURFACE TREATMENTS:

A. Surface treatments shall be mixed and applied in accordance with manufacturer's printed instructions.

C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of all concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Aggregate shall be broadcast uniformly over concrete surface. Trowel concrete surface to smooth dense finish. After curing, rub the treated surface with abrasive brick and water sufficiently to slightly expose abrasive aggregate.

3.11 RESURFACING FLOORS:

Remove existing flooring, in areas to receive resurfacing, to expose existing structural slab and to extend not less than 25 mm (1 inch) below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, wetting, and grouting. Apply topping as specified.

3.12 RETAINING WALLS:

A. Concrete for retaining walls shall be as shown and air-entrained.

B. Install and construct expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves as shown.

C. Finish exposed surfaces to match adjacent concrete surfaces, new or existing.

D. Porous backfill shall be placed as shown.

3.13 PRECAST CONCRETE ITEMS:

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

- - - E N D - - -

SECTION 03 30 53
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

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

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

1.3 TOLERANCES:

A. ACI 117.

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

1.4 REGULATORY REQUIREMENTS:

A. ACI SP-66 ACI Detailing Manual

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Concrete Mix Design.

C. Shop Drawings: Formwork, Reinforcing steel: Complete shop drawings.

D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.

1.6 APPLICABLE PUBLICATIONS:

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

B. American Concrete Institute (ACI):

117R-06 ..... Tolerances for Concrete Construction and Materials

211.1-91(R2002) ..... Proportions for Normal, Heavyweight, and Mass Concrete

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

301-05 ..... Specification for Structural Concrete

305R-06 ..... Hot Weather Concreting

306R-2002 ..... Cold Weather Concreting

SP-66-04 ..... ACI Detailing Manual

318/318R-05 ..... Building Code Requirements for Reinforced Concrete

347R-04 ..... Guide to Formwork for Concrete

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

A185-07 ..... Steel Welded Wire, Fabric, Plain for Concrete Reinforcement

A615/A615M-08 ..... Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

A996/A996M-06 ..... Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

C31/C31M-08 ..... Making and Curing Concrete Test Specimens in the Field

C33-07 ..... Concrete Aggregates

C39/C39M-05 ..... Compressive Strength of Cylindrical Concrete Specimens

C94/C94M-07 ..... Ready-Mixed Concrete

C143/C143M-05 ..... Standard Test Method for Slump of Hydraulic Cement Concrete

C150-07 ..... Portland Cement

C171-07 ..... Sheet Material for Curing Concrete

C172-07 ..... Sampling Freshly Mixed Concrete

C173-07.Air Content of Freshly Mixed Concrete by the Volumetric Method

C192/C192M-07 ..... Making and Curing Concrete Test Specimens in the Laboratory

C231-08 ..... Air Content of Freshly Mixed Concrete by the Pressure Method

C260-06 ..... Air-Entraining Admixtures for Concrete

C330-05 ..... Lightweight Aggregates for Structural Concrete

C494/C494M-08 ..... Chemical Admixtures for Concrete

C618-08 ..... Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

D1751-04.Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D4397-02 ..... Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

E1155-96(2008) ..... Determining F_F Floor Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 FORMS:

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

2.2 MATERIALS:

A. Portland Cement: ASTM C150, Type I or II.

B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.

C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 300 mm (12 inches) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.

D. Fine Aggregate: ASTM C33.

E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1

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

G. Air-Entraining Admixture: ASTM C260.

H. Chemical Admixtures: ASTM C494.

I. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).

J. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.

K. Welded Wire Fabric: ASTM A185.

L. Expansion Joint Filler: ASTM D1751.

M. Sheet Materials for Curing Concrete: ASTM C171.

N. Abrasive Aggregates: Aluminum oxide grains or emery grits.

O.

P. Liquid Densifier/Sealer: 100 percent active colorless aqueous siliconate solution.

Q. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied in accordance with manufacturer's recommendations. Grout shall show no settlement or vertical drying shrinkage at 3 days or thereafter based on initial measurement made at time of placement, and produce a compressive strength of at least 18mpa (2500 psi) at 3 days and 35mpa (5000 psi) at 28 days.

2.3 CONCRETE MIXES:

A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.

B. Compressive strength at 28 days shall be not less than 25mpa// 3000 psi

C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.

D. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.

E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

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

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f’c.
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.

F. Air-entrainment is required for all exterior concrete and as required for Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS. 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 BATCHING & MIXING:

A. Store, batch, and mix materials as specified in ASTM C94.
   1. Job-Mixed: Concrete mixed at job site shall be mixed in a batch mixer in manner specified for stationary mixers in ASTM C94.
   2. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.

PART 3 - EXECUTION

3.1 FORMWORK:

A. Installation conform to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection, all dead and live loads to which they may be subjected.
B. Treating and Wetting: Treat or wet contact forms as follows:
   1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.
   2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather cool metal forms by thoroughly wetting with cool water just before placing concrete.
   3. Use sealer on reused plywood forms as specified for new material.
C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications and required to be in their final position at time

concrete is placed shall be properly located, accurately positioned and built into construction, and maintained securely in place.

D. Construction Tolerances:

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

3.2 REINFORCEMENT:

Details of concrete reinforcement, unless otherwise shown, minimally in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.3 VAPOR BARRIER:

Except where membrane waterproofing is required, place interior concrete slabs on a continuous vapor barrier.

A. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
B. Lap joints 150 mm (8 inches) and seal with a compatible pressure-sensitive tape.
C. Patch punctures and tears.

3.4 PLACING CONCRETE:

A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of Resident Engineer before placing concrete. Provide screeds at required elevations for concrete slabs.
B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, and loose particles.
C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or

cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.

D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.

E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from Resident Engineer.

3.5 PROTECTION AND CURING:

Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

3.6 FORM REMOVAL:

Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.

3.7 SURFACE PREPARATION:

Immediately after forms have been removed and work has been examined and approved by Resident Engineer, remove loose materials, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.

3.8 FINISHES:

A. Vertical and Overhead Surface Finishes:

1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, above suspended ceilings in manholes, and other unfinished areas exposed or concealed will not require additional finishing.
2. Interior and Exterior Exposed Areas (to be painted): Fins, burrs and similar projections on surface shall be knocked off flush by mechanical means approved by Resident Engineer and rubbed lightly with

a fine abrasive stone or hone. Use an ample amount of water during rubbing without working up a lather of mortar or changing texture of concrete.

3. Interior and Exterior Exposed Areas (finished): Finished areas, unless otherwise shown, shall be given a grout finish of uniform color and shall have a smooth finish treated as follows:
   a. After concrete has hardened and laitance, fins and burrs have been removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone or stone.
   b. Apply grout composed of 1 part portland cement and 1 part clean, fine sand (smaller than 600 micro-m (No. 30) sieve). Work grout into surface of concrete with cork floats or fiber brushes until all pits and honeycomb are filled.
   c. After grout has hardened, but still plastic, remove surplus grout with a sponge rubber float and by rubbing with clean burlap.
   d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish for any area in same day. Confine limits of finished areas to natural breaks in wall surface. Do not leave grout on concrete surface overnight.

B. Slab Finishes:
   1. Scratch Finish: Slab surfaces to receive a bonded applied cementitious application shall all be thoroughly raked or wire broomed after partial setting (within 2 hours after placing) to roughen surface to insure a permanent bond between base slab and applied cementitious materials.
   2. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.
   3. Float Finish: Ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, shall be screened and floated to a smooth dense finish. After first floating, while surface is still soft, surfaces shall be checked for alignment using a straightedge or template. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.

4. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, future floor roof and all monolithic concrete floor slabs exposed in finished work and for which no other finish is shown or specified shall be steel troweled. Final steel troweling to secure a smooth, dense surface shall be delayed as long as possible, generally when the surface can no longer be dented with finger. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure on trowel to compact cement paste and form a dense, smooth surface. Finished surface shall be free of trowel marks, uniform in texture and appearance.
5. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after the surfaces have been floated.
6. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

Slab on grade & Shored suspended slabs		Unshored suspended slabs	
Specified overall value	F_F 25/F_L 20	Specified overall value	F_F 25
Minimum local value	F_F 17/F_L 15	Minimum local value	F_F 17

3.9 SURFACE TREATMENTS:

A. Surface treatments shall be mixed and applied in accordance with manufacturer's printed instructions.

C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of all concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Aggregate shall be broadcast uniformly over concrete surface. Trowel concrete surface to smooth dense finish. After curing, rub the treated surface with abrasive brick and water sufficiently to slightly expose abrasive aggregate.

3.11 RESURFACING FLOORS:

Remove existing flooring, in areas to receive resurfacing, to expose existing structural slab and to extend not less than 25 mm (1 inch) below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, wetting, and grouting. Apply topping as specified.

3.12 RETAINING WALLS:

A. Concrete for retaining walls shall be as shown and air-entrained.

B. Install and construct expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves as shown.

C. Finish exposed surfaces to match adjacent concrete surfaces, new or existing.

D. Porous backfill shall be placed as shown.

3.13 PRECAST CONCRETE ITEMS:

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

- - - E N D - - -

SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
Repair of Abraded Galvanized and Painted Surfaces: Section 09 91 00, PAINTING.

1.3 QUALITY ASSURANCE:

1. Fabricator Qualifications: A firm that complies with PCI MNL 117 and the following requirements and is experienced in producing units similar to those indicated for this Project and with a record of successful in-service performance:

Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group A, Category A1- Architectural Cladding and Load Bearing Units. Submit PCI certification.

Fabricator must have a minimum of three (3) years' experience in Precast Architectural Concrete work comparable to that shown and specified in not less than three (3) projects of similar scope.

2. Erector Qualifications:

A precast concrete erector Qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the project site. Submit a current Certificate of Compliance furnished by PCI designating qualification in Category A

(Architectural Systems) for non-load-bearing members. An erector with a minimum of two (2) years of experience who has completed architectural precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance Submit qualifications.

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

Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117.

Sample Panels: Before fabricating units, produce a minimum of two (2) sample panels approximately 1.5 sq. m. (16 sq. ft.) in size for review by Contracting Officer Representative (COR). Incorporate full scale details of architectural features, finishes, textures, and transitions in the sample panels. Approved sample panel will be used for mockup and range sample. Locate panels where indicated or, if not indicated, as directed by COR.

When back face of precast concrete unit is to be exposed, show samples of the workmanship, color, and texture of the backup concrete as well as the facing.

Demolish and remove sample panels only when directed by COR.

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

final shop drawings. Build mockups to comply with the following requirements, using materials indicated for the completed work:

Build mockups in the location and of the size indicated or, if not indicated, as directed by COR.

Notify COR in advance of dates and times when mockups will be constructed.

Obtain COR's approval of mockups before starting fabrication.

Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

Demolish and remove mockups when directed by COR.

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

1.4 PERFORMANCE REQUIREMENTS:

Design Standards: Comply with ACI 318/ACI 318M and the design recommendations of PCI MNL 120 and PCI MNL 122 applicable to types of units indicated.

Limit deflection of precast members as follows:

a. Vertical live load – Span / 360.

Wind load – Height / 400.

Physical Security Life Safety Protected Facilities:

a. Precast concrete panels to meet or exceed the design and construction standards as provided in the Physical Security Design Manual for VA Facilities: Life Safety Protected.

4. Blast Resistance: Design level threat (W1) located at the standoff distance, but not greater than GP1.

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

Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 49 degrees C (120 degrees F).

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

1.5 SOURCE QUALITY CONTROL:

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

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

C. Submit test results in writing on the same day that tests are performed, with copies to COR, Contractor, and precast concrete fabricator. Include the information required in Section 01 45 29, TESTING LABORATORY SERVICES and the following:

a. Identification mark and type of precast concrete units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Defective or Damaged Work: Units that do not comply with acceptability requirements, including concrete strength, manufacturing tolerances, and color and texture range are unacceptable. Chipped, spalled or cored units may be repaired, if repaired units match the visual mock-up. The COR will reject units that do not match the accepted samples and visual mock-up. Remove unacceptable units from the site and replace with precast concrete units that comply with requirements.

1.6 SUBMITTALS:

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

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

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

1. Indicate member locations with distinctive marks that match marks placed on the panels. Provide plans, elevations, dimensions, corner details, shapes, cross sections and relationships to adjacent materials.

2. Indicate aesthetic characteristics including joints, reveals, and extent and location of each surface finish.

3. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, and connections.

4. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.

5. Indicate sequence of erection.

6. Indicate locations and details of facing materials, anchors, and joint widths.

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

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

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

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

G. Testing laboratory accreditations.

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

1. Concrete strengths and mix designs.

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

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

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

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

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

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

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

1.8 WARRANTY:

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

1.9 APPLICABLE PUBLICATIONS:

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

B. ASTM International (ASTM):

A123/A123M-13.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-09.....Zinc Coating (Hot-Dip) on Iron and Steel Hardware

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

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

C150/C150M-12.....Portland Cement

C330/C330M-14.....Lightweight Aggregates for Structural Concrete

C1107/C1107M-14.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

C. American Concrete Institute (ACI):

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

G. Precast/Prestressed Concrete Institute (PCI):

Architectural Precast Concrete – Color and Texture Selection Guide

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

I. Department of Veterans Affairs:

Physical Security Design Manual for VA Facilities-July 2007

PART 2 - PRODUCTS

MOLD MATERIALS:

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

1. Mold-Release Agent: Commercially produced form-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Provide solid backing and form supports to ensure that form liners remain in place during concrete placement. Use with manufacturer’s recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.2 REINFORCING MATERIALS:

Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M.

Epoxy-Coated-Steel Welded Wire Reinforcement: ASTM A884/A884M Class A coated, plain on flat sheet, Type 1 bendable coating.

2.3 CONCRETE MATERIALS:

Portland Cement: ASTM C150/C150M, Type I or III.

For surfaces exposed to view in finished structure, use gray, same type, brand, and mill source throughout the precast concrete production.

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

Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

2.4 STAINLESS-STEEL CONNECTION MATERIALS:

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

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

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

2.6 BEARING PADS AND OTHER ACCESSORIES:

A. Frictionless Pads: Tetrafluoroethylene (teflon), glass-fiber reinforced, bonded to stainless or mild-steel plates, of type required for in-service stress. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

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

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

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

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

2.7 GROUT MATERIALS:

A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of a consistency suitable for application within a 30-minute working time.

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

CONCRETE MIXES:

A. Prepare design mixes to match COR’s sample for each type of concrete required.

1. Release strength as required by design.

2. Lightweight Concrete Back-Up Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

Compressive Strength (28 Days): 34.5 MPa (5000 psi).

Unit Weight: Calculated equilibrium unit weight of 1842 kg per cubic meter (115 lb. per cubic ft.), plus or minus 48 kg per cubic m (3 lb. per cubic ft.), according to ASTM C567/C567M.

Release strength as required by design.

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

PART 3 - EXECUTION

3.1 MOLD FABRICATION:

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

1.Form joints are not acceptable on faces exposed to view in the finished work.

2.Edge and Corner Treatment: Uniformly chamfered.

3.4 FABRICATION:

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Position anchors for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

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

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

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

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

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

1. Place reinforcing steel to maintain at least (2 inch) minimum concrete cover. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.

2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

3. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

4. Accurately position, support, and secure reinforcement against displacement during concrete- placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.

G. Mix concrete according to PCI MNL 117 and requirements in PART 2. After concrete batching, no additional water may be added.

a. A single design mix throughout the entire thickness of panel.

H. Place concrete in a continuous operation. Comply with requirements in PCI MNL 117.

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

J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat.

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

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

M. Comply with requirements in PCI MNL 117 and requirements in this section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

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

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

O. Comply with PCI MNL 117 procedures for hot- and cold-weather concrete placement.

3.5 FABRICATION TOLERANCES:

A. Fabricate units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

1. Additional Position Tolerances: For cast-in items measured from datum line location, as indicated on shop drawings.

a. Location of Bearing Surface from End of Member: Plus or Minus 6 mm (1/4 inch).

3.7 FINISHES:

A. Provide exposed panel faces free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight and sharp. Finish exposed-face surfaces of units to match approved sample panels and as follows:

1. PCI's "Architectural Precast Concrete –Color and Texture Selection Guide," of plate numbers indicated.
2. As-Cast Surface Finish: Provide surfaces free of excessive air voids, sand streaks, and honeycombs.
3. Textured-Surface Finish: Impart by form liners to provide surfaces free of air voids, sand streaks, and honeycombs, with uniform color and texture.
4. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

B. Finish exposed top surfaces of units to match face-surface finish.

C. Finish unexposed back surfaces of units by smooth steel-trowel finish.

3.8 ERECTION PREPARATION:

A. Deliver anchorage devices that are embedded in or attached to the building structural frame or foundation before start of such work. Furnish locations, setting diagrams, and templates for the proper installation of each anchorage device.

B. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.9 ERECTION:

A. Erect units level, plumb and square within the specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
4. Unless otherwise shown provide for uniform joint widths of 3/4 inch.

B. Connect units in position by bolting, grouting, or as otherwise indicated on approved Erection Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting or grouting are completed.

1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.
2. At bolted connections, provide lock washers or other acceptable means to prevent loosening of nuts after final adjustment.

a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connection apply specified

bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

3. Grouting Connections: Grout connections where required or indicated on shop (erection drawings). Retain flowable grout in place until strong enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

E. Setting: Where shown, fill joints with cement mortar specified in Section 04 05 13, MASONRY MORTARING Section 04 05 16, MASONRY GROUTING.

1. Clean surfaces forming beds and other joints for precast concrete panels of dust, dirt, and other foreign matter, and wet thoroughly to prevent suction before precast concrete, elements are set.

2. Set precast element level and true to line with uniform joints filled completely with mortar.

3. Rake out joints 25 mm (1-inch) deep for pointing or sealants.

4. Joints required to have only sealant to be kept free of mortar for full depth.

5. Keep exposed faces of precast concrete elements free of mortar.

6. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.

F. Pointing: Wash and brush clean, leaving joints free from loose mortar, dust and other foreign material.

1. Carefully point with a slightly concave joint.

2. Mortar for pointing as specified in Section 04 05 13, MASONRY MORTARING Section 04 05 16, MASONRY GROUTING. Provide same material and

color sand used in fabrication of precast concrete elements.

G. Sealing of Joints: Where shown and where required to make work watertight: clean, dry and seal joints between precast concrete elements and between precast elements and adjoining materials as specified in Section 07 92 00, JOINT SEALANTS.

3.10 ERECTION TOLERANCES:

A. Erect units level, plumb, square, true, and in alignment without exceeding the erection tolerances of PCI MNL 117, Appendix I.

3.12 REPAIRS:

A. When permitted by COR, repair damaged units.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 6.1 m (10 feet).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.

D. Remove and replace damaged units when repairs do not meet requirements.

E. Repair damaged units to meet acceptability of PCI MNL 117.

F. Wire brush, clean, and paint damaged prime painted components with the same type of shop primer.

3.13 CLEANING:

A. Clean surfaces of precast concrete to be exposed to view, as necessary, prior to shipping.

B. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator’s recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff

fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

- - - E N D - - -

SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grout for filling hollow concrete masonry cores.

1.2 RELATED REQUIREMENTS.

A. Grout used in Section:

1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
2. Section 04 20 00, UNIT MASONRY.
3. Section 04 72 00, CAST STONE MASONRY.

B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES Provided by COR.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standards Institute (ANSI):

1. A118.6-10 - Standard Cement Grouts for Tile Installation.

C. ASTM International (ASTM):

1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
2. C150/C150M-15 - Portland Cement.
3. C207-06(2011) - Hydrated Lime for Masonry Purposes.
4. C404-11 - Aggregates for Masonry Grout.
5. C476-11 - Grout for Masonry.
6. C595/C595M-15e1 - Blended Hydraulic Cement.
7. C979/C979M-10 - Pigments for Integrally Colored Concrete.
8. C1019-14 - Sampling and Testing Grout.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.

C. Test Reports: Certify each product complies with specifications.

1. Grout, each type.
2. Cement.
3. Aggregate.

D. Certificates: Certify each product complies with specifications.
   1. Blended hydraulic cement.
   2. Portland cement.
   3. Grout.
   4. Hydrated lime.
   5. Aggregate.
   6. Color admixture.

1.5 QUALITY ASSURANCE

A. Preconstruction Testing:
   1. Engage independent testing laboratory to perform tests and submit reports.
      a. Deliver samples to laboratory in number and quantity required for testing.
   2. Grout:
      a. Test compressive strength according to ASTM C1019 standard.
   3. Cement:
      a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
      b. Nonstaining cement containing more than 0.03 percent water soluble alkali.
   4. Aggregate:
      a. Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

1.7 STORAGE AND HANDLING

A. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.
B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grout Components:
   1. Hydrated Lime: ASTM C207, Type S.
   2. Aggregate For Masonry Grout: ASTM C404, Size 8.
   3. Blended Hydraulic Cement: ASTM C595, Type IS, IP.
   4. Portland Cement: ASTM C150, Type I.
   5. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

A. Provide each cast stone veneer panel from one manufacturer and from one production run.

2.3 MIXES

A. Grout: ASTM C476; fine grout and coarse grout.
   1. Color Admixture:
      a. Pigments: ASTM C979, inert, stable to atmospheric conditions, nonfading, alkali resistant, and water insoluble.
      b. Use mineral pigments only. Organic pigments are not acceptable.

B. Ready-Mixed Grout: ANSI A118.8.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Clean mortar from masonry cells protruding more than 13 mm (1/2 inch) to permit grout flow.

D. Remove debris from grout spaces.

E. Verify reinforcement is correctly placed before placing grout.

3.2 MIXING

A. Mix grout in mechanically operated mixer.
   1. Mix grout for five minutes, minimum.

B. Measure ingredients by volume using container of known capacity.

C. Mix water with grout dry ingredients.
   1. Slump Range: 200 to 275 mm (8 to 11 inches).

3.3 GROUTING

A. Install grout according to Section 04 20 00, UNIT MASONRY.

B. Use fine grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is 50 mm (2 inches) or less.

C. Use either fine grout or coarse grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is greater than 50 mm (2 inches).

D. Use grout for filling bond beam or lintel units.

- - E N D - -

SECTION 04 05 31
MASONRY TUCK POINTING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for tuck pointing of existing masonry work.

1.2 RELATED WORK

Mortars: Section 04 05 13, MASONRY MORTARING.

1.3 APPLICABLE PUBLICATIONS

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

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

C67-07.....Brick and Structural Clay Tile, Sampling and Testing

C216-07.....Facing Brick (Solid Masonry Units Made From Clay or Shale)

C270-07.....Mortar for Unit Masonry

C. International Masonry Institute: Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

PART 2 - PRODUCTS

2.1 TUCK POINTING MORTAR

As per appendix X3 of ASTM C270.

2.2 REPLACEMENT MASONRY UNITS

A. Face Brick:

1. ASTM C216, Grade SW, Type FBS. Brick shall be classified slightly efflorescent or better when tested in accordance with ASTM C67.
2. Face brick shall match facing brick of the existing building(s) that is being tuck pointed.

B. Clay Tile Units to match existing. Provide sample products from two manucaturers for approval by COR prior to order.

PART 3 - EXECUTION

3.1 CUT OUT OF EXISTING MORTAR JOINTS

A. Cut out existing mortar joints (both bed and head joints) and remove by means of a toothing chisel or a special pointer's grinder, to a uniform depth of to 19 mm (3/4-inch), or until sound mortar is reached. Take care to not damage edges of existing masonry units to remain.

B. Remove dust and debris from the joints by brushing, blowing with air or rinsing with water. Do not rinse when temperature is below freezing.

3.2 JOB CONDITIONS

A. Protection: Protect newly pointed joints from rain, until pointed joints are sufficiently hard enough to prevent damage.

B. Cold Weather Protection:

1. Tuck pointing may be performed in freezing weather when methods of protection approved by COR are utilized.
2. Comply with applicable sections of "Recommended Practices for Cold Weather Construction" as published by International Masonry Industry All Weather Council.
3. Existing surfaces at temperatures to prevent mortar from freezing or causing other damage to mortar.

3.3 INSTALLATION OF TUCK POINTING MORTAR

A. Immediately prior to application of mortar, dampen joints to be tuck pointed. Prior to application of pointing mortar, allow masonry units to absorb surface water.

B. Tightly pack mortar into joints in thin layers, approximately 6 mm (1/4-inch) thick maximum.

C. Allow layer to become "thumbprint hard" before applying next layer.

D. Pack final layer flush with surfaces of masonry units. When mortar becomes "thumbprint hard", tool joints.

3.4 TOOLING OF JOINTS

B. Tool joints with a jointing tool to match the existing surrounding joints.

3.5 REPLACEMENT OF MASONRY UNITS

A. Cut out mortar joints surrounding masonry units that are to be removed and replaced.

1. Units removed may be broken and removed, providing surrounding units to remain are not damaged.
2. Once the units are removed, carefully chisel out the old mortar and remove dust and debris.
3. If units are located in exterior wythe of a cavity or veneer wall, exercise care to prevent debris falling into cavity.

B. Dampen surfaces of the surrounding units before new units are placed.

1. Allow existing masonry to absorb surface moisture prior to starting installation of the new replacement units.
2. Butter contact surfaces of existing masonry and new replacement masonry units with mortar.
3. Center replacement masonry units in opening and press into position.

4. Remove excess mortar with a trowel.
5. Point around replacement masonry units to ensure full head and bed joints.
6. When mortar becomes "thumbprint hard", tool joints.

3.6 CLEANING

A. Clean exposed masonry surfaces on completion.
B. Remove mortar droppings and other foreign substances from wall surfaces.
C. First wet surfaces with clean water, then wash down with a solution of soapless detergent specially prepared for cleaning brick.
D. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
E. Free clean surfaces from traces of detergent, foreign streaks or stains. Protect materials during cleaning operations including adjoining construction.
F. Use of muratic acid for cleaning is prohibited.

- - - E N D - - -

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for construction of masonry unit walls.

1.2 RELATED WORK

A. Mortars and grouts: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING.

B. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.

C. Cavity insulation: Section 07 21 13, THERMAL INSULATION.

D. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.

E. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.

F. Color and texture of masonry units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Samples:

1. Face brick, sample panel, 200 mm by 400 mm (8 inches by 16 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
2. Concrete masonry units, when exposed in finish work.
3. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.
4. Structural clay tile units.
5. Structural clay facing tile, clipped panels (triplicate) of four wall units with base units, showing color range, each color and texture.

C. Shop Drawings:

2. Drawings, showing reinforcement, applicable dimensions and methods of hanging soffit or lintel masonry and reinforcing masonry for embedment of anchors for hung fixtures.
3. Ceramic structural facing tile or concrete masonry units for typical window and door openings, and, for special conditions as affected by structural conditions.

5. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other

arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

D. Certificates:

1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
2. Indicating that the following items meet specification requirements:
   a. Face brick.
   b. Solid and load-bearing concrete masonry units,.
   c.
   d. structural clay facing tile.
   e. Structural clay tile units.
3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

F. Manufacturer's Literature and Data:

1. Anchors, ties, and reinforcement.
2. Shear keys.
3. Reinforcing bars.

1.4 SAMPLE PANEL

A. Before starting masonry, lay up a sample panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA).

1. Use masonry units from random cubes of units delivered on site.
2. Include reinforcing, ties, and anchors.

B. Use sample panels approved by Resident Engineer for standard of workmanship of new masonry work.

C. Use sample panel to test cleaning methods.

1.5 WARRANTY

Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be five years.

1.6 APPLICABLE PUBLICATIONS

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

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

A951-06.....Steel Wire for Masonry Joint Reinforcement.

A615/A615M-07.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

A675/A675M-03.....Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical PropertiesC34-03 Structural Clay Load-Bearing Wall Tile

C55-06.....Concrete Building Brick

C56-05.....Structural Clay Non-Load-Bearing Tile

C62-05.....Building Brick (Solid Masonry Units Made From Clay or Shale)

C67-07.....Sampling and Testing Brick and Structural Clay Tile

C90-06.....Load-Bearing Concrete Masonry Units

C126-99.....Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units

C216-07.....Facing Brick (Solid Masonry Units Made From Clay or Shale)

C476-02.....Standard Specification for Grout for Masonry

C612-04.....Mineral Fiber Block and Board Thermal Insulation

C744-05.....Prefaced Concrete and Calcium Silicate Masonry Units.

D1056-07.....Flexible Cellular Materials - Sponge or Expanded Rubber

D2000-06.....Rubber Products in Automotive Applications

D2240-05.....Rubber Property - Durometer Hardness

D3574-05.....Flexible Cellular Materials-Slab, Bonded, and Molded Urethane Foams

F1667-05.....Fasteners: Nails, Spikes and Staples

C. Masonry Industry Council:

All Weather Masonry Construction Manual, 2000.

D. American Welding Society (AWS):

D1.4-05 Structural Welding Code – Reinforcing Steel.

E. Federal Specifications (FS):

FF-S-107C-00.....Screws, Tapping and Drive

F. Brick Industry Association - Technical Notes on Brick Construction (BIA):

11-1986.....Guide Specifications for Brick Masonry, Part I

11A–1988.....Guide Specifications for Brick Masonry, Part II

11B–1988.....Guide Specifications for Brick Masonry, Part III Execution

11C-1998.....Guide Specification for Brick Masonry Engineered Brick Masonry, Part IV

11D-1988.....Guide Specifications for Brick Masonry Engineered Brick Masonry, Part IV continued

G. Masonry Standards Joint Committee; Specifications for Masonry Structures (ACI 530.1-05/ASCE 6-05/TMS 602-99) (MSJC).

PART 2 - PRODUCTS

2.1 BRICK

A. Face Brick:
   1. ASTM C216, Grade SW, Type FBS.
   2. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
   3. Size:
      a. Modular

B. Building Brick: ASTM C62, Grade MW for backup and interior work; Grade SW where in contact with earth.

2.2 CONCRETE MASONRY UNITS

A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
   1. Unit Weight: Normal weight
   3. Sizes: Modular.
   4. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
   5. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (one inch) minimum radius rounded vertical exterior corners (bullnose units).

2.3 CLAY TILE UNITS

A. Glazed structural Facing Tile:
   1. ASTM C126, Grade S, Type I (single faced units)

   2. Size: 8W, thickness as shown. Match Existing Sizes

C. Structural Clay Non-Load-Bearing Tile: ASTM C56, Grade NB.

2.4 SHEAR KEYS

A. ASTM D2000, solid extruded cross-shaped section of rubber, neoprene, or polyvinyl chloride, with a durometer hardness of approximately 80 when tested in accordance with ASTM D2240, and a minimum shear strength of 3.5 MPa (500 psi).

B. Shear key dimensions: Approximately 70 mm by 8 mm for long flange and 38 mm by 16 mm for short flange (2-3/4 inches by 5/16 inch for long flange, and 1-1/2 inches by 5/8 inch for short flange).

2.5 REINFORCEMENT:

A. Steel Reinforcing Bars: ASTM A615, deformed bars, 420 MPa (Grade 60) for bars No. 10 to No. 57 (No. 3 to No. 18), except as otherwise indicated.

B. Where 6 mm diameter (No. 2) bars are shown, provide plain, round, carbon steel bars, ASTM A675, 550 MPa (Grade 80).

C. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

D. Joint Reinforcement:

1. Form from wire complying with ASTM A951.
2. Galvanized after fabrication.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcing at least 3000 mm (10 feet) in length.
6. Joint reinforcing in rolls is not acceptable.
7. Joint reinforcing that is crimped to form drip is not acceptable.
8. Maximum spacing of cross wires 400 mm (16 inches) to longitudinal wires.
9. Ladder Design:
   a. Longitudinal wires deformed 5 mm (0.20 inch) diameter wire.
   b. Cross wires 4 mm (0.16 inch) diameter.
10. Trussed Design:
   a. Longitudinal and cross wires not less than 4 mm (0.16 inch nominal) diameter.
   b. Longitudinal wires deformed.
11. Multiple Wythes and Cavity wall ties:
   b. Longitudinal wires 4 mm (0.16 inch) with U shape 2.6 mm (0.10 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches) minimum.

2.7 PREFORMED COMPRESSIBLE JOINT FILLER

A. Thickness and depth to fill the joint as specified.

B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.

2.8 ACCESSORIES

A. Weep Hole Wicks: Glass fiber ropes, 10 mm (3/8 inch) minimum diameter, 300 mm (12 inches) long.

B. Box Board:

1. Mineral Fiber Board: ASTM C612, Class 1.
2. 25 mm (1 inch) thickness.

3. Other spacing material having similar characteristics may be used subject to the Resident Engineer's approval.

C. Masonry Cleaner:

1. Detergent type cleaner selected for each type masonry used.
2. Acid cleaners are not acceptable.
3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

D. Fasteners:

1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Protection:

1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.

B. Cold Weather Protection:

1. Masonry may be laid in freezing weather when methods of protection approved by COR are utilized.
2. Comply with MSJC and “Hot and Cold Weather Masonry Construction Manual”.

3.2 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:

B. Maximum variation from plumb:

2. In 6000 mm (20 feet) - 10 mm (3/8 inch).

C. Maximum variation from level:

1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 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).

F. Maximum variation in prepared opening dimensions:

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

3.3 INSTALLATION GENERAL

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

B. Anchor masonry as specified in Paragraph, ANCHORAGE.

C. Wall Openings:

1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.

D. Tooling Joints:

1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
2. Tool while mortar is soft enough to be compressed into joints and not raked out.
3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight joint unless specified otherwise.
4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Partition Height:

1. Extend partitions as shown.

F. Lintels:

1.
3. Precast lintels of 25 Mpa (3000 psi) concrete, of same thickness as partition, and with one Number 5 deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, may be used in lieu of reinforced CMU masonry lintels.
4. Use steel lintels, for openings over 1600 m (5 feet 4 inches) wide, brick masonry, unless shown otherwise.
5.
6. Length for minimum bearing of 100 mm (4 inches) at ends.
7. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

G. Wall, Furring, and Partition Units:

1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Use no piece shorter than 100 mm (4 inches) long.

5. On interior partitions provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.

H. Use not less than 100 mm (4 inches) nominal thick masonry for fireproofing steel columns unless shown otherwise.

I. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

J. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

.

K. Structural Steel Encased in Masonry:

1. Where structural steel is encased in masonry and the voids between the steel and masonry are filled with mortar, provide a minimum 25 mm (1 inch) mortar free expansion space between the masonry and the steel by applying a box board material to the steel before the masonry is laid.
2. Do not place spacing material where steel is bearing on masonry or masonry is bearing on steel.

L. Chases:

1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.
2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
3. Full recess chases after installation of conduit, with mortar and finish flush.
4. When pipes or conduits, or both occur in hollow masonry unit partitions retain at least one web of the hollow masonry units.

M. Wetting and Wetting Test:

1. Test and wet brick or clay tile in accordance with BIA 11B.
2. Do not wet concrete masonry units or structural facing tile before laying.

N. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

O. Construct formwork to conform to shape, line and dimensions shown. Make sufficiently tight to prevent leakage of mortar, grout, or concrete (if any). Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.

P. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

Q. Allow not less than the following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions have been obtained during the curing period.
   3. 7 days for reinforced masonry soffits.

3.4 ANCHORAGE

B. Veneer to Concrete Walls:
   1. Install dovetail slots in concrete vertically at 600 mm (2 feet) on centers.
   2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
   3. Anchor new masonry facing to existing concrete with corrugated wall ties spaced at 400 mm, (16 inch) maximum vertical intervals, and at 600 mm (2 feet) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.

C. Masonry Facing to Backup and Cavity Wall Ties:
   1. Use individual ties for new work.
   2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 600 mm (2 feet) horizontally.
   3. At openings, provide additional ties spaced not more than 900 mm (3 feet) apart vertically around perimeter of opening, and within 300 mm (12 inches) from edge of opening.
   4. Anchor new masonry facing to existing masonry with corrugated wall ties spaced at 400 mm (16 inch) maximum vertical intervals and at every second masonry unit horizontally. Fasten ties to masonry with masonry nails.
   5. Option: Use joint reinforcing for multiple wythes and cavity wall ties spaced not more than 400 mm (16 inches) vertically.
   6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals not to exceed 600 mm (24 inches) on center horizontally, and 400 mm (16 inches) on center vertically. Lay ties in the same line vertically in order to facilitate vibrating of the grout pours.

D. Anchorage of Abutting Masonry:
   1. Anchor interior masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (2 foot) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
   2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.
   3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
   4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with corrugated wall ties. Extend ties at least 100 mm (4 inches) into joints of new masonry. Fastened to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.

F. Anchorage to Steel Beams or Columns:
   1. Use adjustable beam anchors on each flange.
   2. At columns weld the 6 mm (1/4 inch) steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

3.5 REINFORCEMENT

A. Joint Reinforcement:
   1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
   4. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
   5. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry, except where other type anchors are required for anchorage of masonry to concrete structure.

B. Steel Reinforcing Bars:
   1. Install in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for lintels and bond beam

horizontal reinforcement. Install in wall cavities of reinforced masonry walls where shown.

2. Use grade 60 bars if not specified otherwise.
3. Bond Beams:
   a. Form Bond beams of load-bearing concrete masonry units filled with ASTM C476 grout and reinforced with 2-#15m (#5) reinforcing steel unless shown otherwise. Do not cut reinforcement.
   b. Brake bond beams only at expansion joints and at control joints, if shown.

5. Grout openings:
   b. Locate 75 mm x 75 mm (3 in. x 3 in.) min. clean-out holes at location of vertical reinforcement.
   c. Keep grout space clean of mortar accumulation and sand debris. Clean the grout space every day using a high pressure jet stream of water, or compressed air, or industrial vacuum, or by laying wood strips on the metal ties as the wall is built. If wood strips are used, lift strips with wires as the wall progresses and before placing each succeeding course of wall ties.

3.6 CMU CONTROL JOINTS.

A. Provide CMU control (CJ) joints where shown on drawings.
B. Keep joint free of mortar and other debris.
C. Where joints occur in masonry walls.
   2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
   3. Install filler, backer rod, and sealant on exposed faces.
D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint. Alter Structural clay tile units to accommodate shear key flanges.
E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.
F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.8 ISOLATION SEAL

A. Where full height walls or partitions lie parallel or perpendicular to and under structural beams or shelf angles, provide a separation between walls

or partitions and bottom of beams or shelf angles not less than the masonry joint thickness unless shown otherwise.

B. Insert in the separation, a continuous full width strip of non-combustible type compressible joint filler.

C. Where exposed in finish work, cut back filler material in the joint enough to allow for the joint to be filled with sealant material specified in Section 07 92 00, JOINT SEALANTS.

3.9 BRICKWORK

A. Lay clay brick in accordance with BIA Technical Note 11 series.

B. Laying:

1. Lay brick in running bond with course of masonry bonded at corners unless shown otherwise. Match bond of existing building on alterations and additions.
2. Maintain bond pattern throughout.
3. Do not use brick smaller than half-brick at any angle, corner, break or jamb.
4. Where length of cut brick is greater than one half but less than a whole brick, maintain the vertical joint location of such units.
5. Lay exposed brickwork joints symmetrical about center lines of openings.
6. Do not structural bond multi wythe brick walls unless shown.
7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
8. Lay brick for sills with wash and drip.
9. Build solid brickwork as required for anchorage of items.

C. Joints:

1. Exterior and interior joint widths: Lay for three equal joints in 200 mm (eight inches) vertically, unless shown otherwise.
2. Rake joints for pointing with colored mortar when colored mortar is not full depth.
3. Arches:
   a. Flat arches (jack arches) lay with camber of 1 in 200 (1/16 inch per foot) of span.
   b. Face radial arches with radial brick with center line of joints on radial lines.
   c. Form Radial joints of equal width.
   d. Bond arches into backing with metal ties in every other joint.

D. Weep Holes:

1. Install weep holes at 600 mm (24 inches) on center in bottom of vertical joints of exterior masonry veneer or cavity wall facing over foundations, bond beams, and other water stops in the wall.
2. Form weep holes using wicks made of mineral fiber insulation strips turned up 200 mm (8 inches) in cavity. Anchor top of strip to backup to securely hold in place.
3. Install sand or pea gravel in cavity approximately 75 mm (3 inches) high between weep holes.

E. Solid Exterior Walls:

1. Build with 100 mm (4 inches) of nominal thick facing brick, backed up with concrete masonry units
2. Construct solid brick jambs not less than 20 mm (.8 inches) wide at exterior wall openings and at recesses, except where exposed concrete unit backup is shown.
3. Do not use full bonding headers.
4. Parging:
   a. For solid masonry walls, lay backup to height of six brick courses, parge backup with 13 mm (1/2 inch) of mortar troweled smooth; then lay exterior wythe to height of backup.
   b. Make parging continuous over backup, and extend 150 mm (six inches) onto adjacent concrete or masonry.
   c. Parge, with mortar, the ends and backs for recesses in exterior walls to a thickness of 13 mm (1/2 inch).
   d. Parge with mortar to true even surface the inside surface of exterior walls to receive insulation.

3.10 CONCRETE MASONRY AND STRUCTURAL CLAY TILE UNITS

A. Kind and Users:

1. Provide special concrete masonry shapes as required, including lintel unitsand corner units. Use solid concrete masonry units, where full units cannot be used, or where needed for anchorage of accessories.
2. Provide solid load-bearing concrete masonry units or grout the cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.
4. Do not use brick jambs in exposed finish work.

5. Use concrete building brick only as filler in backup material where not exposed.
6. Masonry assemblies shall meet the required fire resistance in fire rated partitions of type and construction that will provide fire rating as shown.
7. Structural Clay Tile Units (Option):
   a. Structural clay tile units load-bearing or non-load bearing as required, may be used in lieu of concrete masonry units, only, but not as an exposed surface, foundation walls or where otherwise noted.
   b. Set units according to applicable requirements specified for concrete masonry units.
   c. Use brick or load-bearing structural clay tile units, with cores set vertically, and filled with grout where structural members impose concentrated load directly on structural clay tile masonry.
8. Where lead lined concrete masonry unit partitions terminate below the underside of overhead floor or roof deck, fill the remaining open space between the top of the partition and the underside of the overhead floor or roof deck, with standard concrete masonry units of same thickness as the lead lined units.

B. Laying:
1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length, except where stack bond is required.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
7. Provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings not less than 50 mm (2 inches) by 75 mm (3 inches).

10. Do not wedge the masonry against the steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
11. Install deformed reinforcing bars of sizes shown.
12. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
13. Steel reinforcement in place before grouting.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacings noted.
16. Support vertical bars near each end and at intermediate intervals not exceeding 192 bar diameters.
17. Reinforcement shall be fully encased by grout or concrete.
18. Splice reinforcement or attach reinforcement to dowels by placing in contact and secured or by placing the reinforcement within 1/5 of the required bar splice length.
19. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
20. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.
21. Cavity and joint horizontal reinforcement may be placed as the masonry work progresses.
22. Rake joints 6 to 10 mm (1/4 to 3/8 inch) deep for pointing.

C. Waterproofing Parging:

1. Parge earth side of concrete masonry unit basement walls with mortar applied in two coats, each coat 6 mm (1/4 inch) thick.
2. Clean wall surfaces to receive parging of dirt, oil, or grease, and moisten before application of first coat.
3. Roughen first coat when partially set, permit to hardened for 24 hours, and moisten before application of second coat.
4. Keep second coat damp for at least 48 hours.
5. Thicken parging and round to form a cove at the junction of outside wall face and footing.

3.11 STRUCTURAL FACING TILE (SFT)

A. Lay facing tile in running bond unless shown otherwise. Match existing adjacent bond and joints in alteration work.

B. Laying:

1. Set facing tile units in full bed of mortar with ends buttered, and units shoved into place. Fill joints with mortar, and rake out 9 mm (3/8 inch) deep for pointing.
2. Use clean units when set.
3. Perform cutting and grinding of units by power-driven cutting saws and grinders.
4. Cut or drill units to accommodate electrical outlets, plumbing fixtures, grab-bars, and equipment.
5. Cove Base Units:
   a. Set base flush with finish floor.
   b. Form base course of two-face partitions of two units to required thickness.
6. Lay out partitions enclosing pipes or conduits with thickness to provide 50 mm (two inch) minimum coverage of pipes or conduits.
7. Joints:
   a. Nominally 6 mm (1/4 inch) width except match existing in alteration work.
   b. Maximum variations in joint width 2 mm (1/16 inch).
   c. Reinforce Two-Face partitions of 100 mm (4 inch nominal) thickness with continuous joint reinforcement, or wire mesh ties in joints at top of base, at top of GSFT, and at three-course intervals between.

3.12 POINTING

A. Fill joints with pointing mortar using rubber float trowel to rub mortar solidly into raked joints.
B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.
C. Finish exposed joints in finish work with a jointing tool to provide a smooth concave joint unless specified otherwise.
D. At joints with existing work match existing joint.

3.13 GROUTING

A. Preparation:
   1. Clean grout space of mortar droppings before placing grout.
   2. Close cleanouts.
   3. Install vertical solid masonry dams across grout space for full height of wall at intervals of not more than 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
   4. Verify reinforcing bars are in cells of units or between wythes as shown.
B. Placing:

1. Place grout by hand bucket, concrete hopper, or grout pump.
2. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
3. Do not slush with mortar or use mortar with grout.
4. Interruptions:
   a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inch) below top of last masonry course.
   b. Grout from dam to dam on high lift method.
   c. A longitudinal run of masonry may be stopped off only by raking back one-half a masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Puddling Method:
1. Double wythe masonry constructed grouted in lifts not to exceed 300 mm (12 inches) or less than 50 mm (2 inches) wide.
2. Consolidate by puddling with a grout stick during and immediately after placing.
3. Grout the cores of concrete masonry units containing the reinforcing bars solid as the masonry work progresses.

D. Low Lift Method:
1. Construct masonry to a height of 1.5 m (5 ft) maximum before grouting.
2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

E. High Lift Method:
1. Do not pour grout until masonry wall has properly cured a minimum of 4 hours.
2. Place grout in lifts not exceeding 1.5 m (5 ft).
3. Exception:
   Where the following conditions are met, place grout in lifts not exceeding 3.86 m (12.67 ft).
   a. The masonry has cured for at least 4 hours.
   b. The grout slump is maintained between 254 and 279 mm (10 and 11 in).
   c. No intermediate reinforced bond beams are placed between the top and the bottom of the pour height.
4. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into the preceding lift to close any shrinkage cracks or separation from the masonry units.

3.14 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on the Contract Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.

3.16 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. Do not wet concrete masonry units (CMU).

B. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 10 mm (3/8 inch) joints.

C. Where solid CMU units are shown, lay with full mortar head and bed joints.

D. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or

cells of non-reinforced vertical cells, or provide units with solid bottoms.

E. Columns, Piers and Pilasters:

1. Use CMU units of the size, shape and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.

F. Grouting:

1. Use “Fine Grout” per ASTM C476 for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
2. Use “Coarse Grout” per ASTM C476 for filling 100 mm (4 inch) spaces or larger in both horizontal directions.
3. Grouting Technique: use either low-lift grouting techniques subject to requirements which follow.

G. Low-Lift Grouting:

1. Provide minimum clear dimension of 50 mm (2 inches) and clear area of 5160 mm^2 (8 square inches) in vertical cores to be grouted.
2. Place vertical reinforcement prior to grouting of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 3 m (10 feet).
3. Lay CMU to maximum pour height. Do not exceed 1.5 m (5 foot) height, or if bond beam occurs below 1.5 m (5 foot) height, stop pour 38 mm (1-1/2 in) below top of bond beam.
4. Pour grout using chute container with spout or pump hose. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 38 mm (1-1/2 inches) below top course of pour.
5. Bond Beams: Stop grout in vertical cells 38 mm (1-1/2 inches) below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

3.17 CLEANING AND REPAIR

A. General:

1. Clean exposed masonry surfaces on completion.

2. Protect adjoining construction materials and landscaping during cleaning operations.
3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

B. Brickwork:
1. First wet surfaces with clean water, then wash down with a solution of soapless detergent. Do not use muriatic acid.
2. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
3. Free clean surfaces of traces of detergent, foreign streaks, or stains of any nature.

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

D. Structural Facing Tile or Brick Units:
1. Clean as recommended by tile or brick manufacturer. Protect light colored mortar joints from discoloration during cleaning.

2. Prepare schedule of test locations.

3.18 WATER PENETRATION TESTING

A. Seven days before plastering or painting, in the presence of Resident Engineer, test solid exterior masonry walls for water penetration at four locations approved by the COR.

B. Direct water on masonry for a period of one hour at a time when wind velocity is less than five miles per hour.

C. Should moisture appear on inside of walls tested, make additional tests at other areas as directed by Resident Engineer.

D. Correct the areas showing moisture on inside of walls, and repeat test at repaired areas, to insure that moisture penetration has been stopped.

- - - E N D - - -

SECTION 04 72 00
CAST STONE MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies manufactured concrete units to simulate a natural stone.

B. Installation of cast stone units.

1.2 RELATED WORK

A. Setting and pointing mortar: Section 04 05 13, MASONRY MORTARING / Section 04 05 16, MASONRY GROUTING.

B. Joint sealant and application: Section 07 92 00, JOINT SEALANTS.

C. Color and texture specified in Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:

1. Cast stone, sample panel, size 4 by 12 by 12 inches for each color and finish.
2. Show finish on two 4-inch) edges and 12 by 12 inch surface.

C. Shop Drawings:

1. Cast stone showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.
2. Setting drawings with setting mark.

D. Certificates: Test results indicating that the cast stone meets specification requirements and proof of plant certification.

E. Submit manufacturers test results of cast stone previously made by manufacturer.

F. Laboratory Data: Description of testing laboratories facilities and qualifications of its principals and key personnel.

G. List of jobs furnished by the manufacturer, which were similar in scope and at least three (3) years of age.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store cast stone under waterproof covers on planking clear of ground.

B. Protect from handling, dirt, stain, and water damage.

C. Mark production units with the identification marks as shown on the shop drawings.

D. Package units and protect them from staining or damage during shipping and storage.

E. Provide an itemized list of product to support the bill of lading.

1.5 WARRANTY

Warranty exterior masonry walls against moisture leaks, any defects and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be two years.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. Cast Stone Institute Technical Manual and Cast Stone Institute standard specifications.

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

A167-99(R2009).....Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A185-07.....Steel, Welded Wire Fabric, Plain for Concrete

A615/A615M-09.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

C33-11.....Concrete Aggregates

C150-09.....Portland Cement

C568-10.....Limestone Dimension Stone

C979-10.....Pigments for Integrally Colored Concrete

C1194-03.....Compressive Strength of Architectural Cast Stone

C1195-03.....Absorption of Architectural Cast Stone

C1364-10.....Architectural Cast Stone.

D2244-09.....Calculation of Color Differences from Instrumentally Measured Color Coordinates.

1.7 QUALITY ASSURANCE

A. The Manufacturer:

1. Must have 5 years minimum continuous operating experience and have facilities for manufacturing cast stone as described herein. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.
2. Must be a member of the Cast Stone Institute.

3. Must have a certified plant (certification by the Cast Stone Institute).

B. Stone setter: Must have 5 years' experience setting cast or natural building stone.

C. Testing: One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m^3) delivered to the job:

1. Three (3) field cut cube specimens from each of these sample shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as specified.
2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
3. Field specimens shall be tested in accordance with ASTMC 1194 and C 1195.
4. Manufacturer shall submit a written list of projects similar and at least three (3) years of age, along with owner, architect and contractor references.

1.8 MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than + 1/8 in. from approved dimension.

B. Length of units shall not deviate by more than length /360 or + 1/8 in., whichever is greater, not to exceed + 1/4 in (6 mm). Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp bow or twist of units shall not exceed length/360 or + 1/8 in., whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in, on unformed sides of unit, 3/8 in maximum deviation.

1.9 MOCK-UP

Provide full size units for use in construction of sample wall. The mock-up becomes the standard of workmanship for the project.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CAST STONE

A. Comply with ASTM C 1364

B. Physical properties: Provide the following:

1. Compressive Strength – ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.

2. Absorption – ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products as 28 days.
3. Air Content – ASTM C173 or C231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for vibrant dry tamp (VDT) products.
4. Freeze thaw - ASTM C 1364L The cumulative percent weight loss (CPWL) shall be less than 5% after 300 cycles of freezing and thawing.
5. Linear Shrinkage - ASTM C 426L Shrinkage shall not exceed 0.065%.

C. Job site testing – One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14m^3) delivered to the job site:
1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.2 RAW MATERIALS

A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.
B. Coarse aggregates –Quartz or limestone, ASTM C 33, except for gradation, and are optional for the vibrant dry tamp (VDT) casting method.
C. Fine aggregates – Manufactured or natural sands, ASTM C 33, except for gradation.
D. Colors – Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
E. Admixtures- Comply with the following:
1. ASTM C 260 for air-entraining admixtures.
2. ASTM C 494/C 495 M Types A-G for water reducing, retarding, accelerating and high range admixtures.
3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

F. Water – Potable

G. Reinforcing bars:

1. ASTM A 615/A 615M. Grade 40 or 60 steel epoxy coated when cover is less than 1.5 in. (37 mm).
2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH

A. Match sample provided by COR.

B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in^2 ($25mm^2$) and not obvious under direct daylight illumination at a 5 ft. (1.5m)distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.

D. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.

1. Total color difference – not greater than 6 units.
2. Total hue difference-not greater than 2 units.

2.4 REINFORCING

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

1. Minimum reinforcing shall be 0.25 percent of the cross section area.

B. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

C. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 10-ft (6m) distance.

D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

E. Remove cement film, if required, from exposed surface prior to packaging for shipment.

2.5 CURING

Cure units in a warm curing chamber 100 F (37.8 C) at 95 percent relative humidity for approximately 12hours, or cure in a 95 percent moist environment at a minimum 70F (21.1 C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350-degree-days (i.e. 7 days @ 50F (10.0 C) or 5 days @ 70F (21.0 C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

PART 3 - EXECUTION

3.1 EXAMINATION

Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.2 SETTING TOLERANCES

A. Comply with Cast Stone Institute SM Technical Manual.
B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.
C. Joints, plus – 1/6 in. (1.5 mm), minus – 1/8 in. (3 mm).

3.3 JOINTING

A. Joint size:
   1. At stone/brick joints 3/8 in. (9.5 cm).
   2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
   3. Stone/stone joint exposed on top 3/8 in. (.5 mm).
B. Joint Materials:
   1. Mortar, Type N, ASTM C 270.
   2. Use a full bed of mortar at all bed joints.
   3. Flush vertical joints full with mortar.
   4. Leave all joints with exposed tops or under relieving angles open for sealant.
   5. Leave head joints in coping and projecting components open for sealant.
B. Location of joints:
   1. As shown on shop drawings.
   2. At control and expansion joints unless otherwise shown.

3.4 SETTING

A. Drench units with clean water prior to setting.
B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
C. Set units in full bed of mortar, unless otherwise detailed.

D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.

E. Remove excess mortar from unit faces immediately after setting.

F. Tuck point unit joints to a slight concave profile.

3.5 JOINT PROTECTION

A. Comply with requirements of Section 07 92 00, JOINT SEALANTS.

B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.

B. Saturate units to be cleaned prior to applying an approved masonry cleaner.

C. Consult with manufacturer for appropriate cleaners.

3.7 INSPECTION AND ACCEPTANCE

Inspect finished installation according to Bulletin #36 published by the Cast Stone Institute.

- - - E N D - - -

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

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 01 45 29, TESTING LABORATORY SERVICES.

B. Painting: Section 09 91 00, PAINTING.

D. Steel Decking: Section 05 31 00, STEEL DECKING.

E. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.

F. Fireproofing: Section 07 81 00, APPLIED 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 LRFD Manual, Second Edition, Page 1-183), 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 - LRFD Specification for Structural Steel Buildings.

B. AISC: Code of Standard Practice for Steel Buildings and Bridges.

1.7 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

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 (Second Edition, 2005)
2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Second Edition, 1995)
3. Code of Standard Practice for Steel Buildings and Bridges (2010).

C. American National Standards Institute (ANSI):

B18.22.1-65(R2008).....Plain Washers

B18.22M-81(R2000).....Metric Plain Washers

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

A6/A6M-09.....Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

A36/A36M-08.....Standard Specification for Carbon Structural Steel

A53/A53M-10.....Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123/A123M-09.....Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A242/A242M-04(R2009)....Standard Specification for High-Strength Low-Alloy Structural Steel

A283/A283M-03(R2007)....Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

A307-10.....Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

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

A490-10.....Standard Specification for Heat-Treated Steel Structural Bolts 150 ksi Minimum Tensile Strength

A500/A500M-10.....Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A501-07.....Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

A572/A572M-07.....Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

A992/A992M-06.....Standard Specification for Structural Steel Shapes

E. American Welding Society (AWS):

D1.1/D1.1M-10.....Structural 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-21035.....Paint, 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,A992 .

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, A490.
2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
3. Plain washers, other than those in contact with high-strength bolt heads and nuts: 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 - Load and Resistance Factor 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 09 91 00, 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.

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 09 91 00, 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 01 00 00, 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.

- - - E N D - - -

SECTION 05 31 00
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 01 45 29, TESTING LABORATORY SERVICES.

B. Finish Painting: Section 09 91 00, PAINTING.

1.3 DESIGN REQUIREMENTS:

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

B. Design all elements with the latest published version of applicable codes.

1.4 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Shop and erection drawings showing 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:

A. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

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-08.....Standard Specification for Carbon Structural Steel

A611-97.....Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled

A653/A653M-08.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process

C. American Institute of Steel Construction (AISC):

1. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition).

D. American Iron and Steel Institute (AISI):

1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members

E. American Welding Society (AWS):

D1.3-08.....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
2. Factory Mutual Research Approval Guide (2002)

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.

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 09 91 00, 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: Provide 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.

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. Intermediate Rib (Type F) deck.
2. Finish: Galvanized G-60.
3. Finish: Prime painted. Apply finished coat of paint to underside of deck after installation. Color as selected by Architect.

C. 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.

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. Fasten roof 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. at every support, and at closer spacing where required for lateral force resistance by diaphragm action. Attach split or partial panels to the structure in every valley. In addition, secure deck to each supporting member in ribs where side laps occur. Power driven fasteners may be used in lieu of welding for roof deck if strength equivalent to the welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
   5. Mechanically fasten side laps of adjacent roof deck units with spans greater than 1524 mm (5 feet) between supports, at intervals not exceeding 915 mm (3 feet) o.c., or midspan, whichever is closer, using self-tapping No. 8 or larger machine screws.
   6. Provide any additional fastening necessary to comply with the requirements of Underwriters Laboratories and/or Factory Mutual to achieve the required ratings.

   7. 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:

1. Areas scarred during erection.
2. Welds to be thoroughly cleaned and touched-up. Touch-up paint for zinc-coated units shall be zinc rich galvanizing repair paint. Touch-up paint for shop painted units of same type used for shop painting.

- - - E N D - - -

SECTION **054000**
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:
   a. Exterior non-load-bearing steel stud wall.
   b. Interior load-bearing steel stud walls

1.2 RELATED WORK:

A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.

B. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

C. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.

1.3 DESIGN REQUIREMENTS:

A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.

B. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.

   a. Design Loads: As indicated.
   b. Design framing systems to withstand design loads without deflections greater than the following:
   c. Exterior Non-load-Bearing Curtain wall: Lateral deflection of 1/600 of the wall height with a lateral pressure of 30.

   2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).
   3. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
   4. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
   5. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.

C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

D. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

1.5 APPLICABLE PUBLICATIONS:

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

B. American Iron and Steel Institute (AISI):

1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)

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

1. A36/A36M(REV. A)-2003 Standard Specifications for Carbon Structural Steel
2. A123/A123M-2002 Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
3. A153/A153M-2003 Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. A307-2002 Standard Specifications for Carbon Steel Bolts and Studs
5. A653/A653M-2003 Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
6. C955-2003 Standard Specifications for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
7. C1107-2002 Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
8. E488-96(Reapproved 2003) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
9. E1190-95(Reapproved 2000) Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

D. American Welding Society (AWS):

1. D1.3-(98) Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

1. MIL-P-21035B(Reinst. Notice 2) Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Sheet Steel for studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G60, with a yield of 340 MPa (50 ksi) minimum.

B. Sheet Steel for studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated G60, with a yield of 230 MPa (33 ksi) minimum.

C. Galvanizing Repair Paint: MIL-P-21035B.

D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 WALL FRAMING:

A. Steel Studs: Manufacturer’s standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:

1. Design Uncoated-Steel Thickness:

a. 0.91 mm (0.0358 inch).
b. 1.20 mm (0.0474 inch).
c. 1.52 mm (0.0598 inch).
d. (0.0747 inch).
e. 2.66 mm (0.1046 inch).

2. Flange Width:
a. (1-5/8 inches).

3. Web: Punched.

B. Steel Track: Manufacturer’s standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturer’s standard deep flange where indicated, standard flange elsewhere.

2.3 FRAMING ACCESSORIES:

A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 psi).

B. Provide accessories of manufacturer’s standard thickness and

configuration, unless otherwise indicated, as follows:

a. Supplementary framing.
b. Bracing, bridging, and solid blocking.
c. Web stiffeners.
d. Gusset plates.
e. Deflection track and vertical slide clips.
f. Reinforcement plates.

2.4 ANCHORS, CLIPS, AND FASTENERS:

A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.

B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

C. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer’s standard elsewhere.

2.5 REQUIREMENTS:

A. Welding in accordance with AWS D1.3

B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Framing components may be preassembled into panels. Panels shall be square with components attached.

B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.

C. Hold members in place until fastened.

D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer’s instructions with screw penetrating joined members by not less than 3 exposed screw threads.

E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 ERECTION:

A. Handle and lift prefabricated panels in a manner as to not distort any member.

B. Securely anchor tracks to supports as shown.

C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.

D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.

E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.

F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.

G. Install headers in all openings that are larger than the stud spacing in that wall.

H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.

I. Studs in one piece for their entire length, splices will not be permitted.

J. Provide a load distribution member at top track where joist is not located directly over bearing stud.

K. Provide temporary bracing and leave in place until framing is permanently stabilized.

L. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.

M. Fasten reinforcement plate over web penetrations that exceed size of manufacturer’s standard punched openings.

3.3 TOLERANCES:

A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.

C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the

requirements of the finishing materials.

D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 FIELD REPAIR:

A. Touch-up damaged galvanizing with galvanizing repair paint.

- - - E N D - - -

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.

B. Items specified.

1. Support for Wall and Ceiling Mounted Items: (12, 14A, 14C)
2. Frames: (24E)
3. Guards
6. Loose Lintels
7. Shelf Angles
11. Ladders
12. Railings: (10)
13. Catwalks and Platforms
17. Steel Counter or Bench Top Frame and Leg

1.2 RELATED WORK

A. Railings attached to steel stairs: Section 05 51 00, METAL STAIRS.

B. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.

C. Prime and finish painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

Fencing

C. Shop Drawings:

1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
3. Provide templates and rough-in measurements as required.

D. Manufacturer's Certificates:

1. Anodized finish as specified.
2. Live load designs as specified.

E. Design Calculations for specified live loads including dead loads.

F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each product type shall be the same and be made by the same manufacturer.

C. Assembled product to the greatest extent possible before delivery to the site.

1.5 APPLICABLE PUBLICATIONS

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

B. American Society of Mechanical Engineers (ASME):

B18.6.1-81(R1997).....Wood Screws

B18.2.2-87(R2005).....Square and Hex Nuts

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

A36/A36M-05.....Structural Steel

A47-99(R2004).....Malleable Iron Castings

A48-03.....Gray Iron Castings

A53-06.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123-02.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A269-07.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A307-07.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A312/A312M-06.....Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

A391/A391M-01.....Grade 80 Alloy Steel Chain

A653/A653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

A786/A786M-05.....Rolled Steel Floor Plate

B221-06.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
B456-03.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
B632-02.....Aluminum-Alloy Rolled Tread Plate
C1107-07.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
D3656-04.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
F436-07.....Hardened Steel Washers
F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
F593-02.....Stainless Steel Bolts, Hex Cap Screws, and Studs
F1667-05.....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):
D1.1-04.....Structural Welding Code Steel
D1.2-03.....Structural Welding Code Aluminum
D1.3-98.....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)
AMP521-01.....Pipe Railing Manual
AMP 500-505-1988.....Metal Finishes Manual
MBG 531-00.....Metal Bar Grating Manual
MBG 532-00.....Heavy Duty Metal Bar Grating Manual

F. Structural Steel Painting Council (SSPC):
SP 1-05.....No. 1, Solvent Cleaning
SP 2-05.....No. 2, Hand Tool Cleaning
SP 3-05.....No. 3, Power Tool Cleaning

G. Federal Specifications (Fed. Spec):
RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
B. Ladders and Rungs: 120 kg (250 pounds) at any point.
C. Railings and Handrails: 900 N (200 pounds) in any direction at any point.
D. Floor Plates, Gratings, Covers, Trap Doors, Catwalks, and Platforms: 500 kg/m^2 (100 pounds per square foot).

2.2 MATERIALS

A. Structural Steel: ASTM A36.
B. Stainless Steel: ASTM A167, Type 302 or 304.

C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.

D. Floor Plate:

1. Steel ASTM A786.
2. Aluminum: ASTM B632.

E. Steel Pipe: ASTM A53.

1. Galvanized for exterior locations.
2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.

F. Cast-Iron: ASTM A48, Class 30, commercial pattern.

G. Malleable Iron Castings: A47.

H. Primer Paint: As specified in Section 09 91 00, PAINTING.

I. Stainless Steel Tubing: ASTM A269, type 302 or 304.

J. Modular Channel Units:

1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
2. Form channel with in turned pyramid shaped clamping ridges on each side.
3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

K. Grout: ASTM C1107, pourable type.

L. Insect Screening: ASTM D3656.

2.3 HARDWARE

A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:

a. ASME B18.2.2.
b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
c. ASTM F468 for nonferrous bolts.
d. ASTM F593 for stainless steel.

2. Screws: ASME B18.6.1.
3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

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

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

C. Connections
1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors
1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.

2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation. Submit to COR for approval.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
   h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
   a. Weld in accordance with AWS.
   b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
   c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
   d. Finish welded joints to match finish of adjacent surface.

3. Joining:
   a. Miter or butt members at corners according to design.
   b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
   a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
   b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
   a. Accurately cut, machine and fit joints, corners, copes, and miters.
   b. Fit removable members to be easily removed.
   c. Design and construct field connections in the most practical place for appearance and ease of installation. Submit for COR approval in shops.
   d. Fit pieces together as required.
   e. Fabricate connections for ease of assembly and disassembly without use of special tools.
   f. Joints firm when assembled.
   g. Conceal joining, fitting and welding on exposed work as far as practical.
   h. Do not show rivets and screws prominently on the exposed face.
   i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:
1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
   a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
   b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
   c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
   d. Painted: AA-C22R10.

3. Steel and Iron: NAAMM AMP 504.
   a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
   b. Surfaces exposed in the finished work:
      1) Finish smooth rough surfaces and remove projections.
      2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
   c. Shop Prime Painting:
      1) Surfaces of Ferrous metal:
         a) Items not specified to have other coatings.
         b) Galvanized surfaces specified to have prime paint.
         c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
         d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
         e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
      2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

G. Protection:
1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.5 SUPPORTS

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

C. For Wall Mounted Items:
1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.

4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. For Trapeze Bars:

1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.
2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.
3. Fabricate concealed components of structural steel shapes unless shown otherwise.
4. Stainless steel ceiling plate drilled for eye bolt.
5. Continuously weld connections where welds shown.
6. Use modular channel where shown with manufacturers bolts and fittings.
   a. Weld ends of steel angle braces to steel plates and secure to modular channel units as shown. Drill plates for anchor bolts.
   b. Fabricate eye bolt, special clamp bolt, and plate closure full length of modular channel at ceiling line and secure to modular channel unit with manufacturers standard fittings.

2.6 FRAMES

B. Channel Door Frames:

1. Fabricate of structural steel channels of size shown.
2. Miter and weld frames at corners.
3. Where anchored to masonry or embedded in concrete, weld to back of frame at each jamb, 5 mm (3/16 inch) thick by 44 mm (1-3/4 inch) wide steel strap anchors with ends turned 50 mm (2 inches), and of sufficient length to extend at least 300 mm (12 inches) into wall. Space anchors 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb. Weld clip angles to bottom of jambs and provide holes for expansion bolts.
4. Where anchored to concrete or masonry in prepared openings, drill holes at jambs for anchoring with expansion bolts. Weld clip angles to bottom of frame and provide holes for expansion bolt anchors as shown. Drill holes starting 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb and at top of jamb. Provide pipe spacers at holes welded to channel.

5. Where closure plates are shown, continuously weld them to the channel flanges.
6. Weld continuous 19 x 19 x 3 mm (3/4 x 3/4 x 1/8 inch) thick steel angles to the interior side of each channel leg at the head and jambs to form a caulking groove.
7. Prepare frame for installation of hardware specified in Section 08 71 00, DOOR HARDWARE.
   a. Cut a slot in the lock jamb to receive the lock bolt.
   b. Where shown use continuous solid steel bar stops at perimeter of frame, weld or secure with countersunk machine screws at not more than 450 mm (18 inches) on center.

C. Frames for Breech Opening:
1. Fabricate from steel channels, or combination of steel plates and angles to size and contour shown.
2. Weld strap anchors on back of frame at not over 600 mm (2 feet) on centers for concrete or masonry openings.

2.7 GUARDS

A. Wall Corner Guards:
1. Fabricate from steel angles and furnish with anchors as shown.
2. Continuously weld anchor to angle.

B. Guard Angles for Overhead Doors:
1. Cut away top portion of outstanding leg of angle and extend remaining portion of angle up wall.
2. Weld filler piece across head of opening to jamb angles.
3. Make provisions for fasteners and anchorage.

D. Edge Guard Angles for Openings in slabs.
1. Fabricate from steel angles of sizes and with anchorage shown.
2. Where size of angle is not shown, provide 50 x 50 x 6 mm (2 x 2 x 1/4 inch) steel angle with 32 x 5 mm (1-1/4 x 3/16 inch) strap anchors, welded to back.
3. Miter or butt angles at corners and weld.
4. Use one anchor near end and three feet on centers between end anchors.

2.8 COVERS AND FRAMES FOR PITS AND TRENCHES

A. Fabricate covers to support live loads specified.

B. Galvanized steel members after fabrication in accordance with ASTM A123, G-90 coating.

C. Steel Covers:

1. Use 6 mm (1/4 inch) thick floor plate for covers unless otherwise shown. Use gratings where shown as specified in paragraph GRATINGS. Use smooth floor plate unless noted otherwise.
2. Provide clearance at all sides to permit easy removal of covers.
3. Make cutouts within 6 mm (1/4 inch) of penetration for passage of pipes and ducts.
4. Drill covers for flat head countersunk screws.
5. Make cover sections not to exceed 2.3 m^2 (25 square feet) in area and 90 kg (200 pounds) in weight.
6. Fabricate trench cover sections not be over 900 mm (3 feet) long and if width of trench is more than 900 mm (3 feet)or over, equip one end of each section with an angle or "T" bar stiffener to support adjoining plate.
7. Use two, 13 mm (1/2 inch) diameter steel bar flush drop handles for each cover section.

2.9 GRATINGS

A. Fabricate gratings to support live loads specified and a concentrated load as specified.
B. Provide clearance at all sides to permit easy removal of grating.
C. Make cutouts in gratings with 6 mm (1/4 inch) minimum to 25 mm (one inch) maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.
D. Fabricate in sections not to exceed 2.3 m^2 (25 square feet) in area and 90 kg (200 pounds) in weight.
E. Fabricate sections of grating with end-banding bars.
F. Fabricate angle frames and supports, including anchorage as shown.
   1. Fabricate intermediate supporting members from "T's" or angles.
   2. Locate intermediate supports to support grating section edges.
   3. Fabricate frame to finish flush with top of grating.
   4. Locate anchors at ends and not over 600 mm (24 inches) o.c.
   5. Butt or miter, and weld angle frame at corners.

G. Steel Bar Gratings:
   1. Fabricate grating using steel bars, frames, supports and other members shown in accordance with Metal Bar Grating Manual.
   2. Galvanize steel members after fabrication in accordance with ASTM A123, G-90 for exterior gratings, gratings in concrete floors, and interior grating where specified.

3. Interior gratings: Prime paint unless specified galvanized.

H. Aluminum Bar Gratings:

1. Fabricate grating and frame assembly from aluminum as shown in accordance with Metal Bar Grating Manual.
2. Use 25 x 5 mm (1 x 3/16 inch) minimum size bearing bars.
3. Mill finish unless specified otherwise.

2.10 LOOSE LINTELS

A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.

B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls. Provide 12″ bearing on clay tile walls

C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.

1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 100 x 90 x 8 mm (4 x 3-1/2 x 5/16 inch).
2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).

D. For 150 mm (6 inch) thick masonry openings 750 mm to 3000 mm (2-1/2 feet to 10 feet) use one angle 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).

E. Provide bearing plates for lintels where shown.

F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.

G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.

H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.

2.11 SHELF ANGLES

A. Fabricate from steel angles of size shown.

B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.

C. Provide adjustable malleable iron inserts for embedded in concrete framing.

2.12 PLATE DOOR SILL

A. Fabricate of checkered plate as detailed.

1. Aluminum Plate: ASTM B632, 3 mm (0.125 inch) thick.

2. Steel Plate: ASTM A786, 3 mm (0.125 inch thick), galvanized G90.

B. Fabricate for anchorage with flat head countersunk bolts at each end and not over 300 mm (12 inches), o.c.

2.14 LADDERS

A. Steel Ladders:

1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
5. Galvanize exterior ladders after fabrication, ASTM A123, G-90.

B. Aluminum Ladders:

1. Fixed-rail type, constructed of structural aluminum, with mill finish.
2. Fabricate side rails and rungs of size and design shown, with the rungs shouldered and headed into and welded to the rails.
3. Where shown fabrication side rails curved, twisted and formed into gooseneck.
4. Fabricate angle brackets at top and bottom and intermediate brackets where shown. Drill for bolting.

C. Ladder Rungs:

1. Fabricate from 25 mm (one inch) diameter steel bars.
2. Fabricate so that rungs will extend at least 100 mm (4 inches) into wall with ends turned 50 mm (2 inches), project out from wall 175 mm (7 inches), be 400 mm (16 inches) wide and be designed so that foot cannot slide off end.
3. Galvanized after fabrication, ASTM A123, G-90 rungs for exterior use and for access to pits.

2.15 RAILINGS

A. In addition to the dead load design railing assembly to support live load specified.

B. Fabrication General:

1. Provide continuous welded joints, dressed smooth and flush.

2. Standard flush fittings, designed to be welded, may be used.
3. Exposed threads will not be approved.
4. Form handrail brackets to size and design shown.
5. Exterior Post Anchors.
   a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
   b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
   c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts.
6. Interior Post Anchors:
   a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
   b. Weld or thread flanged fitting to posts at base.
   c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
   d. Provide sliding flange base plate on posts secured with set screws.
   e. Weld flange base plate to removable posts set in sleeves.

C. Handrails:
1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:
1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
4. Form handrail brackets from malleable iron.
5. Fabricate removable sections with posts at end of section.
6. Removable Rails:
   a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
   b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
   c. Continuously weld brackets to post.

d. Provide slotted bolt holes in rail bracket.

e. Weld bolt heads flush with top of rail.

f. Weld flanged fitting to post where posts are installed in sleeves.

7. Opening Guard Rails:

a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.

b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.

c. Fabricate rails for floor openings for anchorage in sleeves.

8. Gates:

a. Fabricate from steel pipe as specified for railings.

b. Fabricate gate fittings from either malleable iron or wrought steel.

c. Hang each gate on suitable spring hinges of clamp on or through bolted type. Use bronze hinges for exterior gates.

d. Provide suitable stops, so that gate will swing as shown.

9. Chains:

a. Chains: ASTM A391, Grade 63, straight link style, normal size chain bar 8 mm (5/16 inch) diameter, eight links per 25 mm (foot) and with boat type snap hook on one end, and through type eye bolt on other end.

b. Fabricate eye bolt for attaching chain to pipe posts, size not less than 9 mm (3/8 inch) diameter.

c. Fabricate anchor at walls, for engagement of snap hook of either a 9 mm (3/8 inch) diameter eye bolt or punched angle.

d. Galvanize chain and bolts after fabrication.

E. Aluminum Railings:

1. Fabricate from extruded aluminum.

2. Use tubular posts not less than 3 mm (0.125 inch) wall thickness for exterior railings.

3. Punch intermediate rails and bottom of top rails for passage of posts and machine to a close fit.

4. Where shown use extruded channel sections for top rail with 13 mm (1/2 inch) thick top cover plates and closed ends.

5. Fabricate brackets of extruded or wrought aluminum as shown.

6. Fabricate stainless pipe sleeves with closed bottom at least six inches deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of posts where set in concrete.

2.16 CATWALKS

A. Fabricate catwalks including platforms, railings, ladders, supports and hangers, and arrangement of members as shown on drawings.
B. Fabricate stairs as specified in Section 05 51 00, METAL STAIRS.
C. Fabricate steel ladders as specified under paragraph LADDERS unless shown otherwise.
D. Fabricate steel pipe railings as specified under paragraph RAILINGS.
E. Catwalk and platforms floor surfaces as shown.
   1. Steel gratings as specified under paragraph gratings, either bar or plank type.
   2. Steel floor plate.
   3. Aluminum floor plate.
F. Prime paint catwalk system.

.

2.19 SCREENED ACCESS DOORS AND FRAMES

A. Galvanized ASTM A123, G-90 after fabrication.
B. Wall frame:
   1. Fabricate frame from steel angles or channels as shown.
   2. Continuously weld 38 x 13 mm (1-1/2 x 1/2 inch) steel channel door stop to angle frame. Cut out lock strike opening in channel.
   3. Miter and weld channel frame at corners. Reinforce corner with 3 mm (1/8 inch) plate angle.
   4. Reinforce channel frame with 3 x 150 mm (1/8 x 6 inch) long steel plate at channel back to cutout for latch. Cutout lock strike opening in channel face. Drill and tap for hinge anchorage.
   5. Drill jambs for 6 mm (1/4 inch) bolt anchors at top and bottom and not over 450 mm (18 inches) between top and bottom.
   6. Fabricate frame for door to sit flush with face of frame.
C. Doors
   1. Fabricate door using steel channel frame with 3 mm (1/8 inch) angle plate reinforcing at corners.
   2. Miter and weld corners.
   3. Fabricate lock box of 1.6 mm (1/16 inch) plate and weld to channel surround.
   4. Provide wire mesh constructed of 3.5 mm (0.135 inch) diameter galvanized steel wire crimped and woven into 38 mm (1-1/2 inch) diamond mesh pattern. Fasten the wire mesh to door frames by bending the ends

of each strand of wire over through channel clinched and welded to channel door frame.

5. Weld steel plate back-bands to channel door frame at hinge stiles only.
6. Screen on doors in exterior walls.
   a. Fabricate rewirable frame for screen from either extruded or tubular aluminum.
   b. Design to allow for removing or replacement frame and screening or adjoining items without damage.
   c. Use aluminum insect screening specified.
   d. Use stainless steel fasteners for securing screen to door.

D. Hardware:
1. Install hinged door to fixed frame with two 63 mm (2-1/2 inch) brass or bronze hinges.
2. Install lock or latch specified in Section 08 71 00, DOOR HARDWARE in lockbox.

2.20 STEEL COUNTER OR BENCH TOP FRAME AND LEGS

A. Fabricate channel or angle frame with mitered and welded corners as shown.
B. Drill top of frame with 6 mm (1/4inch) holes spaced 200 mm (8 inches) on center for securing countertop.
C. Fabricate legs of angle or pipe shapes and continuously weld to frame.
D. Finish frame with backed on enamel prime coat.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
B. Items set into concrete or masonry.
1. Provide temporary bracing for such items until concrete or masonry is set.
2. Place in accordance with setting drawings and instructions.
3. Build strap anchors, into masonry as work progresses.

C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
D. Field weld in accordance with AWS.
1. Design and finish as specified for shop welding.
2. Use continuous weld unless specified otherwise.

E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.

F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.

H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

A. Anchorage to structure.

1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
2. Secure supports to concrete inserts by bolting or continuous welding as shown.
3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
4. Secure steel plate or hat channels to studs as detailed.

C. Supports for Wall Mounted items:

1. Locate center of support at anchorage point of supported item.
2. Locate support at top and bottom of wall hung cabinets.
3. Locate support at top of floor cabinets and shelving installed against walls.
4. Locate supports where required for items shown.

H. Supports for Trapeze Bars:

1. Secure plates to overhead construction with fasteners as shown.
2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.
   a. Install closure plates in channel between eye bolts.
   b. Install eyebolts in channel.

3.3 COVERS AND FRAMES FOR PITS AND TRENCHES

A. Set frame and cover flush with finish floor.

B. Secure plates to frame with flat head countersunk screws.

C. Set gratings loose in drainage trenches or over pits unless shown anchored.

3.5 DOOR FRAMES

A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.

B. Level and plumb frame; brace in position required.

C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.

D. Set frames in formwork for frames cast into concrete.

E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

3.6 OTHER FRAMES

A. Set frame flush with surface unless shown otherwise.

B. Anchor frames at ends and not over 450 mm (18 inches) on centers unless shown otherwise.

C. Set in formwork before concrete is placed.

3.7 GUARDS

A. Steel Angle Corner Guards:

1. Build into masonry as the work progress.
2. Set into formwork before concrete is placed.
3. Set angles flush with edge of opening and finish floor or wall or as shown.
4. At existing construction fasten angle and filler piece to adjoining construction with 16 mm (5/8 inch) diameter by 75 mm (3 inch) long expansion bolts 450 mm (18 inches) on center.
5. Install Guard Angles at Edges of Trench and Openings in Slab.

B. Channel Guard at Top Edge of Concrete Platforms:

1. Install in formwork before concrete is placed.
2. Set channel flush with top of the platform.

3.8 GRATINGS

A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.

B. Set frame in formwork before concrete is placed.

C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.

D. Secure removable supporting members in place with stainless steel bolts.

E. Bolt gratings to supports.

3.9 STEEL LINTELS

A. Use lintel sizes and combinations shown or specified.

B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.

C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.10 SHELF ANGLES

A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.

B. Provide expansion space at end of members.

3.11 PLATE DOOR SILL

A. Install after roofing base flashing and counter flashing work is completed.

B. Set in sealant and bolt to curb.

3.13 LADDERS

A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.

3.14 RAILINGS

A. Steel Posts:

1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
2. Install sleeves in concrete formwork.
3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
5. Secure sliding flanged fittings to posts at base with set screws.
6. Secure fixed flanged fittings to concrete with expansion bolts.
7. Secure posts to steel with welds.

B. Aluminum Railing, Stainless Steel Railing, and Ornamental Railing Posts:

1. Install pipe sleeves in concrete formwork.
2. Set posts in sleeve and pour grout to surface on exterior locations and to within 6 mm (1/4 inch) of surface for interior locations except to where posts are required to be removable.

3. Apply beveled bead of urethane sealant over sleeve at post perimeter for exterior posts and flush with surface for interior posts as specified in Section 07 92 00, JOINT SEALANTS.

C. Anchor to Walls:
1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
   a. Anchor steel plate to concrete or solid masonry with expansion bolts.
   b. Anchor steel plate to hollow masonry with toggle bolts.
2. Anchor flanged fitting with toggle bolt to steel support in frame walls.

D. Removable Rails:
1. Rest rails in brackets at each end and secure to bracket with stainless steel bolts and nuts where part of a continuous railing.
2. Rest rail posts in sleeves where not part of a continuous railing. Do not grout posts.

E. Gates:
1. Hang gate to swing as shown.
2. Bolt gate hinges to jamb post with clamp on or through bolts.

F. Chains:
1. Eye bolt chains to pipe posts.
2. Eye bolt anchoring at walls.
   a. Expansion bolt to concrete or solid masonry.
   b. Toggle bolt to hollow masonry of frame wall installed support.

G. Handrails:
1. Anchor brackets for metal handrails as detailed.
2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.
3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

3.15 CATWALK AND PLATFORMS

A. Expansion bolt members to concrete unless shown otherwise.
B. Bolt or weld structural components together including ladders and stairs to support system.
C. Weld railings to structural framing.
D. Bolt or weld walk surface to structural framing.
E. Smooth field welds and spot prime damaged prime paint surface.

F. Fasten removable members with stainless steel fasteners.

3.17 SCREENED ACCESS DOOR

A. Set frame in opening so that clearance at jambs is equal and secure with expansion bolts.

B. Use shims at bolts to prevent deformation of frame members in prepared openings.

C. Set frame in mortar bed and build in anchors as the masonry work progresses.

D. Grout jambs solid with mortar.

E. Secure insect screen to inside of door with stainless steel fasteners on doors in exterior walls.

3.18 STEEL COMPONENTS FOR MILLWORK ITEMS

Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.19 CLEAN AND ADJUSTING

A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.

B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

- - - E N D - - -

SECTION **06 10 00**
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. A. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.

B. B. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.

C. C. Cement board sheathing: Section 06 16 63, CEMENTITIOUS SHEATHING.

1.3 SUMBITTALS:

D. A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

E. B. Shop Drawings showing framing spacing and connection details, fasteners, connections and dimensions.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

F. A. Protect lumber and other products from dampness both during and after delivery at site.

G. B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

H. C. Stack plywood and other board products so as to prevent warping.

I. D. Locate stacks on well drained areas, supported at least 150 mm (6 inches) above grade and cover with well ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.5 APPLICABLE PUBLICATIONS:

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

K. B. American Forest and Paper Association (AFPA):
National Design Specification for Wood Construction
NDS-05 Conventional Wood Frame Construction

L. C. American Institute of Timber Construction (AITC):
A190.1-02 Structural Glued Laminated Timber

M. D. American Society of Mechanical Engineers (ASME):
B18.2.1A-96(R2005) Square and Hex Bolts and Screws
B18.2.2-87(R2005) Square and Hex Nuts
B18.6.1-81 (R97) Wood Screws
B18.6.4-98(R2005) Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws

N. E. American Plywood Association (APA):
E30-03 Engineered Wood Construction Guide

O. F. American Society for Testing And Materials (ASTM):
A47-99(R2004) Ferritic Malleable Iron Castings
A48-03 Gray Iron Castings
A653/A653M-07 Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
C954-04 Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (2.24 mm) to 0.112-inch (2.84 mm) in thickness
C1002-04 Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs
D143-94(R2004) Small Clear Specimens of Timber, Method of Testing
D1760-01 Pressure Treatment of Timber Products
D2559-04 Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions
D3498-03 Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
F844-07 Washers, Steel, Plan (Flat) Unhardened for General Use
F1667-05 Nails, Spikes, and Staples

P. G. Federal Specifications (Fed. Spec.):
MM-L-736C Lumber; Hardwood

Q. Commercial Item Description (CID):
A-A-55615 Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)

R. I. Military Specification (Mil. Spec.):
MIL-L-19140E Lumber and Plywood, Fire-Retardant Treated

S. J. Truss Plate Institute (TPI):
TPI-85 Metal Plate Connected Wood Trusses

T. K. U.S. Department of Commerce Product Standard (PS)
PS 1-95 Construction and Industrial Plywood
PS 20-05 American Softwood Lumber Standard

PART 2 - PRODUCTS
2.1 LUMBER:

A. 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. 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. 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. B. Structural Members: Species and grade as listed in the AFPA, National Design Specification for Wood Construction having design

stresses as shown.

C. C. Lumber Other Than Structural:

1. 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
2. 2. Framing lumber: Minimum extreme fiber stress in bending of 1100.
3. 3. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and, members 150 mm (6 inches) and wider, Number 2 Grade.

D. D. Sizes:

1. 1. Conforming to Prod. Std., PS20.
2. 2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

E. E. Moisture Content:

1. 1. At time of delivery and maintained at the site.
2. 2. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
3. 3. Lumber over 50 mm (2 inches) thick: 25 percent or less.
4. Millwork lumber: 12% or less

F. F. Fire Retardant Treatment:

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

G. G. Preservative Treatment:

1. 1. Do not treat Heart Redwood and Western Red Cedar.
2. 2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 600 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members used in connection with roofing and flashing materials.
3. 3. Treat other members specified as preservative treated (PT).
4. 4. Preservative treat by the pressure method complying with ASTM D1760, except any process involving the use of Chromated Copper arsenate (CCA) for pressure treating wood is not permitted.

2.2 PLYWOOD

H. A. Comply with Prod. Std., PS 1.

I. 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.

J. C. Sheathing:

1. 1. APA rated Exposure 1 or Exterior; panel grade CD or better.
2. 2. Wall sheathing:

a. a. Minimum 9 mm (15/32 inch) thick with supports 400 mm (16 inches) on center on center unless specified otherwise.
b. b. Minimum 1200 mm (48 inches) wide at corners without corner bracing of framing.

3. 3. Roof sheathing:

a. a. Minimum 9 mm (11/32 inch) thick with span rating 24/0 or 12 mm (15/32 inch) thick with span rating for supports 400 mm (16 inches) on center unless specified otherwise.
b. b. Minimum 15 mm (19/32 inch) thick or span rating of 40/20 or 18 mm (23/32 inch) thick or span rating of 48/24 for supports 600 mm (24 inches) on center.

2.3 STRUCTURAL-USE PANELS

K. A. Comply with APA.

L. B. Bearing the mark of a recognized association or independent agency that maintains continuing control over quality of panel which identifies compliance by end use, Span Rating, and exposure durability classification.

M. C. Wall and Roof Sheathing:

1. 1. APA Rated sheathing panels, durability classification of Exposure 1 or Exterior Span Rating of 16/0 or greater for supports 400 mm (16 inches) on center and 24/0 or greater for supports 600 mm (24 inches) on center.

2.4 ROUGH HARDWARE AND ADHESIVES:

N. A. Anchor Bolts:

1. 1. ASME B18.2.1 and ANSI B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
2. 2. Extend at least 200 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).

O. B. Miscellaneous Bolts: Expansion Bolts: C1D, A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Use 13 mm (1/2 inch) bolt unless shown otherwise.

P. C. Washers

1. 1. ASTM F844.
2. 2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.

Q. D. Screws:

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

R. E. Nails:

1. 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. 2. ASTM F1667:

   a. a. Common: Type I, Style 10.
   b. b. Concrete: Type I, Style 11.
   c. c. Barbed: Type I, Style 26.
   d. d. Underlayment: Type I, Style 25.
   e. e. Masonry: Type I, Style 27.
   f. f. Use special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

S. F. Framing and Timber Connectors:

1. 1. Fabricate of ASTM A446, Grade A; steel sheet not less than 1.3 mm (0.052 inch) thick unless specified otherwise. Apply standard plating to steel timber connectors after punching, forming and assembly of parts.
2. 2. Framing Angles: Angle designed with bendable legs to provide three way anchors.
3. 3. Straps:

   a. a. Designed to provide wind and seismic ties with sizes as shown or specified.
   b. b. Strap ties not less than 32 mm (1-1/4 inches) wide.
   c. c. Punched for fastener.

4. 4. Metal Bridging:

   a. a. Optional to wood bridging.
   b. b. V shape deformed strap with not less than 2 nail holes at ends, designed to nail to top and side of framing member and bottom and side of opposite member.
   c. c. Not less than 19 mm by 125 mm (3/4 by 5 inches) bendable nailing flange on ends.
   d. d. Fabricated of 1 mm (0.04 inch) minimum thick sheet.

5. 5. Joist Hangers:

   a. a. Fabricated of 1.6 mm (0.063 inch) minimum thick sheet, U design unless shown otherwise.
   b. b. Heavy duty hangers fabricated of minimum 2.7 mm (0.108 inch) thick sheet, U design with bent top flange to lap over beam.

6. 6. Timber Connectors: Fabricated of steel to shapes shown.
7. 7. Joist Ties: Mild steel flats, 5 by 32 mm (3/16 by 1-1/4 inch size with ends bent about 30 degrees from horizontal, and extending at least 400 mm (16 inches) onto framing. Punch each end for three spikes.
8. 8. Wall Anchors for Joists and Rafters:

a. a. Mild steel strap, 5 by 32 mm (3/16 by 1-1/4 inch) with wall ends bent 50 mm (2 inches), or provide 9 by 130 mm (3/8 by 5 inch) pin through strap end built into masonry.
b. b. Strap long enough to extend onto three joists or rafters, and punched for spiking at each bearing.
c. c. Strap not less than 100 mm (4 inches) embedded end.

9. 9. Joint Plates:

a. a. Steel plate punched for nails.
b. b. Steel plates formed with teeth or prongs for mechanically clamping plates to wood.
c. c. Size for axial eccentricity, and fastener loads.

T. G. Adhesives:

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

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

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

1. 1. AFPA National Design Specification for Wood Construction for timber connectors.
2. 2. AITC Timber Construction Manual for heavy timber construction.
3. 3. AFPA WCD-number 1, Manual for House Framing for nailing and framing unless specified otherwise.
4. 4. APA for installation of plywood or structural use panels.
5. 5. ASTM F 499 for wood underlayment.
6. 6. TPI for metal plate connected wood trusses.

B. B. Fasteners:

1. 1. Nails.

a. 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. b. Use special nails with framing connectors.
c. c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
d. d. Use eight penny or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
e. e. Use 16 penny or larger nails for nailing through 50 mm (2 inch) thick lumber.
f. f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
g. g. Nailing Schedule; Using Common Nails:

1) 1) Joist bearing on sill or girder, toe nail three-8d or framing anchor
2) 2) Bridging to joist, toe nail each end two-8d
3) 3) Ledger strip to beam or girder three-16d under each joint.
4) 4) Subflooring or Sheathing:

a) a) 150 mm (6 inch) wide or less to each joist face nail two-8d.
b) b) Subflooring, more than 150 mm (6 inches) wide, to each stud or joint, face nail three-8d.
c) c) Plywood or structural use panel to each stud or joist face nail 8d, at supported edges 150 mm (6 inches) on center and at intermediate supports 250 mm (10 inches) on center. When gluing plywood to joint framing increase nail spacing to 300 mm (12 inches) at supported edges and 500 mm (20 inches) o.c. at intermediate supports.

5) Sole plate to joist or blocking, through sub floor face nail 20d nails, 400 mm (16 inches) on center.
6) Top plate to stud, end nail two-16d.
7) Stud to sole plate, toe nail or framing anchor. Four-8d
8) Doubled studs, face nail 16d at 600 mm (24 inches) on center.
9) Built-up corner studs 16d at 600 mm (24 inches) (24 inches) on center.
10) Doubled top plates, face nails 16d at 400 mm (16 inches) on center.11) Top plates, laps, and intersections, face nail two-16d.
12) Continuous header, two pieces 16d at 400 mm (16 inches) on center along each edge.
13) Ceiling joists to plate, toenail three-8d or framing anchor.
14) Continuous header to stud, four 16d.
15) Ceiling joists, laps over partitions, face nail three-16d or framing anchor. 16) Ceiling joists, to parallel rafters, face nail three-16d.17) Rafter to plate, toe nail three-8d. or framing anchor. Brace 25 mm (1 inch) thick board to each stud and plate, face nail three-8d.18) Built-up girders and beams 20d at 800 mm (32 inches) on center along each edge.

2. 2. Bolts:a. Fit bolt heads and nuts bearing on wood with washers.b. Countersink bolt heads flush with the surface of nailers.c. Embed in concrete and solid masonry or use expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.d. Use toggle bolts to hollow masonry or sheet metal.e. Use bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 600 mm (24 inch) intervals between end bolts. Use clips to beam flanges.

3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.b. ASTM C 954 for steel over 0.84 mm (0.033 inch) thick.

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

    a. a. Where shown or option to nails.
    b. b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
    c. c. Spaced same as nails.

6. 7. Installation of Timber Connectors:

    a. a. Conform to applicable requirements of the NFPA National Design Specification for Wood Construction.
    b. b. Fit wood to connectors and drill holes for fasteners so wood is not split.

C. C. Set sills or plates level in full bed of mortar on masonry or concrete walls.

1. 1. Space anchor bolts 1200 mm (4 feet) on centers between ends and within 150 mm (6 inches) of end. Stagger bolts from side to side on plates over 175 mm (7 inches) in width.
2. 2. Use shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
3. 3. Closely fit, and set to required lines.

D. D. Cut notch, or bore in accordance with NFPA Manual for House-Framing for passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.

E. E. Blocking Nailers, and Furring:

1. 1. Install furring, blocking, nailers, and grounds where shown.
2. 2. Use longest lengths practicable.
3. 3. Use fire retardant treated wood blocking where shown at openings and where shown or specified.
4. 4. Layers of Blocking or Plates:

    a. a. Stagger end joints between upper and lower pieces.
    b. b. Nail at ends and not over 600 mm (24 inches) between ends.
    c. c. Stagger nails from side to side of wood member over 125 mm (5 inches) in width.

F. F. Floor and CeilingFraming:

1. 1. Set with crown edge up.
2. 2. Keep framing at least 50 mm (2 inches) away from chimneys.
3. 3. Bear on not less than 100 mm (4 inches) on concrete and masonry, and 38 mm (1-1/2 inches) on wood and metal unless shown otherwise.
4. 4. Support joist, trimmer joists, headers, and beams framing into carrying members at same relative levels on joist hangers unless shown otherwise.

5. 5. Lap and spike wood joists together at bearing, or butt end-to-end with scab ties at joint and spike to plates. Scab tie lengths not less than 200 mm (8 inches) lap on joist ends. Install wood I beam joists as shown.
6. 6. Frame openings with headers and trimmer joist. Double headers carrying more than two tail joists and trimmer joists supporting headers carrying more than one tail joist unless otherwise shown.
7. 7. Drive nails through headers into joists using two nails for 50 mm by 150 mm (2 inch by 6 inch); three nails for 50 mm by 200 mm (2 inch by 8 inch) and four nails for 50 mm by 250 mm (2 inch by 10 inch) and over in size.
8. 8. Install nearest joist to double headers and spike joist to both header members before trimmer joist is installed and secured together.
9. 9. Doubled joists under partitions parallel with floor joists.
10. 10. Where joists run perpendicular to masonry or concrete, anchor every third joist to masonry or concrete with one metal wall anchor. Securely spike anchors with three nails to side of joist near its bottom.
11. 11. Anchor joists running parallel with masonry or concrete walls to walls with steel flats spaced not over 1800 mm (6 feet) apart. Extend steel flats over at least three joists and into masonry 100 mm (4 inches) with ends turned 50 mm (2 inches); bolt to concrete. Set top of flats flush with top of joists, and securely nail steel flats to each joist.
12. 12. Hook ties at steel framing over top flange of steel members.
13. 13. Nonbearing partitions running parallel with ceiling joists, install solid 50 mm (2 inch) thick bridging same depth as ceiling joists cut to fit snug between joists for securing top plate of partitions. Securely spike bridging to joists. Space 1200 mm (4 feet) on center.

G. G. Bridging:

1. 1. Use 25 mm by 75 mm (1 inch by 3 inch) lumber with ends beveled for slope. Option: Metal bridging may be used for wood bridging.
2. 2. Install one row of bridging for joist spans over 2400 mm (8 feet), but less than 4800 mm (16 feet) long; install two rows for spans over 4800 mm (16 feet) long.
3. 3. Install an extra row of bridging between trimmer and next two joists if header is more than 600 mm (2 feet) from end of trimmer or from regular row of bridging.
4. 4. Secure with two nails at ends.
5. 5. Leave bottom ends loose until after subflooring or roof sheathing is installed.
6. 6. Install single row of bridging at centerline of span and two rows at the third points of span unless otherwise shown.

SPEC WRITER NOTE: Revise roof framing if other wood systems used such as trusses.

H. H. Roof Framing:

1. 1. Set rafters with crown edge up.
2. 2. Form a true plane at tops of rafters.
3. 3. Valley, Ridge, and Hip Members:

a. a. Size for depth of cut on rafters.

b. b. Straight and true intersections of roof planes.
c. c. Secure hip and valley rafters to wall plates by using framing connectors.
d. d. Double valley rafters longer than the available lumber, with pieces lapped not less than 1200 mm (4 feet) and spiked together.
e. e. Butt joint and scab hip rafters longer than the available lumber.

4. 4. Spike to wall plate and to ceiling joists except when secured with framing connectors.
5. 5. Frame openings in roof with headers and trimmer rafters. Double headers carrying more than one rafter unless shown otherwise.
6. 6. Install 50 mm by 100 mm (2 inch by 4 inch) strut between roof rafters and ceiling joists at 1200 mm (4 feet) on center unless shown otherwise.

7. 4. Headers or Lintels:

a. a. Make headers for openings of two pieces of 50 mm (2 inch) thick lumber of size shown with plywood filler to finish flush with face of studs or solid lumber of equivalent size.
b. b. Support ends of headers on top of stud cut for height of opening. Spike cut stud to adjacent stud. Spike adjacent stud to header.

8. 5. Use double top plates, with members lapped at least 610 mm (2-feet) spiked together.
9. 6. Install intermediate cut studs over headers and under sills to maintain uniformity of stud spacing.
10. 7. Use single sill plates at bottom of opening unless shown otherwise. Toe nail to end stud, face nail to intermediate studs.
11. 8. Install 50 mm (2 inch) blocking for firestopping so that maximum dimension of any concealed space is not over 2400mm (8 feet) in accordance with NFPA Manual for House Framing.
12. 9. Install corner bracing when plywood or structured use panel sheathing is not used.

a. a. Let corner bracing into exterior surfaces of studs at an angle of approximately 45 degrees, extended completely over walls plates, and secured at bearing with two nails.
b. b. Use 25 mm by 100 mm (1 inch by 4 inch) corner bracing.

I. N. Sheathing:

1. 1. Use plywood or structural-use panels for sheathing.
2. 2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
3. 3. Set nails not less than 9 mm (3/8 inch) from edges.
4. 4. Install 50 mm by 100 mm (2 inch by 4 inch) blocking spiked between joists, rafters and studs to support edge or end joints of panels.

- - - E N D - - -

SECTION **06 20 00**
FINISH CARPENTRY

PART 1 - GENERAL
1.1 DESCRIPTION

A. A. This section specifies exterior and interior millwork.

B. B. Items specified.
- Command Center Counter
- Counter Shelf
- Counter or Work Tops
- Pegboard (Perforated Hardboard)
- Mounting Strips, Shelves, and Rods

1.2 RELATED WORK

C. A. Fabricated Metal brackets, bench supports and countertop legs: Section 05 50 00, METAL FABRICATIONS.

D. B. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.

E. C. Wood doors: Section 08 14 00, WOOD DOORS.

F. D. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

G. E. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.

H. F. Other Countertops: Division 11, EQUIPMENT and Division 12, FURNISHINGS.

I. G. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

1.3 SUBMITTALS

J. A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

K. B. Shop Drawings:

1. 1. Millwork items – Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
2. 2. Show construction and installation.

L. C. Samples:
Plastic laminate, finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).

M. D. Certificates:

1. 1. Indicating preservative treatment and fire retardant treatment of materials meet the requirements specified.
2. 2. Indicating moisture content of materials meet the requirements specified.

N. E. List of acceptable sealers for fire retardant and preservative treated materials.

O. F. Manufacturer's literature and data:

1. 1. Finish hardware
2. 2. Sinks with fittings
3. 3. Electrical components

1.4 DELIVERY, STORAGE AND HANDLING

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

Q. B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Resident Engineer. Store at a minimum temperature of 21^{0}C (70^{0}F) for not less than 10 days before installation.

R. C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

1.5 APPLICABLE PUBLICATIONS

S. 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.

T. B. American Society of Testing and Materials (ASTM):
A36/A36M-08 Structural Steel
A53-07 Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
A167-99 (R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
B26/B26M-09 Aluminum-Alloy Sand Castings
B221-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
E84-09 Surface Burning Characteristics of Building Materials

U. C. American Hardboard Association (AHA):
A135.4-04 Basic Hardboard

V. D. Builders Hardware Manufacturers Association (BHMA):
A156.9-03 Cabinet Hardware
A156.11-04 Cabinet Locks
A156.16-02 Auxiliary Hardware

W. E. Hardwood Plywood and Veneer Association (HPVA):
HP1-09 Hardwood and Decorative Plywood

X. F. National Particleboard Association (NPA):
A208.1-99 Wood Particleboard

Y. G. American Wood-Preservers’ Association (AWPA):
AWPA C1-03 All Timber Products – Preservative Treatment by Pressure Processes

Z. H. Architectural Woodwork Institute (AWI):

AWI-99 Architectural Woodwork Quality Standards and Quality Certification Program

AA. I. National Electrical Manufacturers Association (NEMA):
LD 3-05 High-Pressure Decorative Laminates

BB. J. U.S. Department of Commerce, Product Standard (PS):
PS20-05 American Softwood Lumber Standard

CC. K. Military Specification (Mil. Spec):
MIL-L-19140E Lumber and Plywood, Fire-Retardant Treated

DD. L. Federal Specifications (Fed. Spec.):
A-A-1922A Shield Expansion
A-A-1936 Contact Adhesive
FF-N-836D Nut, Square, Hexagon Cap, Slotted, Castle
FF-S-111D(1) Screw, Wood
MM-L-736(C) Lumber, Hardwood

PART 2 - PRODUCTS
2.1 LUMBER

A. A. Grading and Marking:

1. 1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.
2. 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. 3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. B. Sizes:

1. 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. 2. Millwork, standing and running trim, and rails: Actual size as shown or specified.

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

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

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

E. E. Use edge grain Wood members exposed to weather.
2.2 PLYWOOD

F. A. Softwood Plywood:

1. 1. Prod. Std.
2. 2. Grading and Marking:

   a. 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. b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.

3. 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. 4. Plastic Laminate Plywood Cores:

   a. a. Exterior Type, any species group.
   b. b. Veneer Grade: A-C.

5. 5. Shelving Plywood:

   a. a. Interior Type, any species group.
   b. b. Veneer Grade: A-B.

6. 6. Other: As specified for item.

G. B. Hardwood Plywood:

1. 1. HPVA: HP.1
2. 2. Species of face veneer shall be as shown or as specified in connection with each particular item.
3. 3. Inside of Building:

   a. a. Use Type II (interior) A grade veneer for transparent finish.
   b. b. Use Type II (interior) Sound Grade veneer for paint finish.

4. 5. Use rotary cut white birch unless specified otherwise.

2.3 PARTICLEBOARD

H. A. NPA A208.1

I. B. Plastic Laminate Particleboard Cores:

1. 1. Use Type 1, Grade 1-M-3, , unless otherwise specified.

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

2.6 ADHESIVE

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

L. B. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

2.7 STAINLESS STEEL

ASTM A167, Type 302 or 304.

2.8 ALUMINUM CAST

ASTM B26

2.9 ALUMINUM EXTRUDED
ASTM B221
2.10 HARDWARE

M. A. Rough Hardware:

1. 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. 2. Use galvanized coating on ferrous metal for exterior work unless non-ferrous metals or stainless is used.
3. 3. Fasteners:

a. a. Bolts with Nuts: FF-N-836.
b. b. Expansion Bolts: A-A-1922A.
c. c. Screws: Fed. Spec. FF-S-111.

N. B. Finish Hardware

1. 1. Cabinet Hardware: ANSI A156.9.

a. a. Door/Drawer Pulls: B02011. Door in seismic zones: B03182.
b. b. Drawer Slides: B05051 for drawers over 150 mm (6 inches) deep, B05052 for drawers 75 mm to 150 mm 3 to 6 inches) deep, and B05053 for drawers less than 75 mm (3 inches) deep.
c. c. Sliding Door Tracks: B07063.
d. d. Adjustable Shelf Standards: B4061 with shelf rest B04083.
e. e. Concealed Hinges: B1601, minimum 110 degree opening.
f. f. Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.
g. g. Cabinet Door Catch: B0371 or B03172.
h. h. Vertical Slotted Shelf Standard: B04103 with shelf brackets B04113, sized for shelf depth.

2. 2. Cabinet Locks: ANSI A156.11.

a. a. Drawers and Hinged Door: E07262.
b. b. Sliding Door: E07162.

3. 3. Auxiliary Hardware: ANSI A156.16.

a. a. Shelf Bracket: B04041, japanned or enameled finish.
b. b. Combination Garment rod and Shelf Support: B04051 japanned or enamel finish.
c. c. Closet Bar: L03131 chrome finish of required length.
d. d. Handrail Brackets: L03081 or L03101.

1) 2) Cast Malleable Iron, japanned or enamel finish.

4. 4. Steel Channel Frame and Leg supports for Counter top. Fabricated under Section 05 50 00, METAL FABRICATIONS.
5. 5. Pipe Bench Supports:

a. a. Pipe: ASTM A53.

6. 7. Thru-Wall Counter Brackets:

a. a. Steel angles drilled for fasteners on 100 mm (4 inches) centers.
b. b. Baked enamel prime coat finish.

7. 8. Folding Shelf Bracket:

a. a. Steel Shelf bracket, approximately 400 mm by 400 mm (16 by 16 inches), folding type with baked gray enamel finish or chrome plated finish.
b. b. Bracket legs shall be approximately 28 mm (1-1/8 inches) wide.
c. c. Distance from center line of hinge pin to back of vertical leg shall be 44 mm (1-3/4 inches) or provide for wood spacer if hinge line is at joint of vertical and horizontal leg.
d. d. Distance from face to face of bracket when closed shall be 50 mm (2 inches).
e. e. Brackets shall automatically lock when counter is raised parallel to floor and shall unlock manually.
f. f. Each bracket shall support not less than 68 Kg (150 pounds) evenly distributed.

8. 9. Edge Strips Moldings:

a. a. Driven type "T" shape with serrated retaining stem; vinyl plastic to match plastic laminate color, stainless steel, or 3 mm (1/8 inch) thick extruded aluminum.
b. b. Stainless steel or extruded aluminum channels.
c. c. Stainless steel, number 4 finish; aluminum, mechanical applied medium satin finish, clear anodized 0.1 mm (0.4 mils) thick.

9. 10. Rubber or Vinyl molding

a. a. Rubber or vinyl standard stock and in longest lengths practicable.
b. b. Design for closures at joints with walls and adhesive anchorage.
c. c. Adhesive as recommended by molding manufacturer.

10. 11. Primers: Manufacturer's standard primer for steel providing baked enamel finish.

2.11 MOISTURE CONTENT

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

1. 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. 2. Exterior treated or untreated finish lumber and trim 100 mm (4 inches) or less in nominal thickness: 15 percent.
3. 3. Moisture content of other materials shall be in accordance with the standards under which the products are produced.

2.12 FIRE RETARDANT TREATMENT

P. A. Where wood members and plywood are specified to be fire retardant treated, the treatment shall be in accordance with Mil. Spec. MIL-L19140.

Q. B. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings.

R. 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.

S. D. Treat wood for maximum flame spread of 25 and smoke developed of 25.

T. E. Fire Resistant Softwood Plywood:

1. 1. Use Grade A, Exterior, plywood for treatment.
2. 2. Meet the following requirements when tested in accordance with ASTM E84.

a. a. Flame spread: 0 to 25.
b. b. Smoke developed: 100 maximum

U. F. Fire Resistant Hardwood Plywood:

1. 1. Core: Fire retardant treated softwood plywood.
2. 2. Hardwood face and back veneers untreated,
3. 3. Factory seal panel edges, to prevent loss of fire retardant salts.

2.13 PRESERVATIVE TREATMENT

Wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including wood members used for rough framing of millwork items except heart-wood Redwood and Western Red Cedar shall be preservative treated in accordance with AWPA Standards.

V. B. Use Grade A, exterior plywood for treatment.

2.14 ACOUSTICAL PANEL

W. A. Performance criteria:

1. 1. NRC 19 mm (3/4 inch) adhesive mounting direct to substrate.
2. 2. Composite flame spread: ASTM E84, 25 or less.
3. 3. Smoke developed: ASTM E84, 140 or less.

X. B. Glass fiber panel covered with fabric.

1. 1. Glass fiber panel one inch thick minimum, self supporting of density required for minimum NRC.
2. 2. Fabric covering treated to resist stains and soil, bonded directly to the glass fiber panel face, flat bonded directly to the glass fiber panel face, flat wrinkle-free surface.

Y. C. Adhesive: As recommended by panel manufacturers.

2.15 FABRICATION

Z. A. General:

1. 1. Except as otherwise specified, use AWI Custom Grade for architectural woodwork and interior millwork.
2. 2. Finish woodwork shall be free from pitch pockets.
3. 3. Except where special profiles are shown, trim shall be standard stock molding and members of the same species.
4. 4. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.
5. 5. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
6. 6. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
7. 8. Plastic Laminate Work:

    a. a. Factory glued to either a plywood or a particle board core, thickness as shown or specified.
    b. 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. c. Provide plastic backing sheet on underside of countertops, vanity tops, thru-wall counter and sills including back splashes and end splashes of countertops.
    d. d. Use backing sheet on concealed large panel surface when decorative face does not occur.

AA. C. Mounting Strips, Shelves and Rods:

1. 1. Cut mounting strips from 25 mm by 100 mm (1 by 4 inches) softwood stock, with exposed edge slightly rounded.
2. 2. Cut wood shelf from softwood 1 inch stock, of width shown, exposed edge slightly rounded. Option: Use 19 mm (3/4 inch) thick plywood with 19 mm (3/4 inch) softwood edge nosing on exposed edge, slightly rounded.
3. 3. Plastic laminate covered, 19 mm (3/4 inch) thick plywood or particle board core with edges and ends having plastic molded edge strips. Size, finish and number as shown.
4. 4. Rod or Closet Bar: L03131. Combination Garment and Shelf Support, intermediate support for closet bar: B04051 for rods over 1800 mm (6 feet) long.

BB. D. Pegboard:

1. 1. Perforated hardboard sheet size as shown.
2. 2. Spacing strip: 13 mm by 13 mm (1/2 by 1/2 inch); glued to hardboard sheet.

    a. a. Locate at perimeter of sheet edge.
    b. b. Locate material intermediate spacing strips at 800 mm (32 inches) o.c.

3. 3. Use 19 mm (3/4 inch) one quarter round edge trim to cover exposed edge and finish flush with hardboard surface. Glue to spacing strip and hard board.

CC. E. Command Center Counter:

1. 1. Fabricate to AWI premium grade construction in conformance

with AWI Section 400, CASEWORK.

2. 2. Use softwood for structural framing member's standard sizes, space not over 400 mm (16 inches) on center.
3. 3. Use red oak for exposed hardwood trim and edging.
4. 4. Use drawer guides on drawers with pulls.
5. 5. Use pulls and concealed hinges on doors.
6. 6. Use adjustable shelf standards with shelf rests.
7. 7. Use decorative plastic laminate on exposed surfaces including interior of cupboard cabinet.
8. 8. Overlay frame of apron with drawer and door face.
9. 9. Provide cut outs for electrical devices and outlets.

DD. K. Work Benches in Work Room:

1. 2. Fabricate wood counter for work benches as shown.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. A. Maintain work areas and storage areas to a minimum temperature of 21^{0}C (70^{0}F) for not less than 10 days before and during installation of interior millwork.

B. 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

C. A. General:

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

D. C. Command Center Counters:

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

E. D. Pegboard or Perforated Hardboard:

1. 1. Install board with chromium plated steel round-head toggle bolts or other fasteners capable of supporting board when loaded at 122 kg/m^2 (25 psf) of board.
2. 2. Install board with spacers to allow hooks and accessories to be inserted and removed.
3. 3. Install 6 mm (1/4 inch) round trim at perimeter to finish flush with face of board and close space between wall and hardboard.

F. F. Shelves:

1. 1. Install mounting strip at back wall and end wall for shelves in closets where shown secured with toggle bolts at each end and not over 600 mm (24 inch) centers between ends.

   a. a. Nail Shelf to mounting strip at ends and to back wall strip at not over 900 mm (36 inches) on center.
   b. b. Install metal bracket, ANSI A156.16, B04041, not over 1200 mm (4 feet) centers when shelves exceed 1800 mm (6 feet) in length.
   c. c. Install metal bracket, ANSI A156.16, B04051, not over 1200 mm (4 feet) on centers where shelf length exceeds 1800 mm (6 feet) in length with metal rods, clothes hanger bars ANSI A156.16, L03131, of required length, full length of shelf.

2. 2. Install vertical slotted shelf standards, ANSI A156.9, B04103 to studs with toggle bolts through each fastener opening. Double slotted shelf standards may be used where adjacent shelves terminate.

   a. a. Install brackets ANSI A156.9, B04113, providing supports for shelf not over 900 mm (36 inches) on center and within 13 mm (1/2 inch) of shelf end unless shown otherwise.
   b. b. Install shelves on brackets so front edge is restrained by bracket.

G. G. Interview Booths:

1. 1. Anchor divider panel floor plates to floor with expansion bolts at ends and not over 900 mm (36 inch) centers.
2. 2. Install both writing surface on mounting strips secured to divider panels and center support with screws if not shop assembled. Field assemble in accordance with shop drawings.

- - - E N D - - -

SECTION **07 08 00**
FACILITY EXTERIOR CLOSURE COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. The requirements of this Section apply to all sections of Division 07 and Division 08.

B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned is specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIRMENTS. A Commissioning Agent (CxA) appointed by the VA will manage the commissioning process.

1.2 RELATED WORK:

A. Section 01 00 00 GENERAL REQUIREMENTS.

B. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

C. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 SUMMARY:

A. This Section includes requirements for commissioning the Facility exterior closure, related subsystems and related equipment. This Section supplements the general requirements specified in Section 01 91 00 General Commissioning Requirements.

B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.

C. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for more details regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

1.4 DEFINITIONS:

A. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

1.5 COMMISSIONED SYSTEMS:

A. Commissioning of a system or systems specified in Division 07 and Division 08 is part of the construction process. Documentation and

testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.

B. The following Facility exterior closure systems will be commissioned:

1. Roofs (flashing & sheet metal, metal roofing, roof specialties, and roof accessories)
2. Exterior Doors Exterior Windows
3. Louvers and Vents
4. Sealants (Caulking, mechanical seals, and wind and vapor barriers)

1.6 SUBMITTALS:

A. The commissioning process requires review of selected Submittals. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRE-FUNCTIONAL CHECKLISTS:

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

3.2 CONTRACTORS TESTS:

A. Contractor tests as required by other sections of Division 07 or Division 08 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. The Commissioning Agent will witness selected Contractor tests. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.3 SYSTEMS FUNCTIONAL PERFORMANCE TESTING:

A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Resident Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

3.4 TRAINING OF VA PERSONNEL:

A. Training of the VA operation and maintenance personnel is required in cooperation with the Resident Engineer and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the VA Resident Engineer after submission and approval of formal training plans. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS and Division 21 Sections for additional Contractor training requirements.

----- END -----

SECTION **07 11 13**
BITUMINOUS DAMPPROOFING

PART 1 - GENERAL
1.1 DESCRIPTION:
This section specifies materials and workmanship for bituminous dampproofing on concrete and masonry surfaces.
1.2 SUBMITTALS:

A. A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. B. Manufacturer's Literature and Data:

1. 1. Product description.
2. 2. Application instructions.

1.3 APPLICABLE PUBLICATIONS:

C. 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.

D. B. American Society for Testing and Materials (ASTM):
D226-06 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
D449-03(R2008) Asphalt Used in Dampproofing and Waterproofing
D1227-95(R2007) Emulsified Asphalt Used as a Protective Coating for Roofing

PART 2 - PRODUCTS
2.3 ASPHALT EMULSION (COLD APPLIED):
ASTM D1227, Type III (spray grade)

PART 3 - - EXECUTION
3.1 SURFACE PREPARATION:

A. A. Surfaces to receive dampproofing shall be clean and smooth.

B. B. Remove foreign matter, loose particles of mortar or other cementitious droppings.

C. C. Clean and wash soil or dirt particles from surface.

D. D. Remove free water; surfaces may remain damp.

3.2 APPLICATION:
A. Comply with Manufacturer written instructions for methods and rates of dampproofing application, cleaning and installation of any protection course.

E. B. Apply each coat at the rate of not less than 1 L/m^2 (2-1/2 gallons per 100 square feet) and allow not less than 24 hours drying time after application.

3.3 LOCATION:

F. A. Apply to surfaces where shown.
B. Apply to exterior surface of inner wythe of masonry cavity walls where shown. Coordinate application with masonry work.

- - - E N D - - -

SECTION 07 13 00
SHEET WATERPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies sheet waterproofing materials used for shower pan waterproofing in personnel showers.

1.2 QUALITY CONTROL:

Approval by the Resident Engineer is required of products of proposed manufacturers.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Sheet waterproofing.
2. Printed installation instructions.

C. Certificates:

1. Sheet waterproofing manufacturer's approval of adhesive used.
2. Waterproofing tests report indicating that water test as specified has been made for each shower area and that each area was found to be watertight.

D. Samples:

1. Sheet waterproofing, 150 mm (6 inches) square.
2. Waterproofed building paper, 150 mm^2 (6 inches square).
3. Adhesive, 0.24 L (1/2 pint).

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to job in manufacturer's original unopened containers with brand name marked thereon.

B. Unload and store so as to prevent injury to materials.

C. Do not store material in areas where temperature is lower than 10°C (50°F), or where prolonged temperature is above 32°C (90°F).

1.5 WARRANTY

Shower pan waterproofing is subject to the terms of Article titled "Warranty of Construction”, FAR clause 52.246-21, except that warranty period is extended to two years.

1.6 APPLICABLE PUBLICATIONS:

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

Ceramic Tile Manufacturers Recommended Instructions

B. Federal Specification (Fed. Spec.):
UU-B-790A INT AMD.....Building Paper, Vegetable Fiber: (Kraft, Waterproof, Water Repellent ad Fire Resistant)

PART 2 - PRODUCTS

2.1 SHOWER PAN WATERPROOFING SHEET:

A. Rubber type sheet formed of non-reinforced, homogeneous, impermeable, sheeting compound reduced to thermoplastic state, resistant to fungus, mildew and bacteria, not less than 1.5 mm (60 mils) thick.

2.2 ADHESIVES:

A. As furnished by the manufacturer of the sheet waterproofing.
B. Compatible with adjacent materials where contact occurs.

2.3 WATERPROOFED BUILDING PAPER:

Fed. Spec. UU-B-790, Type I, Grade C.

2.4 CONCRETE PATCHING COMPOUND:

A. Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors.
B. Have not less than the following physical properties:
   1. Compressive strength - 25 mPa (3500 psi).
   2. Tensile strength - 7 mPa (1000 psi).
   3. Flexural strength - 7 mPa (1000 psi).
   4. Density - 1.9.
C. Capable of being applied in layers up to 50 mm (two inches) thick, being brought to a feather edge, and being troweled to a smooth finish.
D. Ready for use in 48 hours after application.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Before installing shower pan waterproofing, adjoining surfaces shall be clean, smooth, firm and dry.
B. Concrete surfaces shall be cured a minimum of seven days and be free from release agents, concrete curing agents, and other contaminates.
C. Remove all high spots and loose and foreign particles and fill all voids, depressions joints and cracks with concrete patching compound.

D. Ensure vertical surfaces have a continuous supportive back substrate for waterproofing.

3.2 INSTALLATION:

A. Coat entire surfaces to receive shower pan waterproofing with adhesive spread at rate of 1 L/m^2 (one gallon per 40 square feet).

B. Butt joints and cover with a strip of the waterproofing sheeting material eight inches in width and seal with adhesive.

C. Carry sheeting up vertical surfaces not less than 4 inches above surface of shower floor. Carry over tops of curbs.

D. Roll entire horizontal surfaces with 23 to 45 kg (50 to 100 pounds) roller and roll corners and vertical sections with a rubber roller to insure solid anchorage.

E. Make cut out for floor drains and fit to drain for watertight assembly, coordinating with drain installation.

3.3 PROTECTION:

A. When finish floor will not be immediately installed, protect waterproofing pan.

B. Cover with 2 inches of sand or waterproofed building paper.

C. Maintain protection until finished floor is placed.

3.4 WATER TEST:

A. Test in presence of Resident Engineer for leaks before permanent finish is applied over shower pan waterproofing.

B. Seal floor drain watertight and fill waterproofing pan with water to within approximately 25 mm (1 inch) of top of its vertical surfaces.

C. When leakage occurs, repair waterproofing and repeat testing until no leakage occurs.

D. Submit certificate to Resident Engineer of test results.

- - - E N D - - -

SECTION 07 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Thermal insulation.
      a. Board or block insulation at foundation perimeter.
      b. Batt or blanket insulation at framed and furred walls.
      c. Board insulation at floor assemblies above conditioned spaces.
      d. Board or block insulation at masonry cavity walls.
   2. Acoustical insulation.
      a. Batt and blanket insulation at interior framed partitions and ceilings.
      b. Board insulation at interior concrete and masonry partitions.

1.2 RELATED REQUIREMENTS

A. Insulation for Insulated Wall Panels: Section 07 40 00, ROOFING AND SIDING PANELS.
B. Safing Insulation: Section 07 84 00, FIRESTOPPING.
C. Insulation for Sound Absorptive Pad: Section 09 54 23. LINEAR METAL CEILINGS.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. ASTM International (ASTM):
   1. C516-08(2013)e1 - Vermiculite Loose Fill Thermal Insulation.
   2. C549-06(2012) - Perlite Loose Fill Insulation.
   3. C552-15 - Cellular Glass Thermal Insulation.
   4. C553-13 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
   5. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
   6. C591-15 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
   7. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
   8. C665-12 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   9. C728-15 - Perlite Thermal Insulation Board.

10. C954-15 - Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness.
11. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
12. D312/D312M-15 - Asphalt Used in Roofing.
13. E84-15a - Surface Burning Characteristics of Building Materials.
14. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show insulation type, thickness, and R-value for each location.

C. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Adhesive indicating manufacturer recommendation for each application.

D. Sustainable Construction Submittals:
   1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
   2. Low Pollutant-Emitting Materials:
      a. Show volatile organic compound types and quantities.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

C. Protect foam plastic insulation from UV exposure.

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

A. Insulation Thickness:
   1. Provide thickness required by R-value shown on drawings.
   2. Provide thickness indicated when R-value is not shown on drawings.

B. Insulation Types:
   1. Provide one insulation type for each application.

C. Sustainable Construction Requirements:
   1. Insulation Recycled Content:
      a. Polyisocyanurate/polyurethane rigid foam: 9 percent recovered material.
      b. Glass fiber reinforced: 6 percent recovered material.
   2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
      a. Non-Flooring Adhesives and Sealants.

2.2 THERMAL INSULATION

A. Perimeter Insulation In Contact with Soil:
   1. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX.

B. Exterior Framing or Furring Insulation:
   1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
   2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.

C. Inside Face of Exterior Wall Insulation:
   1. Mineral Fiber Board: ASTM C612, Type IB or II.
   2. Perlite Board: ASTM C728.
   3. Cellular Glass Block: ASTM C552, Type I.

2.3 ACOUSTICAL INSULATION

A. Semi Rigid, Batts and Blankets:
   1. Widths and lengths to fit tight against framing.
   2. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semi rigid unfaced .
      a. Density: nominal 4.5 pound.
   3. Mineral Fiber Batt or Blankets: ASTM C665 unfaced .
   4. Maximum Surface Burning Characteristics: ASTM E84.
      a. Flame Spread Rating: 25.
      b. Smoke Developed Rating: 450.

B. Sound Deadening Board:
   1. Mineral Fiber Board: ASTM C612, Type IB.
      a. Thickness: 13 mm (1/2 inch).

2.4 ACCESSORIES

A. Fasteners:
   1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.
   2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 50 mm (2 inches) diameter.
   3. Impaling Pins: Steel pins with head minimum 50 mm (2 inches) diameter.
      a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
      b. Adhesive: Type recommended by manufacturer to suit application.

B. Insulation Adhesive:
   1. Nonflammable type recommended by insulation manufacturer to suit application.

C. Tape:
   1. Pressure sensitive adhesive on one face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.

C. Install board insulation with joints close and flush, in regular courses, and with end joints staggered.

D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal penetrations, terminations, facing joints, facing cuts, tears, and unlapped joints with tape.

E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

A. Perimeter Insulation In Contact with Soil:

1. Vertical insulation:

a. Fill joints of insulation with same material used for bonding.

b. Bond polystyrene board to surfaces with adhesive.

2. Horizontal insulation under concrete floor slab:

a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.

b. Extend insulation from foundation walls towards center of building minimum 600 mm (24 inches).

B. Exterior Framing or Furring Insulation:

1. General:

a. Open voids are not acceptable.

b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.

c. Pack behind outlets, around pipes, ducts, and services encased in walls.

d. Hold insulation in place with pressure sensitive tape.

e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.

2. Metal Studs:

a. Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.

3. Roof Rafters and Floor Joists:

a. Friction fit insulation between framing to provide minimum 50 mm (2 inch) air space between insulation and roof sheathing and subfloor.

4. Ceilings and Soffits:

a. Metal Framing:

1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.

2) At metal framing and ceilings suspension systems, install insulation above suspended ceilings and metal framing at right angles to main runners and framing.
3) Tape insulation tightly together without gaps. Cover metal framing members with insulation.

C. Inside Face of Exterior Wall Insulation:
1. Location: On interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to face of studs to support interior wall finish where indicated.
2. Bond insulation to solid vertical surfaces with adhesive. Fill joints with adhesive cement.
3. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings maximum 300 mm (12 inches) on center. Stagger fasteners at board joints. Install fasteners at each corner.

3.4 ACOUSTICAL INSULATION

A. General:
1. Install insulation without voids.
2. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
3. Pack behind outlets, around pipes, ducts, and services encased in walls.
4. Hold insulation in place with pressure sensitive tape.
5. Lap facer flanges together over framing for continuous surface. Seal all penetrations through the insulation and facers.
6. Do not compress insulation below required thickness except where embedded items prevent required thickness.

B. Semi Rigid, Batts and Blankets:
1. Semi Rigid Batts and Blankets:
a. When insulation is not full thickness of cavity, adhere insulation to one side of cavity, maintaining continuity of insulation and covering penetrations or embedments.
b. Metal Framing:
1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
2) At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing.

3) Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.

C. Sound Deadening Board:

1. Secure with adhesive to masonry and concrete walls and decks. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

3.5 CLEANING

A. Remove excess adhesive before adhesive sets.

3.6 PROTECTION

A. Protect insulation from construction operations.

B. Repair damage.

- - E N D - -

SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

B. Roof and deck insulation, substrate board, and cover board on new metal deck and substrates ready to receive roofing.

1.2 RELATED REQUIREMENTS

A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Wood Cants, Blocking, and Edge Strips: Section 06 10 00, ROUGH CARPENTRY.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

1. Standard 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. ASTM International (ASTM):

1. C726-05 - Mineral Fiber Roof Insulation Board.
2. C1278/C1278M-07a(2015) - Fiber-Reinforced Gypsum Panel.
3. C1289-15 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
4. C1396/C1396M-14a - Gypsum Board.
5. E84-15a - Surface Burning Characteristics of Building Materials.
6. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

D. National Roofing Contractors Association (NRCA):

1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.

E. U.S. Department of Agriculture (USDA):

1. USDA BioPreferred Program Catalog.

F. UL LLC (UL):

1. Listed - Online Certifications Directory.

G. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

1. DOC PS 1-09 - Structural Plywood.
2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and installation details.

a. Nailers, cants, and terminations.

b. Layout of insulation showing slopes, tapers, penetrations, and edge conditions.

C. Manufacturer's Literature and Data:

1. Description of each product.

D. Samples:

1. Roof insulation, each type.

2. Fasteners, each type.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

2. Low Pollutant-Emitting Materials:

a. Show volatile organic compound types and quantities.

b. Certify each composite wood product contain no added urea formaldehyde.

F. Qualifications: Substantiate qualifications meet specifications.

1. Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Same installer as Division 07 roofing section installer.

1.6 DELIVERY

A. Comply with recommendations of NRCA Manual.

B. Deliver products in manufacturer's original sealed packaging.

C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.

D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Comply with recommendations of NRCA Manual.

B. Store products indoors in dry, weathertight facility.

C. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:

1. Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

1.9 WARRANTY

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

B. Manufacturer's Warranty: Warrant substrate board, vapor retarder, insulation, and cover board against material and manufacturing defects as part of Division 07 roofing system warranty.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Insulation Thermal Performance:

1. Overall Average R-Value: RSI-57 (R-33), minimum.
2. Any Location R-Value: RSI-17 (R-10), minimum.

B. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.

C. Insulation on Combustible and Metal Decking: UL labeled indicating compliance with one of the following:

1. UL Listed.
2. Insulation Surface Burning Characteristics: When tested according to ASTM E84.
   a. Flame Spread Rating: 75 maximum.
   b. Smoke Developed Rating: 150 maximum.

2.2 PRODUCTS - GENERAL

A. Provide each product from one manufacturer.

B. Sustainable Construction Requirements:

1. Insulation Recycled Content:
   a. Mineral Fiber: 75 percent total recycled content, minimum.
   b. Fiberglass: 20 percent total recycled content, minimum.
   c. Cellulose: 75 percent post-consumer recycled content, minimum.
   d. Perlite Composite Board: 23 percent post-consumer recycled content, minimum.
   e. Rigid Foam: 9 percent total recycled content, minimum.
   f. Glass Fiber Reinforced Rigid Foam: 6 percent total recycled content, minimum.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-flooring adhesives and sealants.
   b. Composite wood.

2.3 ADHESIVES

A. Primer: ASTM D41/D41M.

B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

2.4 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.

C. Tapered Roof Insulation System:
   1. Fabricate of mineral fiberboard, polyisocyanurate, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
   2. Cut to provide high and low points with crickets and slopes as shown.
   3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
   4. Minimum slope 1/48 (1/4 inch per 12 inches).

D. Composite Nail Base Insulated Roof Sheathing:
   1. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Polyisocyanurate thermal insulation ASTM C1289, Type V, insulation

thickness as shown, with oriented strand board laminated to top surface.

2. Oriented Strand Board: NIST DOC PS 1, Exposure 1, 11 mm (7/16 inch) thick.
3. Bottom surface faced with felt facers.

2.5 INSULATION ACCESSORIES

A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.

B. Cants and Tapered Edge Strips:

1. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
2. Tapered Edge Strips: 1/12 (1 inch per 12 inches), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
   a. Cellulosic Fiberboard: ASTM C208.
   b. Mineral Fiberboard: ASTM C726.

C. Vapor Retarder:

1. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV, asphalt impregnated.

D. Substrate Board:

1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, Type X, 16 mm (5/8 inch) thick, factory primed.

E. Cover Board:

1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, 16 mm (5/8 inch) thick,
2. Oriented Strand Board: DOC PS 2, Exposure 1, 11 mm (7/16 inch) thick.

2.6 ACCESSORIES

A. Fasteners: Corrosion-resistant carbon steel fasteners and galvalume-coated steel or plastic round plates for fastening substrate board and insulation to roof deck.

B. Nails: ASTM F1667; type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

3.3 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
B. Comply with requirements of UL for insulated steel roof deck.
C. Attach substrate board and other products to meet requirements of Division 07 roofing section.

3.4 SUBSTRATE BOARD INSTALLATION

A. Fasten substrate board to top flanges of steel decking to resist uplift pressures according requirements for specified roofing system.
   1. Locate the long dimension edge joints solidly bearing on top of decking ribs.

3.5 VAPOR RETARDER INSTALLATION

A. Vapor Retarder Installation, General:
   1. Install continuous vapor retarder on roof decks where indicated.
   2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
   3. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.
B. Cast in Place Concrete Decks, Except Insulating Concrete:
   1. Prime deck as specified.

3.6 INSULATION INSTALLATION

A. Insulation Installation, General:
   1. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate before installation of insulation.
   2. Cant Strips: Install preformed insulation cant strips at junctures of roofing system with vertical construction.
B. Insulation Thickness:
   1. Thickness of roof insulation shown on drawings is nominal. Provide thickness required to comply with specified thermal performance.
   2. Insulation on Metal Decks: Provide insulation in minimum thickness recommended by insulation manufacturer to span deck flutes. Support edges of insulation on metal deck ribs.

3. When actual insulation thickness differs from drawings, coordinate alignment and location of roof drains, flashing, gravel stops, fascias and similar items.
4. Where tapered insulation is used, maintain insulation thickness at high points and roof edges shown on drawings.
   a. Low Point Thickness: Minimum 38 mm (1-1/2 inches).
5. Use minimum two layers of insulation when required thickness is 68 mm (2.7 inch) or greater.

C. Lay insulating units with close joints, in regular courses and with end joints staggered.
   1. Stagger joints between layers minimum 150 mm (6 inches).

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tightly against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

H. Installation Method:
   1. Adhered Insulation:
      a. Prime substrate as required.
      b. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
   2. Mechanically Fastened Insulation:
      a. Fasten insulation according to requirements in Division 07 roofing section.
      b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
   3. Mechanically Fastened and Adhered Insulation:
      a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
      b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

3.7 COVER BOARD INSTALLATION

A. Install cover boards over insulation with long joints in continuous straight lines with staggered end joints.

B. Offset cover board joints from insulation joints 150 mm (6 inches), minimum.

C. Secure cover boards according to "Adhered Insulation" or "Mechanically Fastened Insulation" requirements as noted.

- - E N D - -

SECTION 07 40 00
ROOFING AND SIDING PANELS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies uninsulated metal wall and roof panels as shown on contract documents.

BASIS of DESIGN: MATERIAL: UNITED ZINC MANUFACTURER: IMETCO Series 300 structural standing seam panel system with separate mechanically seamed batten cap.

1. 20 gauge, Zinc-Coated (Galvanized) Steel Sheet as per ASTM653: G90 (Z275)coating designation; structural quality ,grade 40 ksi(275MPa)

1.2 RELATED WORK:

B. Sealant: Section 07 92 00, JOINT SEALANTS.

C. Color and texture of finish: ONYX BLACK:

1.3 QUALITY ASSURANCE:

A. Manufacturer’s Qualifications: Provide metal roof panels products of a manufacturer regularly engaged for not less than five (5) years in the fabrication of metal panels of the type and design indicated.

B. Installer: A firm with three (3) years of successful experience with installation of roofing and siding panels of type and scope equivalent to Work of this Section. Submit installer qualifications.

1.4 FIRE RATING:

A. Fire Resistance Classification: The panel system shall be listed as a Class A Roof Covering, as determined by UL 790.

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Sustainable Design Submittals, as described below:

1. Postconsumer recycled content as specified in PART 2 - PRODUCTS.

C. Samples: Metal panel, 2’x full panel width, showing finish, each color and texture.

D. Shop Drawings: Wall and roof panels, showing entire panel layout, details of construction and installation, collateral framing and kind of material, closures, flashing, fastenings and related components and accessories. Show interfaces and relationships to work at other trades and continuity with adjacent thermal, weather, air and vapor barriers.

E. Manufacturer's Literature and Data: Wall and roof panels
F. Fire Test Report: Report of fire test by recognized testing laboratory for fire rating specified, showing details of construction.
G. Manufacturer’s Certificates: Indicating manufacturer’s qualifications specified.
H. Installer qualifications.
I. Manufacturer warranty.

1.6 QUALITY ASSURANCE:

A. Approval by Contracting Officer Representative (COR) is required of products of proposed manufacturer.
B. Certify manufacturer has five (5) years continuous documented experience in fabrication of metal roofing and siding panels.
C. Source: For each material type required for work of this section, provide primary materials, which are products of one manufacturer. Provide secondary or accessory materials, which are acceptable to manufacturers of primary materials.
D. Installer: A firm with a minimum of three (3) years’ experience in type of work required by this section and which is acceptable to manufacturers of primary materials.

1.7 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 “Warranty of Construction”.
B. Manufacturer Warranty: Manufacturer shall warranty their metal roofing and wall panels for a minimum of ten (20) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.
C. Warranty on Panel Finishes: Manufacturer’s shall warrant their roofing and wall panel finish and provide standard agreement to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when testing according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of installation and final acceptance by the COR.

1.8 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 Architecture Manufacturers Association (AAMA):

611-14..... Anodized Architectural Aluminum

621-02..... Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

2605-13..... Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

C. American Iron and Steel Institute (AISI):

SG03-02..... Cold-Formed Steel Design Manual

D. ASTM International (ASTM):

A463/A463M-10..... Steel Sheet, Cold-Rolled, Aluminum-Coated, by the Hot-Dip Process

A653/A653M-13..... Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

A924/A924M-14..... Steel Sheet, Metallic Coated by the Hot-Dip Process

A1008/A1008M-10..... Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy

B209-14..... Aluminum and Aluminum Alloy Sheet and Plate

B209M-14..... Aluminum and Aluminum Alloy Sheet and Plate (Metric)

C553-13..... Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

C591-13..... Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

C612-14..... Mineral Fiber Block and Board Thermal Insulation

C1396/C1396M..... Gypsum Board

D2244-14..... Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D4214-07..... Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

E119-14..... Fire Test of Building Construction and Materials

E283-04(R2012)..... Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

E331-00(R2009)..... Test Method for Water Penetration of Exterior Windows, Skylight, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

E1592-10..... Terminology Relating to Occupational Health and Safety

E1646-95(R2011)..... Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference

E1680-11..... Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems

E1980-11..... Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces

E2140-01(R2009)..... Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head

E. Cool Roof Rating Council (CRRC):

1 Standard-14

F. FM Global:

4471-10..... Class 1 Panel Roofs

G. Underwriters Laboratories (UL):

580-05(R2013)..... Tests for Uplift Resistance of Roof Assemblies

Fire Resistance Directory

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS ROOF PANELS:

A. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592.
   1. Wind Loads: 90 MPH
   2. Other Design Loads: N/A
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
C. Air Infiltration: Air leakage of not more than 0.3 L/s per sq. m (0.06 cfm/sq. ft.) when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:
   1. Test-Pressure Difference: 300 Pa (6.24 lbf/sq. ft.).
D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 or ASTM E331 at the following test-pressure difference:
   1. Test-Pressure Difference: 300 Pa (6.24 lbf/sq. ft.).
E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.
G. FM Global Listing: Provide metal roof panels and composite component materials that comply with requirements FM Global 4771 as part of a panel roofing system and that are listed in FM Global’s “Approval Guide” for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
   1. Fire/Windstorm Classification: Class 1A- 90.
   2. Hail Resistance: SH.
H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joints sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 67 degrees C (120 degrees F), ambient; 100 degrees C (180 degrees F), material surfaces.

2.2 STANDING SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats and accessories required for weathertight installation.

B. Vertical-Rib, Standing-Seam Metal Roof Panels with separate mechanically field crimped batten seam cap: Formed with vertical ribs at panel edges, pencil beads and an intermediate stiffening rib symmetrically spaced between ribs; designed for 2-direction installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, attaching a separate batten seam cap and mechanically seaming panels together.

Basis-of-Design System: Panel shall be IMETCO Series 300 (S300) roof panel system as manufactured by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia:

Alternate manufacturers are subject to full compliance with specification requirements, and shall be submitted for approval as follows:

Manufacturers not listed above must submit for approval, ten (10) days prior to bid date, each of the following: Manufacturer's literature; certification of testing in accordance with specification requirements and article 1.4; sample warranties in accordance with specification article 1.10; installer qualifications in accordance with specification article 1.6, and a list of five (5) similar projects in size and scope of work

No substitutions will be permitted after the bid date of this project.

C. Material: Zinc-coated (galvanized) steel sheet, 0.034-inch (0.86-mm) nominal thickness.

D. Characteristics:

The same panel profile from a single manufacturer shall be used for ALL standing seam roof areas.

Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips which allow unlimited thermal movement.

Profile of panel shall have two stiffening beads positioned 1-½″ (38 mm) from the vertical seam and one raised stiffening rib centered in the panel.

Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required and approved by architect) and trim details (as per manufacturer's guidelines).

Panels must be furnished in continuous lengths from ridge to eave with no overlaps unless approved by architect.

E. Concealed Standard Anchor Clips: Clips must be 16 gauge (1.4 mm) stainless steel alloy 410 ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.

Two-piece clips are NOT acceptable.

Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from the clip during expansion and contraction.

Clip must maintain a clearance of a minimum of 3/8" (9.5 mm) between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.

Seam cap: Snap-on cap shall be a minimum of 1-inch- (25-mm-) wide "T" shaped of continuous length up to 45 feet (11.4 m) according to job conditions and field seamed by means of manufacturer's standard seaming machine.

Cap shall be designed to receive two (2) beads of hot applied, high viscosity, pressure sensitive adhesive with high heat resistance during manufacturing which will not come in contact with the anchor clip.

In all cases, seam caps shall be factory formed to insure quality and precision in the process of sealant application.

Standing Seam Panel Width: 18" (nominal).

Stiffening ribs: Located in flat of panel to minimize oil canning and telegraphing of structural members.

Replaceability: Panels shall be of a symmetrical design with mechanically seamed cap configuration such that individual panels may be removable for replacement without removing adjacent panels and installation may proceed in both directions simultaneously.

Panel ends shall be folded up 90 degrees at ridge, headwall, and hip conditions, where applicable. No metal shall be cut or otherwise perforated at the folded end.

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.

B. Install panels in full and firm contact with supports and with each other at side and end laps.

C. Where panels are cut in the field, or where factory applied coverings or coatings are abraded or damaged in handling or installation, make finish repairs with material of the same type and color as the weather coating, before being installed.

D. Seal cut ends and edges, including those at openings through the sheets.
E. Correct defects or errors in the materials in a manner approved by the COR.
F. Replace defective materials which cannot be corrected with nondefective material.
G. Provide molded closure strips where indicated and whenever sheets terminate with open ends after installation.
H. Wall Panels: n/a
I. Roof Panels:
   1. Apply roofing panels with the configurations parallel to the slope of the roof. Provide roofing panels in full lengths from ridge (or ridge panel) to eaves with no transverse joints except at the junction of ventilators, curbs, skylights, chimneys and similar openings.
   2. Lay side laps away from the prevailing wind, and seal side and end laps with joint sealing material.
   3. Flash and seal the roof at the ridge, at eaves and rakes, at projections through the roof, and elsewhere as necessary.
   4. Install closure strips, flashing, and sealing material in a manner that will assure complete weather tightness.
J. Flashing:
   1. Provide flashing and related closures and accessories in connection with the preformed metal panels as indicated and as necessary to provide a watertight installation.
   2. Install details of installation, which are not indicated, in accordance with the panel manufacturer's printed instruction and details, or the approved shop drawings.
   3. Allow for expansion and contraction of flashing.
K. Fasteners:
   1. Space fasteners in accordance with the manufacturer's recommendations, and as necessary to withstand the design loads indicated.
   2. Install fasteners in valleys or crowns as recommended by the manufacturer of the panel being used.
   3. Install fasteners in straight lines within a tolerance of 13 mm (1/2-inch) in the length of a bay.

4. Drive exposed penetrating type fasteners normal to the surface, and to a uniform depth to seat gasketed washers properly, and drive so as not to damage factory applied coating.
5. Exercise care in drilling pilot holes for fastenings to keep drills perpendicular and centered in valleys, or crowns, as applicable. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Do not torque fasteners to exceed values recommended by the manufacturer.
6. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.
7. Remove metal shavings and filings from roofs on completion to prevent rusting and discoloration of the panels.

3.2 ISOLATION OF ALUMINUM:

A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze, or other metal compatible with aluminum by one of the following:
   1. Painting the dissimilar metal with a prime coat of Zinc-Molybdate followed by two coats of aluminum paint.
   2. Placing a non-abrasive tape or gasket between the aluminum and the dissimilar metal.

B. Paint aluminum in contact with, or built into mortar, concrete, plaster, or other masonry materials with a coat of alkali-resistant bituminous paint.

C. Paint aluminum in contact with wood or other absorptive materials that may become repeatedly wet, with two coats of bituminous paint, or two coats of aluminum paint. Seal joints with caulking material.

3.3 PROTECTION AND CLEANING:

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

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

- - - E N D - - -

SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ethylene Propylene Diene Monomer (EPDM) sheet roofing fully adhered to insulated metal roof deck.
   2. Fire rated roof system.

1.2 RELATED REQUIREMENTS

A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
B. Substrate Board, Vapor Retarder, Roof Insulation, and Cover Board: Section 07 22 00, ROOF AND DECK INSULATION.
C. Roof Membrane Color: WHITE.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
   1. FX-1-01(R2006) - Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
   2. RP-4 2013 - Wind Design Standard for Ballasted Single-ply Roofing Systems.
C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
   1. 7-10 - Minimum Design Loads For Buildings and Other Structures.
D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
   1. 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
E. ASTM International (ASTM):
   1. A276/A276M-15 - Stainless Steel Bars and Shapes.
   2. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
   3. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
   4. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
   5. C140/C140M-15 - Sampling and Testing Concrete Masonry Units and Related Units.
   6. C936/C936M-15 - Solid Concrete Interlocking Paving Units.

7. C1371-15 - Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
8. C1549-09(2014) - Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
9. D751-06(2011) - Coated Fabrics.
10. D1248-12 - Polyethylene Plastics Extrusion Materials for Wire and Cable.
11. D1876-08(2015)e1 - Peel Resistance of Adhesives (T-Peel Test).
12. D2103-15 - Polyethylene Film and Sheeting.
13. D2240-05(2010) - Rubber Property-Durometer Hardness.
14. D3884-09(2013)e1 - Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method).
15. D4263-83(2012) - Indicating Moisture in Concrete by the Plastic Sheet Method.
16. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
17. D4637/D4637M-14e1 - EPDM Sheet Used In Single-Ply Roof Membrane.
18. E96/E96M-15 - Water Vapor Transmission of Materials.
19. E408-99(2015) - Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
20. E1918-06(2015) - Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. E1980-11 - Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
22. G21-15 - Resistance of Synthetic Polymeric Materials to Fungi.

F. Cool Roof Rating Council (CRRC):
1. 1-15 - Product Rating Program.

G. Federal Specifications (Fed. Spec.):
1. UU-B-790A - Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant).

H. Florida Department of Business and Professional Regulation (FL):
1. Approved - Product Approval.

I. National Roofing Contractors Association (NRCA):
1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.

J. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog.

K. UL LLC (UL):
1. 580-06 - Tests for Uplift Resistance of Roof Assemblies.
2. 1897-15 - Uplift Tests for Roof Covering Systems.

L. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
   1. DOC PS 1-09 - Structural Plywood.
   2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

M. U.S. Environmental Protection Agency (EPA):
   1. Energy Star - ENERGY STAR Program Requirements for Roof Products Version 3.0.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at the Project site minimum 30 days before beginning Work of this section.
   1. Required Participants:
      a. Contracting Officer's Representative.
      b. Architect/Engineer.
      c. Contractor.
      d. Installer.
      e. Manufacturer's field representative.
      f. Other installers responsible for adjacent and intersecting work, including roof deck, flashings, roof specialties, roof accessories, utility penetrations, rooftop curbs and equipment, and lightning protection.
   2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
      a. Installation schedule.
      b. Installation sequence.
      c. Preparatory work.
      d. Protection before, during, and after installation.
      e. Installation.
      f. Terminations.
      g. Transitions and connections to other work.
      h. Inspecting and testing.
      i. Other items affecting successful completion.
      j. Pull out test of fasteners.
      k. Material storage, including roof deck load limitations.
   3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Roofing membrane layout.
2. Roofing membrane seaming and joint details.
3. Roof membrane penetration details.
4. Base flashing and termination details.
5. Paver layout.
6. Paver anchoring locations and details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Installation instructions.
3. Warranty.

D. Sustainable Construction Submittals:

1. Solar Reflectance Index (SRI) for roofing membrane.
2. Low Pollutant-Emitting Materials:
   a. Show volatile organic compound types and quantities.
3. Energy Star label for roofing membrane.

E. Samples:

1. Roofing Membrane: 150 mm (6 inch) square.
2. Base Flashing: 150 mm (6 inch) square.
3. Roofing Membrane Seam: 300 mm (12 inches) square.

F. Certificates: Certify products comply with specifications.

1. Fire and windstorm classification.
2. Energy performance requirements.

G. Qualifications: Substantiate qualifications comply with specifications.

1. Installer, including supervisors with project experience list.
2. Manufacturer's field representative with project experience list.

H. Field quality control reports.

I. Temporary protection plan. Include list of proposed temporary materials.

J. Operation and Maintenance Data:

1. Maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Approved by roofing system manufacturer as installer for roofing system with specified warranty.

2. Regularly installs specified products.
3. Installed specified products with satisfactory service on five similar installations for minimum five years.
   a. Project Experience List: Provide contact names and addresses for completed projects.
4. Employs full-time supervisors experienced installing specified system and able to communicate with Contracting Officer's Representative and installer's personnel.

B. Manufacturer's Field Representative:
1. Manufacturer's full-time technical employee or independent roofing inspector.
2. Individual certified by Roof Consultants Institute as Registered Roof Observer.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Comply with NRCA Manual storage and handling requirements.
B. Store products indoors in dry, weathertight facility.
C. Store adhesives according to manufacturer's instructions.
D. Protect products from damage during handling and construction operations.
E. Products stored on the roof deck must not cause permanent deck deflection.

1.9 FIELD CONDITIONS

A. Environment:
1. Product Temperature: Minimum 4 degrees C (40 degrees F) and rising before installation.
2. Weather Limitations: Install roofing only during dry current and forecasted weather conditions.

1.10 WARRANTY

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

B. Manufacturer's Warranty: Warrant roofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the roofing system materials or workmanship of the installer.
   1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Roofing System: Adhered roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, pavers, copings, edge metal, and, walkway pads.

2.2 SYSTEM PERFORMANCE

A. Design roofing system meeting specified performance:
   1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
      a. Uplift Pressures: Comply with UL 580 and UL 1897 for uplift resistance.
         Corner Uplift Pressure: 90 psf).
         Perimeter Uplift Pressure: 90 psf).
         Field-of-Roof Uplift Pressure: 60 psf).
   2. Energy Performance:
      a. EPA Energy Star Listed for low-slope roof products.
      b. Three-Year Aged Performance: Minimum 0.55 solar reflectance tested in according to ASTM C1549 or ASTM E1918, and minimum 0.75 thermal emittance tested in according to ASTM C1371 or ASTM E408.
         Where tested aged values are not available:
            Calculate compliance adjusting initial solar reflectance according to ASHRAE 90.1.
            Provide roofing system with minimum 64 three-year aged Solar Reflectance Index calculated according to ASTM E1980 with 12 W/sq. m/degree K (2.1 BTU/h/sq. ft.) convection coefficient.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Provide roof system components from one manufacturer.
C. Sustainable Construction Requirements:

1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-flooring adhesives and sealants.

2.4 EPDM ROOFING MEMBRANE

A. EPDM Sheet: ASTM D4637/D4637M, Type I - non-reinforced
   1. Thickness: 1.5 mm (60 mils).
   2. Color: WHITE.

B. Additional Properties:

PROPERTY	TEST METHOD	REQUIREMENT
Shore A Hardness	ASTM D2240	55 to 75 Durometer
Water Vapor Permeance	ASTM E96/E96M	Minimum 8 ng/Pa/s/sq. m (0.14 perms) Water Method
Fungi Resistance	ASTM G21	After 21 days, no sustained growth or discoloration.

1. Use fire retardant membrane when not protected by ballast or pavers. Verify for UL or approval.

2.5 MEMBRANE ACCESSORY MATERIALS

A. Sheet roofing manufacturer's specified products.

B. Flashing Sheet: Manufacturer's standard; same material, and color as roofing membrane.
   1. Self-curing EPDM flashing adaptable to irregular shapes and surfaces.
   2. Minimum Thickness: 1.5 mm (0.060 inch).

C. Factory Formed Flashings: Inside and outside corners, pipe boots, and other special flashing shapes to minimize field fabrication.

D. Splice Adhesive or Tape: Manufacturer's standard for roofing membrane and flashing sheet.

E. Splice Lap Sealant: Liquid EPDM rubber for exposed lap edge.

F. Bonding Adhesive: Manufacturer's standard, solvent based, to suit substrates.

G. Termination Bars: Manufacturer's standard, stainless steel or aluminum, 25 mm wide by 3 mm thick (1 inch wide by 1/8 inch thick) factory drilled for fasteners.

H. Pipe Compression Clamp:
   1. Stainless steel drawband.
   2. Worm drive clamp device.
I. Fasteners: Manufacturer's standard coated steel with metal or plastic plates, to suit application.
J. Fastener Sealer: One part elastomeric adhesive sealant.
K. Temporary Closure Sealers (Night Sealant): Polyurethane two part sealer.
L. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.
M. Asphalt Roof Cement: ASTM D4586/D4586M.

2.6 FASTENERS

A. Fasteners or Connectors for Pavers:
   1. Fasteners for Pavers Straps:
      a. Stainless steel as recommended by manufacturer of paver in which fastener is anchored.
      b. Fasteners that are not acceptable include:
         Impact or power actuated fasteners.
         Fasteners that do not require a predrilled pilot hole.
         Fasteners with lead or white metal anchors.
         Plastic anchors not stabilized against ultraviolet light.

2.7 SEPARATION SHEET

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.

2.8 FLEXIBLE TUBING

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

2.9 WALKWAY PADS

A. Manufacturer's standard, slip resistant, approximately 450 mm by 450 mm (30 by 30 inches) square and 5 mm (3/16 inch) thick with rounded corners.

2.10 ACCESSORIES

A. Temporary Protection Materials:
   1. Expanded Polystyrene (EPS) Insulation: ASTM C578.

2. Plywood: NIST DOC PS 1, Grade CD Exposure 1.
3. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine and verify substrate suitability for product installation with roofing installer and roofing inspector present.
   1. Verify roof penetrations are complete, secured against movement, and firestopped.
   2. Verify roof deck is adequately secured to resist wind uplift.
   3. Verify roof deck is clean, dry, and in-plane ready to receive roofing system.
B. Correct unsatisfactory conditions before beginning roofing work.

3.2 PREPARATION

A. Complete roof deck construction before beginning roofing work:
   1. Curbs, blocking, edge strips, and other components to which roofing and base flashing is attached in place ready to receive insulation and roofing.
   2. Coordinate roofing membrane installation with flashing work and roof insulation work so insulation and flashing are installed concurrently to permit continuous roofing operations.
   3. Complete installation of flashing, insulation, and roofing in same day except for the area where temporary protection is required when work is stopped for inclement weather or end of work day.
B. Dry out surfaces including roof deck flutes, that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates, only.
C. Broom clean roof decks. Remove dust, dirt and debris.
D. Remove projections capable of damaging roofing materials.
E. Concrete Decks, except Insulating Concrete:
   1. Test concrete decks for moisture according to ASTM D4263 before installing roofing materials.
   2. Prime concrete decks. Keep primer back 100 mm 4(four inches) from precast concrete deck joints.
   3. Allow primer to dry before application of bitumen.
F. Insulating Concrete Decks:
   1. Allow deck to dry out minimum five days after installation before installing roofing materials.

2. Allow additional drying time when precipitation occurs before installing roofing materials.

3.3 TEMPORARY PROTECTION

A. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.

B. Install temporary cap flashing over top of base flashings where permanent flashings are not in place to protect against water intrusion into roofing system. Securely anchor in place to prevent blow off and damage by construction activities.

C. Temporarily seal exposed insulation surfaces within roofing membrane.

1. Apply temporary seal and water cut off by extending roofing membrane beyond insulation and securely embedding edge of the roofing membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant. Weight roofing membrane edge with sandbags, to prevent displacement; space sandbags maximum 2400 mm (8 feet) on center.

2. Direct water away from work. Provide drainage, preventing water accumulation.

3. Check daily to ensure temporary seal remains watertight. Reseal open areas and weight down.

D. Before the work resumes, cut off and discard portions of roof membrane in contact with temporary seal.

1. Cut minimum 150 mm (6 inches) back from sealed edges and surfaces.

E. Remove sandbags and store for reuse.

3.4 INSTALLATION, GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with NRCA Manual installation requirements.

C. Comply with UL 580 and UL 1897 for uplift resistance.

D. Do not allow membrane and flashing to contact surfaces contaminated with asphalt, coal tar, oil, grease, or other substances incompatible with EPDM.

3.5 ROOFING INSTALLATION

A. Install membrane perpendicular to long dimension of insulation boards.

B. Begin membrane installation at roof low point and work towards high point. Lap membrane shingled in water flow direction.

C. Position membrane free of buckles and wrinkles.

D. Roll membrane out; inspect for defects as membrane is unrolled. Remove defective areas:

1. Allow 30 minutes for membrane to relax before proceeding.
2. Lap edges and ends minimum 75 mm (3 inches). Clean lap surfaces.
3. Install seam adhesive or tape, unless furnished with factory applied adhesive strips. Apply pressure to develop full adhesion.
4. Check seams to ensure continuous adhesion and correct defects.
5. Finish seam edges with beveled bead of lap sealant.
6. Finish seams same day as membrane is installed.
7. Anchor membrane perimeter to roof deck and parapet wall as indicated on drawings.

E. Membrane Perimeter Anchorage:

1. Install batten with fasteners at perimeter of each roof area, curb flashing, expansion joints and similar penetrations on top of roof membrane as indicated on drawings.

F. Adhered System Installation:

1. Apply bonding adhesive in quantities required by roofing membrane manufacturer.
2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of substrate with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's instructions, roll roofing membrane into adhesive minimizing voids and wrinkles.
4. Repeat for other half of sheet.
5. Cut voids and wrinkles to lay flat. Clean and patch cut area.

3.6 FLASHING INSTALLATION

A. Install flashings on same day as roofing membrane is installed. When flashing cannot be completely installed in one day, complete installation until flashing is watertight and provide temporary covers or seals.

B. Flashing Roof Drains:

1. Install roof drain flashing according to roofing membrane manufacturer's instructions.
   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 roof cement to contact EPDM roofing membrane.
   c. Adhere roofing membrane to metal flashing with bonding adhesive.
2. Turn metal drain flashing and roofing membrane down into drain body. Install clamping ring and strainer.

C. Installing Base Flashing and Pipe Flashing:
1. Install flashing sheet to pipes, walls and curbs to minimum 200 mm (8 inches) height above roof surfaces and extend roofing manufacturer's standard lap dimension onto roofing membranes.
   a. Adhere flashing with bonding adhesive.
   b. Form inside and outside corners of flashing sheet according to NRCA Manual. Form pipe flashing according to NRCA Manual.
   c. Lap ends roofing manufacturer's standard dimension.
   d. Adhesively splice flashing sheets together, and adhesively splice flashing sheets to roofing membranes. Finish exposed edges with lap sealant.
2. Anchor top of flashing to walls and curbs with fasteners spaced maximum 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.

D. Installing Building Expansion Joints:
1. Install base flashing on curbs as specified.
2. Coordinate installation with metal expansion joint cover.
3. Install flexible tubing 1-1/2 times width of joint centered over joint. Cover tubing with flashing sheet adhered to base flashing and lapping base flashing roofing manufacturer's standard dimension. Finish edges of laps with lap sealant.

E. Repairs to Membrane and Flashings:
1. Remove sections of roofing membrane or flashing sheet that are creased, wrinkled, or fishmouthed.
2. Cover removed areas, cuts and damaged areas with patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Adhesively splice patch to roofing membrane or flashing sheet. Finish edge of lap with lap sealant.

3.7 WALKWAY PAD INSTALLATION

A. Clean membrane where pads are applied.

B. Adhere pads to membrane with splicing cement.

C. Layout with minimum 25 mm (1 inch) and maximum 50 mm (2 inch) space between pads.

3.8 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

1. Fastener Pull Out Tests: ANSI/SPRI FX-1; one test for every 230 sq. m (2,500 sq. ft.) of deck. Perform tests for each combination of fastener type and roof deck type before installing roof insulation.
   a. Test at locations selected by Contracting Officer's Representative.
   b. Do not proceed with roofing work when pull out resistance is less than manufacturer's required resistance.
   c. Test Results:
      Repeat tests using different fastener type or use additional fasteners achieve pull out resistance required to meet specified wind uplift performance.
      Patch cementitious deck to repair areas of fastener tests holes.
2. Examine and probe roofing membrane and flashing seams in presence of Contracting Officer's Representative and Manufacturer's field representative.
3. Probe seams to detect marginal bonds, voids, skips, and fishmouths.
4. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through seams where directed by Contracting Officer's Representative.
5. Cut one sample for every 450 m (1500 feet) of seams.
6. Cut samples perpendicular to seams.
7. Failure of samples to pass ASTM D1876 test will be cause for rejection of work.
8. Repair areas where samples are taken and where marginal bond, voids, and skips occur.
9. Repair fishmouths and wrinkles by cutting to lay flat. Install patch over cut area extending 100 mm (4 inches) beyond cut.

B. Manufacturer Services:

1. Inspect initial installation, installation in progress, and completed work.

2. Issue supplemental installation instructions necessitated by field conditions.
3. Prepare and submit inspection reports.
4. Certify completed installation complies with manufacturer's instructions and warranty requirements.

3.9 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed roofing surfaces. Remove contaminants and stains to comply with specified solar reflectance performance.

3.10 PROTECTION

A. Protect roofing system from traffic and construction operations.
   1. Protect roofing system when used for subsequent work platform, materials storage, or staging.
   2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.

B. Loose lay temporary insulation board overlaid with plywood or OSB.
   1. Weight boards to secure against wind uplift.

C. Remove protection when no longer required when approved by Contacting Officer's Representative.

D. Repair damage.

- - E N D - -

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, and formed expansion joint covers shall be 20 gauge, Zinc-Coated (Galvanized) Steel Sheet as per ASTM653: G90 (Z275)coating designation; structural quality ,grade 40 ksi(275MPa).

1.2 RELATED WORK

A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.
B. Membrane base flashings and stripping:
C. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
E. Color of factory coated exterior architectural metal and anodized aluminum items: Section 09 06 00, SCHEDULE FOR FINISHES.
F. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 72 00, ROOF ACCESSORIES, Division 22, PLUMBING sections and Division 23 HVAC sections.
G. Paint materials and application: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
B. Aluminum Association (AA):

AA-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick

AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick

AA-C22A44.....Chemically etched medium matte with electrolytically deposited metallic compound,

integrally colored coating Class I Architectural, 0.7-mil thick finish

C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

D. American Architectural Manufacturers Association (AAMA):

AAMA 620.....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum

AAMA 621.....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

E. ASTM International (ASTM):

A240/A240M-14.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A653/A653M-11.....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process

B32-08.....Solder Metal

B209-10.....Aluminum and Aluminum-Alloy Sheet and Plate

B370-12.....Copper Sheet and Strip for Building Construction

D173-03(R2011).....Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing

D412-06(R2013).....Vulcanized Rubber and Thermoplastic Elastomers-Tension

D1187-97(R2011).....Asphalt Base Emulsions for Use as Protective Coatings for Metal

D1784-11.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

D3656-07.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

D4586-07.....Asphalt Roof Cement, Asbestos Free

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

G. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual

H. Federal Specification (Fed. Spec):
A-A-1925A.....Shield, Expansion; (Nail Anchors)
UU-B-790A.....Building Paper, Vegetable Fiber

I. International Code Commission (ICC): International Building Code, Current Edition

1.4 PERFORMANCE REQUIREMENTS

A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
1. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.

B. Wind Design Standard: Fabricate and install copings, roof-edge flashings, tested per ANSI/SPRI ES-1 to resist design pressure 90-lbf/sq. ft.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: For all specified items, including:
1. Flashings
2. Copings
3. Not Used
4. Gutter and Conductors
5. Expansion joints
6. Fascia-cant

C. Manufacturer's Literature and Data: For all specified items, including:
1. Two-piece counterflashing
2. Thru wall flashing
3. Expansion joint cover, each type
4. Nonreinforced, elastomeric sheeting
5. Copper clad stainless steel
6. Polyethylene coated copper
7. Bituminous coated copper
8. Copper covered paper
9. Fascia-cant

D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

A. 20 gauge, Zinc-Coated (Galvanized) Steel Sheet as per ASTM653: G90 (Z275)coating designation; structural quality ,grade 40 ksi(275MPa)

B. Stainless Steel: ASTM A240, Type 302B, dead soft temper.

C. Bituminous Coated Copper: Minimum copper ASTM B370, weight not less than 1 kg/m² (3 oz/sf). Bituminous coating shall weigh not less than 2 kg/m² (6 oz/sf); or, copper sheets may be bonded between two layers of coarsely woven bitumen-saturated cotton fabric ASTM D173. Exposed fabric surface shall be crimped.

D. Copper Covered Paper: Not Used

E. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.

F. Aluminum Sheet: Not Used

G. Galvanized Sheet: ASTM, A653.

H. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

2.2 FLASHING ACCESSORIES

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

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

C. Bituminous Paint: ASTM D1187, Type I.

D. Fasteners:

1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
2. Nails:
   a. Minimum diameter for copper nails: 3 mm (0.109 inch).
   b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
   c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
   d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
3. Rivets: Not less than 3 mm (1/8 inch) diameter.
4. Expansion Shields: Fed Spec A-A-1925A.

E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

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

G. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

A. 20 gauge, Zinc-Coated (Galvanized) Steel Sheet or except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B. Concealed Locations (Built into Construction):
1. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
2. Stainless steel: 0.25 mm (0.010 inch) thick.
3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.
4. Galvanized steel: 0.5 mm (0.021 inch) thick.

C. Exposed Locations:
1. Copper: 0.4 Kg (16 oz).
2. Stainless steel: 0.4 mm (0.015 inch).
3. Copper clad stainless steel: 0.4 mm (0.015 inch).

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

2.4 FABRICATION, GENERAL

A. Jointing:
1. In general, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.

2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
3. Joints shall conform to following requirements:
   a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
   b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
   c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
4. Flat and lap joints shall be made in direction of flow.
5. Edges of bituminous coated copper, copper covered paper, 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 copper, stainless steel, and copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).
4. Space expansion and contraction joints at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.

6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:

1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips or minimum 0.6 mm (0.024 inch) thick stainless steel.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 0.8 mm (0.031 inch) thick stainless steel.

E. Drips:

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

F. Edges:

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

G. Metal Options:
1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.
3. Where gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, use stainless steel.

2.5 FINISHES

A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
C. Finish exposed metal surfaces as follows, unless specified otherwise:
1. Copper: Not Used
2. Stainless Steel: Finish No. 2B or 2D.
3. Aluminum:
a. Fluorocarbon Finish: AAMA 620, high performance organic coating.
4. Steel and Galvanized Steel:
a. Manufacturer's finish: BLACK ONYX at Roof Panels, Fascia, and Soffit

2.6 THROUGH-WALL FLASHINGS

A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.

1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
2. Fabricate so keying nests at overlaps.

B. For Masonry Work When Concealed Except for Drip:
1. Either copper, stainless steel, or copper clad stainless steel.
2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.

C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
1. Use same metal and thickness as counter flashing.
2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
3. Form exposed portion as snap lock receiver for counter flashing upper edge.

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 stainless steel or nonreinforced elastomeric sheeting, bituminous coated copper, or polyethylene coated copper.
2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
3. Turn up back edge as shown.
4. Form exposed portion with drip as specified or receiver.

F. Door Sill Flashing:
1. Where concealed, use either 0.5 Kg (20 oz) copper, 0.5 mm (0.018 inch) thick stainless steel, or 0.5 mm (0.018 inch) thick copper clad stainless steel.
2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

2.7 BASE FLASHING

A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.

1. Use 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 stainless steel at pipe flashings.

B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).

C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.

D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.

E. Pipe Flashing: (Other than engine exhaust or flue stack)
1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
   a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
   b. Allow for loose fit around and into the pipe.
4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
   a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
   b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. 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 or masonry joint.
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; Not Allowed

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 0.33 mm (0.013 inch) thick 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.

2.9 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.
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.

2.11 HANGING GUTTERS

A. Fabricate gutters of not less than the following:
1. 0.6mm (0.025 inch)thick stainless steel..

B. Fabricate hanging gutters in sections not less than 2400 mm (8 feet) long, except at ends of runs where shorter lengths are required.

C. Building side of gutter shall be not less than 38 mm (1 1/2 inches) higher than exterior side.

D. Gutter Bead: Stiffen outer edge of gutter by folding edge over approximately 19 mm (3/4 inch) toward roof and down approximately19 mm (3/4 inch) unless shown otherwise.

E. Gutter Spacers:

1. Fabricate of same material and thickness as gutter.
2. Fabricate 25 mm (one inch) wide strap and fasten to gutters not over 900 mm (36 inches) on center.
3. Turn back edge up 25 mm (one inch) and lap front edge over gutter bead.
4. Rivet and solder to gutter except rivet and seal to aluminum.

F. Outlet Tubes:

1. Form outlet tubes to connect gutters to conductors of same metal and thickness as gutters extend into the conductor 75 mm (3 inch). Flange upper end of outlet tube 13 mm (1/2 inch).
2. Lock and solder longitudinal seam.
3. Solder tube to gutter.
4. Fabricate basket strainers of same material as gutters.

G. Gutter Brackets:

1. Fabricate of same metal as gutter. Use the following:
   a. 3 by 40 mm (1/8 by 1 1/2 inch) stainless steel.
2. Fabricate to gutter profile.
3. Drill two 5 mm (3/16 inch) diameter holes in anchor leg for countersunk flat head screws.

2.12 CONDUCTORS (DOWNSPOUTS)

A. Fabricate conductors of same metal and thickness as gutters in sections approximately 3000 mm (10 feet) long [with 19 mm (3/4 inch) wide flat locked seams].

1. Fabricate open face channel shape with hemmed longitudinal edges.

B. Fabricate elbows by mitering, riveting, and soldering except seal aluminum in lieu of solder. Lap upper section to the inside of the lower piece.

C. Fabricate conductor brackets or hangers of same material as conductor, 2 mm (1/16 inch) thick by 25 mm (one inch) minimum width. Form to support conductors 25 mm (one inch) from wall surface in accordance with Architectural Sheet Metal Manual Plate 34, Design C for rectangular shapes and E for round shapes.

D. Conductor Heads:

1. Fabricate of same material as conductor.
2. Fabricate conductor heads to not less than 250 mm (10 inch) wide by 200 mm (8 inch) deep by 200 mm (8 inches) from front to back.
3. Form front and side edges channel shape not less than 13 mm (1/2 inch) wide flanges with edge hemmed.
4. Slope bottom to sleeve to conductor or downspout at not less than 60 degree angle.
5. Extend wall edge not less than 25 mm (one inch) above front edge.
6. Solder joints for water tight assembly.
7. Fabricate outlet tube or sleeve at bottom not less than 50 mm (2 inches) long to insert into conductor.

2.13 SPLASHPANS

A. Fabricate splashpans from the following:
   1. 0.4 mm (0.015 inch) thick stainless steel.
   B. Fabricate in accordance with Architectural Sheet Metal Manual Plate 35 with not less than two ribs as shown in alternate section.

2.14 REGLETS

A. Fabricate reglets of one of the following materials:
   1. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.15 INSULATED EXPANSION JOINT COVERS

A. Use only one type throughout.
B. Types:
   1. Construct of two preformed, stainless steel strips, not less than 0.4 mm (0.015 inch) thick, mechanically and adhesively bonded to

both sides of a 2 mm (1/16 inch) thick neoprene or butyl sheet, or to a 0.4 mm (32 mil) thick reinforced chlorinated polyethylene sheet. Adhesively attach a 10 mm (3/8 inch) thick sheet of closed cell, neoprene foam insulation, to the underside of the neoprene, butyl, or chlorinated polyethylene sheet.

C. Expansion joint covers shall have factory fabricated mitered corners, crossing tees, and other necessary accessories. Furnish in the longest available lengths.

D. Metal flange of sufficient width to extend over the top of the curb and down curb sides 50 mm (2 inches) with hemmed edge for lock to edge strip.

2.16 ENGINE EXHAUST PIPE OR FLUE OR STACK FLASHING

A. Flashing at penetrations through roofing shall consist of a metal collar, sheet metal flashing sleeve and hood.

B. Fabricate collar with roof flange of 1.2 mm (0.047 inch) minimum thick black iron or galvanized steel sheet.
   1. Fabricate inside diameter of collar 100 mm (4 inches) larger than the outside diameter of the item penetration the roofing.
   2. Extend collar height from structural roof deck to not less than 350 mm (14 inches) above roof surface.
   3. Fabricate collar roof flange not less than 100 mm (4 inches) wide.
   4. Option: Collar may be of steel tubing 3 mm (0.125 inch) minimum wall thickness, with not less than four, 50 mm x 100 mm x 3 mm (2 inch by 4 inch by 0.125 inch) thick tabs bottom edge evenly spaced around tube in lieu of continuous roof flange. Full butt weld joints of collar.

C. Fabricate sleeve base flashing with roof flange of stainless steel.
   1. Fabricate sleeve roof flange not less than 100 mm (4 inches) wide.
   2. Extend sleeve around collar up to top of collar.
   3. Flange bottom of sleeve out not less than 13 mm (1/24 inch) and soldered to 100 mm (4 inch) wide flange to make watertight.
   4. Fabricate interior diameter 50 mm (2 inch) greater than collar.

D. Fabricate hood counter flashing from same material and thickness as sleeve.
   1. Fabricate the same as pipe counter flashing except allow not less than 100 mm (4 inch) lap below top of sleeve and to form vent space minimum of 100 mm (4 inch) wide.

2. Hem bottom edge of hood 13 mm (1/2 inch).
3. Provide a 50 mm (2 inch) deep drawband.

E. Fabricate insect screen closure between sleeve and hood. Secure screen to sleeve with sheet metal screws.

2.17 SCUPPERS

A. Fabricate scuppers with minimum of 100 mm (4 inch) wide flange.
B. Provide flange at top on through wall scupper to extend to top of base flashing.
C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.
D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.
E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.
F. Fabricate gravel stop bar of 25 mm x 25 mm (one by one inch) angle strip soldered to bottom of scupper.
G. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.
H. Solder joints watertight.

2.18 GOOSENECK ROOF VENTILATORS

A. Form of 1.3 mm (0.0508 inch) thick sheet aluminum, reinforce as necessary for rigidity, stiffness, and connection to curb, and to be watertight.
   1. Form lower-edge to sleeve to curb.
   2. Curb:
      a. Form for 100 mm (4 inch) high sleeve to ventilator.
      b. Form for concealed anchorage to structural curb and to bear on structural curb.
      c. Form bottom edge of curb as counterflashing to lap base flashing.
B. Provide open end with 1.6 mm (16 gage), stainless steel wire guard of 13 mm (1/2 inch) square mesh.
   1. Construct suitable aluminum angle frame to retain wire guard.
   2. Rivet angle frame to end of gooseneck.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.

12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
    a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
    b. Paint dissimilar metal with a coat of bituminous paint.
    c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
    a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
    b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:
1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches)and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.

5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
14. Continue flashing around columns:
    a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
    b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).

B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.

C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).

D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if

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

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

F. Lintel Flashing when not part of shelf angle flashing:
   1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
   2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
   3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.

G. Window Sill Flashing:
   1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
   2. Turn back edge up to terminate under window frame.
   3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

H. Door Sill Flashing:
   1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.
   2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
   3. Where doors thresholds cover over waterproof membranes install sill flashing over water proof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.

I. Flashing at Masonry, Stone, or Precast Concrete Copings:
   1. Install flashing with drips on both wall faces unless shown otherwise.

2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.3 BASE FLASHING

A. Install where roof membrane type base flashing is not used and where shown.
   1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
   2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
   3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
   4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.

B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.

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

3.4 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 GRAVEL STOPS

A. General:

1. Install gravel stops and fascias with allowance for expansion at each joint; minimum of 6 mm (1/4 inch).
2. Extend roof flange of gravel stop and splice plates not less than four inches out over roofing and nail or screw to wood nailers. Space fasteners on 75 mm (3 inch) centers in staggered pattern.
3. Install continuous cleat for fascia drip edge. Secure with fasteners as close to lower edge as possible on 75 mm (3 inch) centers.
4. Where ends of gravel stops and fascias abut a vertical wall, provide a watertight, flashed and sealant filled joint.
5. Set flange in roof cement when installed over built-up roofing.
6. Edge securement for low-slope roofs: Low-slope membrane roof systems metal edge securement, except gutters, shall be designed in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609, of IBC 2003.

B. Sheet metal gravel stops and fascia:

1. Install with end joints of splice plates sheets lapped three inches.
2. Hook the lower edge of fascia into a continuous edge strip.
3. Lock top section to bottom section for two piece fascia.

C. Corrugated sheet gravel stops and fascia:

1. Install 300 mm (12 inch) wide sheet flashing centered under joint. A combination bottom and cover plate, extending above and beneath the joint, may be used.
2. Hook lower edge of fascia into a continuous edge strip.

D. Scuppers:

1. Install scupper with flange behind gravel stops; leave 6 mm (1/4 inch) joint to gravel stop.

2. Set scupper at roof water line and fasten to wood blocking.
3. Use sealant to seal joint with fascia gravel stops at ends.
4. Coordinate to lap over conductor head and to discharge water into conductor head.

3.7 COPINGS

A. General:
1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.

B. Aluminum Coping:
1. Not Used

C. Stainless steel Copings:
1. Join ends of sheets by a 19 mm (3/4 inch) locked and soldered seam, except at intervals of 9600 mm (32 feet), provide a 38 mm (1 1/2 inch) loose locked expansion joint filled with sealant or mastic.
2. At straight runs between 7200 mm (24 feet) and 19200 mm (64 feet) locate expansion joint at center.
3. At straight runs that exceed 9600 mm (32 feet) and form the leg of a corner locate the expansion joint not more than 4800 mm (16 feet) from the corner.

3.8 EXPANSION JOINT COVERS, INSULATED

A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.

B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.

C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

3.9 ENGINE EXHAUST PIPE OR STACK FLASHING

A. Set collar where shown and secure roof tabs or flange of collar to structural deck with 13 mm (1/2 inch) diameter bolts.

B. Set flange of sleeve base flashing not less than 100 mm (4 inch) beyond collar on all sides as specified for base flashing.
C. Install hood to above the top of the sleeve 50 mm (2 inch) and to extend from sleeve same distance as space between collar and sleeve beyond edge not sleeve:
   1. Install insect screen to fit between bottom edge of hood and side of sleeve.
   2. Set collar of hood in high temperature sealant and secure with one by 3 mm (1/8 inch) bolt on stainless steel draw band type, or stainless steel worm gear type clamp. Install sealant at top of head.

3.10 HANGING GUTTERS

A. Hang gutters with high points equidistant from downspouts. Slope at not less than 1:200 (1/16 inch per foot).
B. Lap joints, except for expansion joints, at least 25 mm (one inch) in the direction of flow. Rivet and seal or solder lapped joints.
C. Support gutters in brackets spaced not more than 600 mm (24 inch) on centers, brackets attached to facial or wood nailer by at least two screws or nails.
   1. For stainless steel gutters use stainless steel brackets.
   2. Use stainless steel screws.
D. Secure brackets to gutters in such a manner as to allow free movement of gutter due to expansion and contraction.
E. Gutter Expansion Joint:
   1. Locate expansion joints midway between outlet tubes.
   2. Provide at least a 25 mm (one inch) expansion joint space between end baffles of gutters.
   3. Install a cover plate over the space at expansion joint.
   4. Fasten cover plates to gutter section on one side of expansion joint only.
   5. Secure loose end of cover plate to gutter section on other side of expansion joint by a loose-locked slip joint.
F. Outlet Tubes: Set bracket strainers loosely into gutter outlet tubes.

3.11 CONDUCTORS (DOWNSPOUTS)

A. Where scuppers discharge into downspouts install conductor head to receive discharge with back edge up behind drip edge of scupper. Fasten

and seal joint. Sleeve conductors to gutter outlet tubes and fasten joint and joints between sections.

B. Set conductors plumb and clear of wall, and anchor to wall with two anchor straps, located near top and bottom of each section of conductor. Strap at top shall be fixed to downspout, intermediate straps and strap at bottom shall be slotted to allow not less than 13 mm (1/2 inch) movement for each 3000 mm (10 feet) of downspout.

C. Install elbows, offsets and shoes where shown and required. Slope not less than 45 degrees.

3.12 SPLASH PANS

A. Install where downspouts discharge on low slope roofs unless shown otherwise.

B. Set in roof cement prior to pour coat installation or sealant compatible with single ply roofing membrane.

3.13 GOOSENECK ROOF VENTILATORS

A. Install on structural curb not less than 200 mm (8 inch) high above roof surface.

B. Securely anchor ventilator curb to structural curb with fasteners spaced not over 300 mm (12 inch) on center.

C. Anchor gooseneck to curb with screws having nonprene washers at 150 mm (6 inch) on center.

- - - E N D - - -

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies copings, gravel stops, fascias, and expansion joints.

1.2 RELATED WORK

A. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES
B. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
C. General insulation: Section 07 21 13, THERMAL INSULATION
D. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL

A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.
B. Each accessory type shall be the same and be made by the same manufacturer.
C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Samples: Representative sample panel of color anodized aluminum not less than 100 mm X 100 mm (four by four inches), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.
C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
D. Manufacturer's Literature and Data: Each item specified.
E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
B. American Society for Testing and Material (ASTM):
B209/209M-07.....Aluminum and Aluminum Alloy-Sheet and Plate

B221/221M-08.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

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

D1187-97 (R2002).....Asphalt-Base Emulsions for Use as Protective Coatings for Metal

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

D. American Architectural Manufacturers Association (AAMA):

2605-11.....High Performance Organic Coatings on Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

1.1 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.

2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips meeting ASTM D1056 and/or D3575; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

3. Gable anchor clips: 16 gauge (1.4 mm) stainless steel alloy 410.

B. Flashing and Trim: Formed from same material and gauge as roof panels, prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 10-foot- (3-m-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced per SMACNA’s recommendation based on gauge and stretch-out, fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels and roof fascia and rake trim.

1. Gutter Hangers: External gutter supports shall be 2-inch- (50-mm-) wide x ¼-inch- (6-mm-) thick formed aluminum, and shall be spaced at no greater than 36” (0.9m) on center. External supports shall be post-painted with a matching full-strength 70 percent PVDF finish and warranted by the panel manufacturer for same term as specified for material finishes.

2. Gutter Straps: Internal gutter straps shall be 1-inch- (25-mm-) wide x 1/8-inch- (3-mm-) thick formed aluminum, and shall be spaced at no greater than 36” (0.9m) on center. Internal straps shall be post-painted with a matching full-strength 70 percent PVDF finish and warranted by the panel manufacturer for same term as specified for material finishes.

D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.

1. Downspout Brackets: Where detailed, surface mounted downspout protection guards shall be fabricated from ¼-inch- (6-mm-) thick formed aluminum, and shall be post-painted with a matching full-strength 70 percent PVDF finish and warranted by the panel manufacturer for same term as specified for material finishes.

E. Roof Curbs: Fabricated from same material as roof panels, minimum and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch- (1.5-mm-) thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof accessories where shown.

B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.

C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.

D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.

E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

F. Gravel Stops and Fascias:
   1. Install gravel stops and fascia with butt joints with approximately 6 mm (1/4 inch) space for expansion.
   2. Over each joint provide cover plates of sheet aluminum, complete with concealed sheet aluminum flashing, centered under each joint.
   3. Lap cover plates and concealed flashing over the gravel stop and fascia not less than four inches.
   4. Extend concealed flashing over built-up roofing, embed in roof cement and turn down over face of blocking at roof edge.

G. Aluminum Coping:
   1. Install sections of coping with approximately 6 mm (1/4-inch) space between ends of sections.
   2. Center joint gutter bar and covers at joints and securely lock in place.
   3. When snap-on system is used insure front and back edges are locked in place.

H. Fascia-Cant System:
   1. Install galvanized steel cant; coordinate with roofing work and after completion of roofing work install extruded aluminum fascia, concealed joint cover plate, and aluminum compression clamp, where shown.
   2. Install system to allow for expansion and contraction with 6 mm (1/4 inch) space between extruded aluminum members and galvanized steel cant as required by manufacturer of system.
   3. Offset joints in extruded aluminum members from galvanized steel cant joints.

I. Expansion Joint Covers:
   1. Install to terminate base flashing 200 mm (8 inches) above roof.
   2. Install moisture seals to drain water to outlets that do not permit water to enter buildings construction.
   3. Use stainless steel screws when exposed.
   4. Three piece assembly:
      a. Install curb section with screws to wood blocking, allowing 6 mm (1/4 inch) at butt joints between sections with splice plate at joint.
      b. Install cant to wood blocking by nailing along horizontal flange every 150 mm (6 inches), with galvanized roofing nails 25 mm (one inch) long.
      c. After completion of base flashing install cap flashing and compression clamp and fasten to the curb or metal cant with

stainless steel self-tapping screws with neoprene washers under head spaced approximately 450 mm (18 inches) on center.

d. Install expansion joint cover with a 6 mm (1/4 inch) wide end joints.

e. Install over end joint a cover plate complete with concealed aluminum flashing, centered under each joint. Fabricate flashing to lap cover not less than four inches.

5. Two piece assembly:

a. Install curb section with screws allowing 6 mm (1/4 inch) space at end joints with splice plate at joint.

b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.

c. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 600 mm (24 inches) on center.

d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).

3.2 PROTECTION OF ALUMINUM

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.

B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.3 ADJUSTING

Adjust expansion joints to close tightly and be watertight; insuring maximum allowance for building movement.

3.4 PROTECTION

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

- - - E N D - - -

SECTION 07 81 00
APPLIED 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 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

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.
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):

C841-03(R2008).....Installation of Interior Lathing and Furring

C847-10.....Metal Lath

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

E119-10.....Fire Tests of Building Construction and Materials

E605-93(R2006).....Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members

E736-00(R2006).....Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

E759-92(R2005).....The Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

E760-92(R2005).....Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members

E761-92(R2005).....Compressive Strength of Fire-Resistive Material Applied to Structural Members

E859-93(R2006).....Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members

E937-93(R2005).....Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members

E1042-02(R2008).....Acoustically, Absorptive Materials Applied by Trowel or Spray.

G21-09.....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 Guide.....Latest Edition including Supplements

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING

A. ASTM E1042, Class (a), Category A.

2. Type II, factory mixed mineral fiber with integral inorganic binders minimum 240 kg/m^3 (15 1b/ft^3) density per ASTM E605 test unless specified otherwise. Use in areas that are completely encased.

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 48 kPa (1000psf).
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/m^2 (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 fire-proofing 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. 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 purl in or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms shall be as follows:
   b. Type II - 350 kg/m^3 (22 lb/ft^3).

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 01 45 29, 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 in interior structural steel members and on underside of roof decks.

C. Type II:

1. One hour fire rating.

- - - E N D - - -

SECTION 07 84 00
FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.

B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK:

A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Expansion and seismic joint firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.

C. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING

D. Sealants and application: Section 07 92 00, JOINT SEALANTS.

E. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Sustainable Design Submittals, as described below:

1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Installer qualifications.

D. Inspector qualifications.

E. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.

F. List of FM, UL, or WH classification number of systems installed.

G. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

H. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

1.4 DELIVERY AND STORAGE:

A. Deliver materials in their original unopened containers with manufacturer’s name and product identification.

B. Store in a location providing protection from damage and exposure to the elements.

1.5 QUALITY ASSURANCE:

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

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Submit qualification data.

C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

1.6 APPLICABLE PUBLICATIONS

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

B. ASTM International (ASTM):

E84-14.....Surface Burning Characteristics of Building Materials

E699-09.....Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components

E814-13a.....Fire Tests of Through-Penetration Fire Stops

E2174-14.....Standard Practice for On-Site Inspection of Installed Firestops

E2393-10a.....Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

C. FM Global (FM):

Annual Issue Approval Guide Building Materials

4991-13.....Approval of Firestop Contractors

D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

723-10(2008).....Standard for Test for Surface Burning Characteristics of Building Materials

1479-04(R2014).....Fire Tests of Through-Penetration Firestops

E. Intertek Testing Services - Warnock Hersey (ITS-WH):
Annual Issue Certification Listings

F. Environmental Protection Agency (EPA):
40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS:

A. Provide either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.

B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 in.) nominal pipe or 0.01 sq. m (16 sq. in.) in overall cross sectional area.

C. Firestop sealants used for firestopping or smoke sealing to have the following properties:

1. Contain no flammable or toxic solvents.
2. Release no dangerous or flammable out gassing during the drying or curing of products.
3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
   a. Sealants: 250 g/L.
   b. Sealant Primers for Nonporous Substrates: 250 g/L.
   c. Sealant Primers for Porous Substrates: 775 g/L.

D. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
   1. Classified for use with the particular type of penetrating material used.
   2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
E. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.
F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
G. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.
H. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 101 mm (4 in.) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS:

A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
B. Provide mineral fiber filler and bond breaker behind sealant.
C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.

D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION:

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

B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Remove dirt, grease, oil, laitance and form-release agents from concrete, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.

B. Remove insulation on insulated pipe for a distance of 150 mm (6 inches) on each side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer’s recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION:

A. Do not begin firestopping work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.

B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.

C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP:

A. As work on each floor is completed, remove materials, litter, and debris.

B. Clean up spills of liquid type materials.

C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK:

A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).

B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

- - - E N D - - -

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section covers interior and exterior sealant and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK (INCLUDING BUT NOT LIMITED TO THE FOLLOWING):

A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Sealing of Site Work Concrete Paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

C. Masonry Control and Expansion Joint: Section 04 20 00, UNIT MASONRY.

D. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.

E. Glazing: Section 08 80 00, GLAZING.

F. Glazed Aluminum Curtain Wall: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.

G. Sound Rated Gypsum Partitions/Sound Sealants: Section 09 29 00, GYPSUM BOARD.

H. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION, Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

1.3 QUALITY ASSURANCE:

A. Installer Qualifications: An experienced installer with a minimum of three (3) years’ experience and who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance. Submit qualification.

B. Source Limitations: Obtain each type of joint sealant through one (1) source from a single manufacturer.

C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.

2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.

D. Lab Tests: Submit samples of materials that will be in contact or affect joint sealants to joint sealant manufacturers for tests as follows:

1. Adhesion Testing: Before installing elastomeric sealants, test their adhesion to protect joint substrates according to the method in ASTM C794 to determine if primer or other specific joint preparation techniques are required.
2. Compatibility Testing: Before installing elastomeric sealants, determine compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Perform testing per ASTM C1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work is to start until results of these tests have been submitted to the Contracting Officer Representative (COR) and the COR has given written approval to proceed with the work.

E. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections and to demonstrate aesthetic effects and qualities of materials and execution:

1. Joints in mockups of assemblies that are indicated to receive elastomeric joint sealants.

1.4 CERTIFICATION:

A. Contractor is to submit to the COR written certification that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Sustainable Design Submittals, as described below:

1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Installer qualifications.

D. Contractor certification.

E. Manufacturer's installation instructions for each product used.

F. Cured samples of exposed sealants for each color.

G. Manufacturer's Literature and Data:

1. Primers

2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

H. Manufacturer warranty.

1.6 PROJECT CONDITIONS:

A. Environmental Limitations:

1. Do not proceed with installation of joint sealants under following conditions:

a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C (40 degrees F).

b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

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

1.7 DELIVERY, HANDLING, AND STORAGE:

A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.

B. Carefully handle and store to prevent inclusion of foreign materials.

C. Do not subject to sustained temperatures exceeding 32 degrees C (90 degrees F) or less than 5 degrees C (40 degrees F).

1.8 DEFINITIONS:

A. Definitions of terms in accordance with ASTM C717 and as specified.

B. Backing Rod: A type of sealant backing.

C. Bond Breakers: A type of sealant backing.

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

1.9 WARRANTY:

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

B. Manufacturer Warranty: Manufacturer shall warranty their sealant for a minimum of five (5) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.10 APPLICABLE PUBLICATIONS:

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

B. ASTM International (ASTM):

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

C612-14.....Mineral Fiber Block and Board Thermal Insulation

C717-14a.....Standard Terminology of Building Seals and Sealants

C734-06(R2012).....Test Method for Low-Temperature Flexibility of Latex Sealants after Artificial Weathering

C794-10.....Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants

C919-12.....Use of Sealants in Acoustical Applications.

C920-14a.....Elastomeric Joint Sealants.

C1021-08(R2014).....Laboratories Engaged in Testing of Building Sealants

C1193-13.....Standard Guide for Use of Joint Sealants.

C1248-08(R2012).....Test Method for Staining of Porous Substrate by Joint Sealants

C1330-02(R2013).....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants

C1521-13.....Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints

D217-10.....Test Methods for Cone Penetration of Lubricating Grease

D412-06a(R2013).....Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension

D1056-14.....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber

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

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

D. Environmental Protection Agency (EPA):
40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SEALANTS:

A. Exterior Sealants:
1. S-#01 Vertical surfaces, provide non-staining ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
2. S-#02 Horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T.
3. Provide location(s) of exterior sealant as follows:
a. Joints formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Provide sealant at exterior surfaces of exterior wall penetrations.
b. Metal to metal.
c. Masonry to masonry or stone.
d. Stone to stone.
e. Cast stone to cast stone.
f. Masonry expansion and control joints.
g. Wood to masonry.
h. Masonry joints where shelf angles occur.
i. Voids where items penetrate exterior walls.
j. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.

B. Floor Joint Sealant:
1. ASTM C920, Type S or M, Grade P, Class 25, Use T. S-#02
2. S-#02 Provide location(s) of floor joint sealant as follows.
a. Seats of metal thresholds exterior doors.
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

C. Interior Sealants:

1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system are to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
   a. Architectural Sealants: 250 g/L.
   b. Sealant Primers for Nonporous Substrates: 250 g/L.
   c. Sealant Primers for Porous Substrates: 775 g/L.
2. S-#3 Vertical and Horizontal Surfaces: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
3. Provide location(s) of interior sealant as follows:
   a. Typical narrow joint 6 mm, (1/4 inch) or less at walls and adjacent components.
   b. Perimeter of doors, windows, access panels which adjoin concrete or masonry surfaces.
   c. Interior surfaces of exterior wall penetrations.
   d. Joints at masonry walls and columns, piers, concrete walls or exterior walls.
   e. Perimeter of windows and plaster or gypsum wallboard walls.
   f. Exposed isolation joints at top of full height walls.
   g. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplanar tile surfaces meet.
   h. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.
   i. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.

D. Acoustical Sealant:
1. Conforming to ASTM C919; flame spread of 25 or less; and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant have a consistency of 250 to 310 when tested in accordance with ASTM D217; remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734; and be non-staining.
2. Provide location(s) of acoustical sealant as follows:
   a. Exposed acoustical joint at sound rated partitions.
   b. Concealed acoustic joints at sound rated partitions.
   c. Joints where item pass-through sound rated partitions.

2.2 COLOR:

A. Sealants used with exposed masonry are to match color of mortar joints.

B. Sealants used with unpainted concrete are to match color of adjacent concrete.

C. Color of sealants for other locations to be light gray or aluminum, unless otherwise indicated in construction documents.

2.3 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Type C: Closed-cell material with a surface skin.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056 or synthetic rubber (ASTM C509), nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 degrees C (minus 26 degrees F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 WEEPS:

A. Weep/Vent Products: Provide the following unless otherwise indicated or approved.

1. Round Plastic Tubing: Medium-density polyethylene, 10 mm (3/8-inch) OD by thickness of stone or masonry veneer.

2.5 FILLER:

A. Mineral fiberboard: ASTM C612, Class 1.

B. Thickness same as joint width.

C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

A. As recommended by manufacturer of caulking or sealant material.

B. Stain free type.

2.7 CLEANERS-NON POROUS SURFACES:

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

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.

B. Coordinate for repair and resolution of unsound substrate materials.

C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

A. Prepare joints in accordance with manufacturer's instructions and SWRI (The Professionals’ Guide).

B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.

1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include but are not limited to the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous surfaces include but are not limited to the following:
   a. Metal.
   b. Glass.

c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

C. Do not cut or damage joint edges.

D. Apply non-staining masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions or as indicated by pre-construction joint sealant substrate test.

1. Apply primer prior to installation of back-up rod or bond breaker tape.
2. Use brush or other approved means that will reach all parts of joints. Avoid application to or spillage onto adjacent substrate surfaces.

3.3 BACKING INSTALLATION:

A. Install backing material, to form joints enclosed on three sides as required for specified depth of sealant.

B. Where deep joints occur, install filler to fill space behind the backing rod and position the rod at proper depth.

C. Cut fillers installed by others to proper depth for installation of backing rod and sealants.

D. Install backing rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.

E. Where space for backing rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

3.4 SEALANT DEPTHS AND GEOMETRY:

A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.

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

3.5 INSTALLATION:

A. General:

1. Apply sealants and caulking only when ambient temperature is between 5 degrees C and 38 degrees C (40 degrees and 100 degrees F).
2. Do not install polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
3. Do not install sealant type listed by manufacture as not suitable for use in locations specified.
4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
5. Avoid dropping or smearing compound on adjacent surfaces.
6. Fill joints solidly with compound and finish compound smooth.
7. Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C1193 unless shown or specified otherwise in construction documents. Remove masking tape immediately after tooling of sealant and before sealant face starts to “skin” over. Remove any excess sealant from adjacent surfaces of joint, leaving the working in a clean finished condition.
8. Finish paving or floor joints flush unless joint is otherwise detailed.
9. Apply compounds with nozzle size to fit joint width.
10. Test sealants for compatibility with each other and substrate. Use only compatible sealant. Submit test reports.
11. Replace sealant which is damaged during construction process.

B. Weeps: Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, at all flashing, and as indicated on construction documents.
   1. Use round plastic tubing to form weep holes.
   2. Space weep holes formed from plastic tubing not more than 406 mm (16 inches) o.c.
   3. Trim tubing material used in weep holes flush with exterior wall face after sealant has set.

C. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.

D. Interior Sealants: Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM

C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cutouts to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform 10 tests for first 305 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform one test for each 305 m (1000 feet) of joint length thereafter or one test per each floor per elevation.

B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

C. Inspect tested joints and report on following:
   1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
   2. Compare these results to determine if adhesion passes sealant manufacturer’s field-adhesion hand-pull test criteria.
   3. Whether sealants filled joint cavities and are free from voids.

4. Whether sealant dimensions and configurations comply with specified requirements.

D. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

3.7 CLEANING:

A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by manufacturer of the adjacent material or if not otherwise indicated by the caulking or sealant manufacturer.

B. Leave adjacent surfaces in a clean and unstained condition.

- - - E N D - - -

SECTION 079513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Prefabricated floor, wall, and ceiling building expansion joint assemblies.
      a. Metal plate covers at floor, wall, and ceiling joints.
      b. Elastomeric joint covers at wall and ceiling joints.
      c. Preformed elastomeric sealant joint at interior floor and wall control joints.
      d. Exterior wall joints.

1.2 RELATED REQUIREMENTS

A. Sheet Metal Expansion Joint Seals: Section 07 60 00, FLASHING AND SHEET METAL.
B. Roof Expansion Joint Cover Assemblies: Section 07 72 00, ROOF ACCESSORIES.
C. Color of Elastomer Inserts, Filler Strips, Exterior Wall Seals and Metal Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this Section.
B. American Society of Civil Engineers (ASCE):
   1. ASCE/SEI 7-10 - Minimum Design Loads For Buildings and Other Structures.
C. ASTM International (ASTM):
   1. A36/A36M-14 - Structural Steel.
   2. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
   3. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
   4. A786/A786M-05(2009) - Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
   5. B36/B36M-13 - Brass, Plate, Sheet, Strip, and Rolled Bar.
   6. B121/B121M-11 - Leaded Brass Plate, Sheet, Strip and Rolled Bar.
   7. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
   8. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

9. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
10. B221M 13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
11. B455-10 - Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes.
12. C864-05(2011) - Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
13. D1187/D1187M-97(2011)e1 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
14. E1399/E1399M-97(2013)e1 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
15. E1966-15 - Standard Test Method for Fire-Resistive Joint Systems.

D. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 - Metal Finishes Manual.

E. UL LLC (UL):
1. 2079-15 - Standard for Tests for Fire Resistance of Building Joint Systems.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this Section.
1. Required Participants:
a. Contracting Officer's Representative.
b. Architect/Engineer.
c. Contractor.
d. Installer.
2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
a. Installation schedule.
b. Installation sequence.
c. Preparatory work.
d. Protection before, during, and after installation.
e. Installation.
f. Terminations.
g. Transitions and connections to other work.
h. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Include large-scale details indicating profiles of each type of expansion joint cover, splice joints between joint sections, transitions to other assemblies, terminations, anchorages, fasteners, and relationship to adjoining work and finishes.
2. Show size, configuration, and fabrication and installation details.
3. Include composite drawings showing work specified in other Sections coordinated with expansion joints.

C. Manufacturer's Literature and Data:

1. Description of each product specified.
2. Show movement capability of each cover assembly and suitability of material used in exterior seals for ultraviolet exposure.
3. Description of materials and finishes.
4. Installation instructions.

D. Samples: Submit 300 mm (12 inch) long samples.

1. Each type and color of metal finish for each required thickness and alloy.
2. Each type and color of flexible seal.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Low Pollutant-Emitting Materials:
   a. Identify volatile organic compound types and quantities.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Installer with project experience list.

G. Certificates: Indicate products comply with specifications.

1. Fire rated expansion joint cover assemblies.

H. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Regularly installs specified products.
2. Installed specified products with satisfactory service on five similar installations for minimum five years.

a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify field conditions affecting expansion joint cover assembly fabrication and installation. Show field measurements on Submittal Drawings.

1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

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

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Provide joint cover assemblies that permit unrestrained movement of joint without disengagement of cover, and, where applicable, maintain moisture, watertight and fire-rated protection.

B. Provide templates to related trades for location of support and anchorage items.

2.2 SYSTEM PERFORMANCE

A. Design expansion joint cover assemblies complying with specified performance.

B. Joint Movement: ASTM E1399.

1. Nominal Joint Width: (1 inch).
2. Minimum Movement Capability: 25 percent.
3. Movement Type: Thermal and wind and seismic.

C. Floor Joints: Live loads, including rolling loads.
   1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
   2. Maximum Deflection: 1/360 of span, maximum.
D. Fire Rated Joints: ASTM E1399, ASTM E1966, or UL 2079, including hose stream test at full-rated period.
   1. Fire rating: Match adjacent floor, wall, and ceiling construction.
   2. System: Capable of anticipated movement while maintaining fire rating.
   3. Coverless Applications: Maintain fire rating without joint cover system.

2.3 MATERIALS

A. Stainless Steel: ASTM A240/A240M, Type 302 or 304.
B. Flexible Membrane: 1.5 mm (60 mil) EPDM sheet, with manufacturer's standard support foam.

2.4 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Provide each product from one manufacturer.
   1. Provide ceiling and wall expansion joint cover assemblies design matching floor to wall and floor to floor expansion joint cover design.
   2. Provide expansion joint cover assembly designs, profiles, materials and configuration indicated, as required to accommodate joint size variations in adjacent surfaces, and anticipated movement.
C. Sustainable Construction Requirements:
   1. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
   2. Low Pollutant-Emitting Materials: Maximum VOC content by weight.
      a. Non-Flooring Adhesives and Sealants.

2.5 FABRICATION

A. Fabricate Expansion Joint Cover Assemblies:
   1. As complete assembly ready for installation.
   2. In longest practicable lengths to minimize number of end joints.
   3. With factory mitered corners where joint changes directions or abuts other materials.
      a. With closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other assemblies.

4. Joints within enclosed spaces such as chase walls, include 1 mm (0.04 inch) thick galvanized steel cover where conventional expansion joint cover is not used.
5. Where floor slab is fire rated provide ceramic blanket at joints.
6. Seal Strip: Factory-formed and bonded to metal frames and anchor members.
7. Compression Seals: Fabricate from expanding foam as secondary seal and elastomeric sealant to sizes and profiles shown.

B. Floor-to-Floor Metal Plate Joints:
1. Frames: Metal, continuous on both sides of joint designed to support cover plate.
   a. Flush Design: Seating surface and raised floor rim to accommodate adjacent flooring.
   b. Anchorage: Concealed bolt and steel anchors for embedment in concrete.
2. Cover Plate: Metal, matching frames where exposed.
   a. Supported Load: 19.2 MPa (400 psf), minimum.
   b. Rattle-free due to traffic.
3. Fillers: Resilient material between raised rim of frame and edge of cover plate, where shown.
   a. No gaps or bulges over full design range joint movement.
4. Fire Barrier: As required for fire resistance rating.
5. Water Stop: Manufacturer's standard, continuous, full length of joint.
6. Seismic: As required by Code.
7. Finishes: Stainless Steel

C. Floor-to-Wall Metal Plate Joints:
1. Frames: Metal, continuous on floor side of joint only.
   a. Provide wall side frame where required by manufacturer's design.
2. Cover Plates: Angle cover plates with countersunk flat-head exposed fasteners for securing cover plate to wall unless shown otherwise.
   a. Fastener Spacing: As recommended by manufacturer.
3. Joint Design: Match adjacent floor to floor design.
4. Fire Barrier: As required for fire resistance rating.
5. Water Stop: Manufacturer's standard, continuous, full length of joint.
6. Seismic: As required by Code.
7. Finishes: Stainless Steel.

D. Interior Wall Joint Cover Assemblies:
   1. Frame: Metal, surface mounted, concealed fastening to wall on one sides of joint.
   2. Cover Plate: Metal, smooth surface, lap both sides of joint and permitting free movement on one side.
      a. Fabricate with concealed attachment of cover to frame when cover is in close contact with adjacent wall surface finish.
      b. Use angle cover plates at intersecting walls.
   3. Joint Design: Match adjacent floor to floor design.
   4. Fire Barrier: As required for fire resistance rating.
   5. Seismic: As required by Code.
   6. Finishes: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

E. Exterior Wall Joint Assemblies:
   1. Design seal for variable movement and prevention of water and air infiltration.
   2. Frame: Metal, concealed, for fastening to wall on one side of joint.
   3. Cover Plate: Metal, surface mounted, lap both sides of joint, permitting free movement on one side.
      a. Fabricate with concealed attachment of cover to frame for cover with cover in close contact with adjacent finish surfaces.
      b. Use angle cover plate at intersecting walls.
   4. Water Seal: Vinyl seal strip as secondary seal behind primary seal.
   5. Seismic: As required by Code.
   6. Finish: Stainless steel.

F. Ceiling and Soffit Assemblies:
   1. Frames: Metal, continuous on both sides of joint, flush mounted with no exposed fasteners.
   2. Flexible Insert: Variable movement semi-rigid vinyl locked into frame.
      a. Face Style: Flush or accordion, as shown, to span joint width without sagging.
   3. Seismic: As required by Code.
   4. Finishes: Stainless Steel.

2.6 FINISHES

A. Stainless Steel: NAAMM AMP 500, No. 2B bright finish.

2.7 ACCESSORIES

A. General: Manufacturer's standard anchors, fasteners, set screws, spaces, protective coating, and filler materials, adhesive and other accessories required for installation.

B. Barrier Coating: ASTM D1187/D1187M.

C. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

D. Fasteners: Type and size recommended by expansion joint cover assembly manufacturer.

1. Exterior Applications: Stainless steel.
2. Fasteners for Aluminum: Stainless steel.
3. Other Applications: Galvanized steel or stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Provide items embedded in concrete and masonry in time for building into work without delaying work.

B. Protect existing construction and completed work from damage.

C. Apply barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Install anchorage devices and fasteners for securing expansion joint assemblies to in-place construction where anchors are not embedded in concrete and masonry.

1. Secure with metal fasteners, type and size to suit application.

C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.

D. Install joint cover assemblies aligned and positioned in correct relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.

1. Allow for thermal expansion and contraction of metal to avoid buckling.
2. Accommodate joint opening size at time of installation.

E. Set floor covers at elevations flush with adjacent finished flooring, unless shown otherwise.

F. Grout floor frames set in prepared recesses.

G. Locate wall, ceiling and soffit covers in continuous contact with adjacent surfaces. Secure with required accessories.

H. Locate anchors at interval recommended by manufacturer, but minimum 75 mm (3 inches) from each end, and, maximum 600 mm (24 inches) on centers.

I. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.

J. Cut and fit ends to accommodate thermal expansion and contraction of metal to avoid buckling of frames and cover plates.

K. Flush Metal Cover Plates:
1. Secure flexible filler between frames to allow compression and expansion.
2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

L. Waterstops:
1. Install in conjunction with floor joints, and where shown.
2. Install continuously to prevent water damage to finish spaces.
3. Seal waterstop to frames to prevent water leakage.
4. Install drainage tubes from waterstops to discharge collected water in nearest plumbing air gap drain.

M. Fire Barriers:
1. Install in compliance with tested assembly.
2. Install at joints in floors and in fire rated walls.
3. Use fire barrier sealant furnished with expansion joint assembly.

N. Apply sealant where required to prevent water and air infiltration.

O. Vertical Exterior Extruded Thermoplastic Rubber.
1. Install side frames mounted on sealant or butyl caulk tape with appropriate anchors 600 mm (24 inches) on center complete with secondary seal.
2. Install primary seals retained in extruded aluminum side frames.

P. Extruded Thermoplastic Rubber or Seals:

1. For straight sections, install preformed seals in continuous lengths.
2. Vulcanize or heat-seal field spliced joints to provide watertight joints as recommended by manufacturer.

3.3 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed metal surfaces. Remove contaminants and stains.

3.4 PROTECTION

A. Cover floor joints with plywood where wheel traffic occurs before Substantial completion.

B. Remove protective covering when adjacent work areas are completed. Clean exposed surfaces in compliance with manufacture's printed instructions.

- - E N D - -

SECTION **08 11 13**
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies steel doors, steel frames and related components.

B. Terms relating to steel doors and frames as defined in ANSI A123.1 and as specified.

1.2 RELATED WORK

A. Frames fabricated of structural steel: Section 05 50 00, METAL FABRICATIONS.

B. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.

C. Door Hardware: Section 08 71 00, DOOR HARDWARE.

D. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.

1.3 TESTING

A. An independent testing laboratory shall perform testing.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturers Literature and Data:

1. Fire rated doors and frames, showing conformance with NFPA 80 and Underwriters Laboratory, Inc., or Intertek Testing Services or Factory Mutual fire rating requirements.

1.5 SHIPMENT

A. Prior to shipment label each door and frame to show location, size, door swing and other pertinent information.

B. Fasten temporary steel spreaders across the bottom of each door frame.

1.6 STORAGE AND HANDLING

A. Store doors and frames at the site under cover.

B. Protect from rust and damage during storage and erection until completion.

1.7 APPLICABLE PUBLICATIONS

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

B. Door and Hardware Institute (DHI):

1. A115 Series Steel Door and Frame Preparation for Hardware, Series A115.1 through A115.17 (Dates Vary)

C. Steel Door Institute (SDI):

1. 113-01 Thermal Transmittance of Steel Door and Frame Assemblies
2. A250.8-03 Standard Steel Doors and Frames

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

1. A568/568-M-07 Steel, Sheet, Carbon, and High- Strength, Low-alloy, Hot-Rolled and Cold-Rolled
2. A1008-08 Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability
3. B209/209M-07 Aluminum and Aluminum-Alloy Sheet and Plate
4. B221/221M-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

E. The National Association Architectural Metal Manufactures (NAAMM):

1. Metal Finishes Manual (1988 Edition)

F. National Fire Protection Association (NFPA):

1. 80-09 Fire Doors and Fire Windows

G. Underwriters Laboratories, Inc. (UL):

1. Fire Resistance Directory

H. Intertek Testing Services (ITS):

1. Certifications Listings…Latest Edition

I. Factory Mutual System (FM):

1. 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 METAL FRAMES

A. General:

1. SDI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
2. Frames for exterior doors: Fabricate from 1.7 mm (0.067 inch) thick galvanized steel conforming to ASTM A525.
3. Frames for labeled fire rated doors[**and windows**].

   a. Comply with NFPA 80. Test by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual.
   b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements. Provide labels of metal or engraved stamp, with raised or incised markings.

4. Frames for lead-lined doors:

   a. Frames for doors 900 mm (3 feet) or less in width and having lead lining of 1 mm or less in thickness, and not shown to have structural steel supports: Minimum 1.7 mm (0.067 inch) thick.
   b. Frames for doors over 900 mm (3 feet) in width or having lead-lining more than 1 mm in thickness shown to be supported by and attached to structural steel subframes: Minimum 1.3 mm (0.053 inch) thick.
   c. Lead-lining and its application are specified in Section 13 49 00, RADIATION PROTECTION.

5. Frames for detention door (Type 22): Minimum 2 mm (0.093 inch) thick.
6. Frames for doors specified to have automatic door operators; Security doors (Type 36); service window: minimum 1.7 mm (0.067 inch) thick.
7. 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.

C. 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 (3/8 inch) clip angle for lead lined frames, drilled for 9 mm (3/8 inch) floor bolts.

2. Jamb anchors:

a. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 600 mm (24 inches) apart[, 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.

2.3 SHOP PAINTING

A. SDI A250.8.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

B. Floor Anchors:

1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts. Use 9 mm (3/8 inch) bolts on lead lined frames.
2. Power actuated drive pins may be used to secure frame anchors to concrete floors.

C. Jamb Anchors:

1. 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

A. Install doors and hardware as specified in Sections Section 08 71 00, DOOR HARDWARE .

- - - E N D - - -

SECTION **08 31 13**
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Section specifies access doors or panels.

1.2 RELATED WORK:

A. Access doors in acoustical ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.

B. Locations of access doors for duct work cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS; Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Access doors, each type, showing construction, location and installation details.

C. Manufacturer's Literature and Data: Access doors, each type.

1.4 APPLICABLE PUBLICATIONS

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

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

1. A167-99(R-2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
2. A1008-07 Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy

C. American Welding Society (AWS):

1. D1.3-98 Structural Welding Code Sheet Steel

D. National Fire Protection Association (NFPA):

1. 80-06 Fire Doors and Windows

E. The National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500 Series Metal Finishes Manual

F. Underwriters Laboratories, Inc. (UL):

1. Fire Resistance Directory

PART 2 - PRODUCTS

2.1 FABRICATION, GENERAL

A. Fabricate components to be straight, square, flat and in same plane where required.

1. Slightly round exposed edges and without burrs, snags and sharp edges.
2. Exposed welds continuous and ground smooth.
3. Weld in accordance with AWS D1.3.

B. Number of locks and non-continuous hinges as required to maintain alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.

C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. Provide anchors as required by fire test.

2.2 ACCESS DOORS, FLUSH PANEL:

A. Door Panel:

1. Form of 1.9 mm (0.0747 inch) thick steel or 1.5 mm (0.0598 inch) thick stainless steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:

1. Form of 1.5 mm (0.0598 inch) thick steel or stainless steel sheet of depth and configuration to suit material and type of construction where installed.
2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
3. Weld exposed joints in flange and grind smooth.

C. Hinge:

1. Concealed spring hinge to allow panel to open 175 degrees.
2. Provide removable hinge pin to allow removal of panel from frame.

D. Lock:

1. Flush, screwdriver operated cam lock.

2.3 FINISH:

A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.

B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating for general use.

C. Stainless Steel: No. 4 for exposed surfaces for wet areas and in ceramic tile finishes.

2.4 SIZE:

A. Minimum 600 mm (24 inches) square door unless otherwise shown or required to suit opening in suspension system of ceiling.

PART 3 - EXECUTION

3.1 LOCATION:

A. Provide access panels or doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical and conveyor work are concealed in wall or partition, or are above ceiling of gypsum board or plaster.

B. Use fire rated doors in fire rated partitions and ceilings.

C. Use flush panels in partitions and gypsum board or plaster ceilings, except lay-in acoustical panel ceilings or upward access acoustical tile ceilings.

3.2 INSTALLATION, GENERAL:

A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.

B. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.

C. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.

D. Set recessed panel access doors recessed so that face of surrounding materials will finish on the same plane, when finish in door is installed.

3.3 ANCHORAGE:

A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.

B. Type, size and number of anchoring device suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.

C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

3.4 ADJUSTMENT:

A. Adjust hardware so that door panel will open freely.

B. Adjust door when closed so door panel is centered in the frame.

- - - E N D - -

SECTION 083613
SECTIONAL DOORS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies electrically operated sectional overhead steel/aluminum doors.

1.2 RELATED WORK:

A. Lock Cylinders for Cylindrical Locks: Section 08 71 00, DOOR HARDWARE.
D. Electrical Installation:
1. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS:

A. Manufacturer's with three (3) years’ experience in providing items of type specified. Submit manufacturer qualifications.
B. Installers who are trained and approved by manufacturer for installation of units required. Submit installer qualifications.

1.4 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Shop Drawings:
1. Details of construction, accessories and hardware, electrical and mechanical items, supporting brackets for motors, location, and ratings of motors, and safety devices.
2. Wiring diagrams for motors and controls, including wiring diagram for door, showing electrical interlock for motor with manually operated dead lock.
C. Manufacturer's Literature and Data:
1. Brochures or catalog cuts.
2. Manufacturer's installation procedures and instructions.
3. Maintenance instructions, parts list.
D. Installer’s qualifications.
E. Manufacturer’s qualifications.
F. Certificates:
1. Attesting door, anchors and hardware will withstand the horizontal loads specified.
2. Attesting door complies with thermal performance, air infiltration, and water infiltration requirements.
G. Manufacturer warranty.

1.5 QUALITY ASSURANCE:

A. Source: Obtain sectional doors from single source from single manufacturer. Obtain operators and controls from sectional door manufacturer.

1.6 WARRANTY:

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

B. Manufacturer Warranty: Manufacturer shall warranty their sectional doors for a minimum of two (2) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.7 APPLICABLE PUBLICATIONS:

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

B. American Architectural Manufacturers Association (AAMA):
2603-13.....Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

C. American Society of Civil Engineers (ASCE):
7-10.....Wind Load Provisions

D. ASTM International (ASTM):
A36/A36M-14.....Structural Steel
C1036-11(R2012).....Flat Glass
C1363-11.....Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
E283-04(R2012).....Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen
E330/E330M-14.....Structural Performance of Exterior Windows, Curtain Walls, and Doors by the Uniform Static Air Pressure Difference.
E331-00(R2009).....Water Penetration of Exterior Windows, Curtain Walls, and Doors by the Uniform Static Air Pressure Difference.

E. American National Standards Institute and Door and Access Systems Manufacturers Association (ANSI/DASMA):
102-11.....Sectional Overhead Type Doors.

F. National Electrical Manufacturer's Association (NEMA):
ICS 6-93(R2011).....Industrial Controls and Systems: Enclosures
MG 1-11(R2014).....Motors and Generators
ST 20-14.....Dry Type Transformers for General Applications

G. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual

H. Underwriters Laboratories, Inc. (UL):
325-06(R2013).....Door, Drapery, Gate, Louver, and Window Operators and Systems

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel: ASTM A653/A653M for forming operations. ASTM A36/A36M for structural sections.

B. Hard Drawn Spring wire: ASTM A227/A227M.

C. Oil Tempered Spring wire: ASTM A229/A229M.

D. Glass:

1. Blast Resistant SEE SECTION 085653 Blast Resistant Windows
2. Fabricated into sealed insulating glass 25 mm (1 inch) thick.

E. Weather-strips, Gaskets, and Thermal Breaks:
1. Neoprene, EPDM, PVC, silicone rubber, or other low conductance material.
2. Standard with door manufacturer.

2.2 DESIGN REQUIREMENTS:

A. Wind Load: Design to withstand uniform pressure (velocity pressure) of 960 Pa (30 lbs. per sq. ft.) acting inward and outward when tested in accordance with ASTM E330/E330M. Doors are to remain operable under design wind load.
B. Thermal Performance:
C. Air Infiltration for Exterior Doors: Maximum of 0.10 cfm at 24 Km (15 miles per hour) wind speed per foot of crack between door sections and door perimeter opening when tested in accordance with ASTM E283.
D. Water Infiltration for Exterior Doors: No infiltration when tested in accordance with ASTM E331.

E. Seismic Performance: Sectional doors are to withstand the effects of earthquake motions determined according to ASCE 7.
F. Comply with ANSI/DASMA 102. Provide metal doors with horizontal sections hinged together to operate in a system of tracks to completely close the door opening in the closed position and make the full width and height of the door opening available for use in the open position.
g. Operation-Cycle Requirements: Door components and actuators to operate for not less than 10,000 cycles.

2.3 FABRICATION:

A. Steel Door Sections:
1. Formed of hot-dipped galvanized steel.
2. Meeting rails: Interlocking joints with thermal breaks separating face sheets formed to provide weathertight closure and alignment for full width of door.
3. Height of Each Section: Not to exceed 610 mm (24 inches).
4. Install glazing panels where indicated using rubber thermal break gaskets standard with door manufacturer.
5. Reinforced for hardware anchorage with not less than 10 gage galvanized steel.

B. Tracks:
1. Manufacturer's standard, formed of galvanized steel.
2. Track Configuration: Standard-lift track.
3. Minimum of 2.78 mm (12 gauge) for 75 mm (3 inch) tracks.
4. Vertical tracks fabricated with adjustable brackets for mounting at incline to continuous steel angle wall bracket.
5. Horizontal Track: Reinforce with continuous steel angle anchored to vertical steel angle wall bracket and to ceiling angle supports. Provide vertical and cross or diagonal braces to obtain rigid installation of horizontal track.

6. Provide not less than 2.38 mm (13 gage) galvanized steel angles.

C. Hardware:
1. Manufacturers heavy duty hinges, brackets, rollers, locking devices and other hardware required for a complete installation.
2. Hinges and Roller Brackets: Minimum of 2.38 mm (13 gage) galvanized steel.
3. Provide rollers with ball bearings and case hardened races.
4. Provide positive locking device to receive cylinder lock, specified in Section 08 71 00, DOOR HARDWARE, with interlocking switch to motor actuator.
5. Weatherseals: Manufacturer’s standard fitted around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

2.4 ELECTRIC MOTOR OPERATORS:

A. Complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, wall mount push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation, including emergency manual actuator.

B. Design:
1. Design the actuator for motor removal without disturbing the limit-switch adjustment and without affecting the emergency manual actuators.
2. Make provision for emergency manual operation of door by chain-gear mechanism in case of electrical failure.
3. Arrange the emergency manual operating mechanism to immediately be put into and out of operation from the floor with a mechanical device to disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged. This operation is not to affect the adjustment of the limit switches.
4. Provide interlock with motor to prevent motor from operating when manual locks are activated.

C. Motors:
1. NEMA MG 1, maximum operation 3600 rpm.
2. Suitable for operation on power current of the characteristics indicated on the electrical construction documents.
3. Use high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from door position, and produce door travel speed range of 0.20 to 0.30 m per second (8 to 12 inches per second), without exceeding the rated capacity.
4. Single-phase motors are not to have commutation or more than one starting contact.
5. Motor Enclosures: Drip proof type or NEMA TENV type.

D. Controls:
1. Control enclosures:
a. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

b. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

2. At door actuators, provide an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations on construction documents.
3. Control switches:
   a. Three push button type on interior, unless noted to be key activated.
   b. Buttons marked, OPEN, CLOSE and STOP.
   c. The OPEN and STOP buttons: Momentary pressure or contact type.
   d. The CLOSE button: Constant pressure type.
   e. Provide key activated switch on exterior requiring constant pressure to operate.
   f. Limit switches: Manufacturers standard, position of switches readily adjustable.
4. Operation:
   a. Open door upon activation of OPEN button.
   b. Close door only when constant key pressure applied to CLOSE button.
   c. When the door is in motion, and the STOP button is pressed, door is to stop instantly and remain in the stop position; from stop position, door may be operated in either direction by OPEN or CLOSE button.
   d. Limit switches automatically stop doors at their fully open and closed positions.
6. Provide push buttons with guards to prevent accidental operation.
7. Transformer:
   a. Provide control transformer in power circuits to reduce the voltage on control circuits to 120 volts or less.
   b. Conform to NEMA ST 20.
8. Electrical Components: Conform to NFPA 70.
9. Safety Device:
   a. Provide bottom door edge weather-strip safety device to immediately stop and reverse the door closing to full open position upon contact with an obstruction in compliance with UL 325. Door is to open upon failure of device, component of device or component of control system.
   b. The door closing circuit is to be electrically locked out and door to remain capable of manual operation until the failure or damage has been corrected.
   c. Do not use safety device as a limit switch.
   d. Safety Device Connecting Cable to Motor: Flexible type SO cable, with spring loaded automatic take up reel or equivalent device, as required for proper operation of the doors.

2.5 FINISHES:

A. Steel:

1. Comply with NAAMM’s AMP 500-06 Metal Finishes Manual for recommendations for applying and designating finishes.
2. Clean surfaces free of scale, rust, oil and grease.
3. Powder-Coat Finish: AAMA 2603.
5. Galvanized steel: Apply phosphate treatment.
6. Apply shop prime coat of corrosion inhibitive paint on exposed surfaces after fabrication that is compatible with field applied finishes.
7. Apply finish paint of color scheduled when specified in Section 09 06 00, SCHEDULE FOR FINISHES.
8. Do not paint track, rollers, hinges, or locks.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install in accordance with approved shop drawings and manufacturer's instructions.
B. For electrical work, see:
   1. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
C. Locate anchors and inserts for tracks, brackets, motors, switches, hardware, and other accessories in accordance with approved shop drawings.
D. Attach tracks to adjoining construction with not less than 9 mm (3/8 inch) diameter bolts, spaced near each end and not over 610 mm (24 inches) apart.
E. Locate control switches where indicated in construction documents, not less than 1219 mm (4 feet) or more than 1372 mm (4 feet 6 inches) above finished floor.
F. Lubricate, adjust and demonstrate door to operate freely.
G. Upon completion, leave door openings weathertight and doors free from warp, twists, or distortion.

3.2 REPAIR:

A. Repair zinc-coated surfaces both bare and painted, by the application of galvanizing repair compound.
B. Spot prime and apply finish paint to repairs.

- - - E N D - - -

SECTION 085113
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

GENERAL

1.1 DESCRIPTION:

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

B. Aluminum Framed Entrances and Store fronts must also meet Blast Resistant Criteria in SECTION 085653 Blast Resistant Windows.

C. Basis of Design is Kawneer Ultra Thermal/Blast Resistant Products.

1.2 RELATED WORK:

A. Glass and Glazing: Section 08 80 00, GLAZING.

B. Hardware: Section 08 71 00, DOOR HARDWARE.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: (1/2 full scale) showing construction, anchorage, reinforcement, and installation details.

C. Manufacturer’s Literature and Data:

1. Doors, each type.
2. Entrance and Storefront construction.

D. 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):

1. B209-06 Aluminum and Aluminum-Alloy Sheet and Plate
2. B221-05 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
3. E283-04 Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
4. E331-00 Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
5. F468-06 Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
6. F593-04 Stainless Steel Bolts, Hex Cap Screws, and Studs

C. National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500 Series Metal Finishes Manual

D. American Architectural Manufacturer's Association (AAMA):

1. 2604-05 High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels

E. American Welding Society (AWS):

1. D1.2-03 Structural Welding Code Aluminum

1.7 PERFORMANCE REQUIREMENTS:

A. Shapes and thickness of framing members shall be sufficient to withstand a design wind load 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 (applied to overall load failure of the unit). Provide glazing beads, moldings, and trim of not less than 1.25 mm (0.050 inch) nominal thickness.

B. Air Infiltration: When tested in accordance with ASTM E 283, air infiltration shall not exceed 2.63 x 10-50 cm per square meter (0.06 cubic feet per minute per square foot) of fixed area at a test pressure of 0.30 kPa (6.24 pounds per square foot) 80 kilometers (50 mile) per hour wind.

C. Water Penetration: When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 0.38 kPa (8 pounds per square foot) of fixed area.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum, ASTM B209 and B221:

1. Alloy 6063 temper T5 for doors, door frames,.

B. Fasteners:

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

2.2 FABRICATION:

A. Fabricate doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.

B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.

C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.

D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, DOOR HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.

E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

2.3 PROTECTION OF ALUMINUM:

A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:

1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.4 STILE AND RAIL DOORS:

A. Nominal 45 mm (1-3/4 inch) thick, with stile and head rail 90 mm (3-1/2 inches) wide, and bottom rail 250 mm (10 inches) wide.

B. Bevel single-acting doors 3 mm (1/8 inch) at lock, hinge and meeting stile edges. Provide clearances of 2 mm (1/16 inch) at hinge stiles, 3 mm (1/8 inch) at lock stiles and top rails, and 5 mm (3/16 inch) at floors and thresholds. Form glass rebates integrally with stiles and rails. Glazing beads may be formed integrally with stiles and rails or applied type secured with fasteners at 150 mm (6 inches) on centers.

C. Construct doors with a system of welded joints or interlocking dovetail joints between stiles and rails. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel rod extending into the stiles, and having a self-locking nut and washer at each end. Reinforce stiles and rails to prevent door distortion when tie rods are tightened. Provide a compensating spring-type washer under each nut to take up any stresses that may develop. Construct joints between rails and stiles to remain rigid and tight when door is operated.

D. Weather-stripping: Provide removable, woven pile type (silicone-treated) weather-stripping attached to aluminum or vinyl holder. Make slots for applying weather-stripping integral with doors and door frame stops. Apply continuous weather-stripping to heads, jambs, bottom, and meeting stiles of doors and frames. Install weather-stripping so doors can swing freely and close positively.

2.5 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.

2.6 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 (8 feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.

B. Anchor aluminum door 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..

C. Install hardware specified under Section 08 71 00, DOOR HARDWARE.

3.2 ADJUSTING:

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

3.3 PROTECTION, CLEANING AND REPAIRING:

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

- - - E N D - - -

SECTION 085653
BLAST RESISTANT WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Prefabricated aluminum, blast resistant interior and exterior window units.

1.2 RELATED REQUIREMENTS

A. Window Color: WHITE.
B. Forced entry and ballistic rated glazing: Section 08 80 00, GLAZING.
C. See also ALUMINUM FRAMED ENTRANCES and STOREFRONT

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this Section.
B. American Architectural Manufacturers Association (AAMA):
   1. AAMA/WDMA/CSA 101/I.S.2/A440-11 Windows, Doors, and Skylights.
C. American Welding Society (AWS):
   1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
   2. D1.6/D1.6M-07 - Structural Welding Code - Stainless Steel.
D. ASTM International (ASTM):
   1. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   2. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. E283-04(2012) - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
   4. E331-00(2009) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
   5. F1233-08(2013) - Standard Test Method for Security Glazing Materials and Systems.
   6. F1642-12 - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings.
E. National Association of Architectural Metal Manufactures (NAAMM):
   1. AMP 500-06 - Metal Finishes Manual.
F. Unified Facilities Criteria (UFC):
   1. 4-010-01-2012 - DOD Minimum Antiterrorism Standards for Buildings.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this Section.
   1. Required Participants:
      a. Contracting Officer's Representative.
      b. Architect/Engineer.
      c. Inspection and Testing Agency.
      d. Contractor.
      e. Installer.
      f. Manufacturer's field representative.
   2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
      a. Verification of Blast Criteria
      b. Installation schedule.
      c. Installation sequence.
      d. Preparatory work.
      e. Protection before, during, and after installation.
      f. Installation.
      g. Transitions and connections to other work.
      h. Inspecting and testing.
      i. Other items affecting successful completion.
   3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
B. Submittal Drawings:
   1. Show dimensioned details of window units, including intended metal and glazing materials. 1: 20 (Three quarter inch equals 1 foot) scaled elevations showing interior and exterior. Indicated how window units can be replaced or removed, including replacement of glazing.
   2. Show detailed sections at 1: 5 (3 inch equal 1 foot) scale for members; indicating construction, size, and thickness of components, together with connections, fasteners, and means of separating dissimilar metals.
   3. Provide final submittal drawings as DWG AutoCAD files.
C. Manufacturer's Literature and Data:

1. Description of each product, metal, and alloy when applicable.
2. Indicate manufacturer's recommendations for fasteners, welding, applied finishes, hardware and accessories.
3. Installation instructions.
4. Standard color chart.

D. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Certificates: Indicate each product complies with specifications.
1. Window blast resistance.

F. Calculations: Prepared by qualified blast consultant verifying window and glazing assembly including anchors comply with specified blast resistance performance.

G. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer with project experience list.
2. Installer with project experience list.
3. Welders and welding procedures.

1.6 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications:
1. Regularly manufactures and installs specified products.
2. Manufactured and installed specified products with satisfactory service on five similar installations for minimum five years.
   a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.

B. Welders and Welding Procedures Qualifications:
1. Stainless Steel: AWS D1.6/D1.6M.
2. Steel: AWS D1.1/D1.1M.

1.7 DELIVERY

A. Deliver prefabricated unit in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, unit type, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, wet, or opened packaging.

1.8 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify field conditions affecting window fabrication and installation. Show field measurements on Submittal Drawings.
   1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

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

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design windows complying with specified performance:
   1. Comply with UFC 4-010-01, ASTM F1642, ASTM F1233 and AAMA/WDMA/CSA 101/I.S.2/A440.
   2. Provide indicated levels of resistance for blast resistant window assemblies. Resistance level applies to anchorages, interfaces with adjoining substrates, glass retention, and hardware.
   3. Provide units meeting UFC 4-010-01 High rating.
   4. Would be attackers cannot penetrate through secure closed window assembly.
   5. Provide combined performances within rating limitations knowing certain attacks can result in severe damage to unit and require replacement.

B. Blast Resistant (BR) Assemblies: Manufacturer's window unit assembled with panels, inserts, glazing and framing.
   1. Provide BR rated units where shown or scheduled:
      a. UL 752, Level 3.

C. Thermal Movement: Assembly capable of withstanding thermal movements resulting from ambient range of 67 degrees C (150 degrees F) to 82 degrees C (180 degrees F).

D. Design Performance: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA/WDMA/CSA 101/I.S.2/A440 for AW Class.
   1. Wind Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
   2. Water Infiltration: ASTM E331; no uncontrolled penetration at 300 Pa (6.2 psf), minimum, pressure differential.

3. Air Infiltration: ASTM E283; Maximum 6 L/s/sq. m (0.1 cu. Ft./min./sq. ft.) at static pressure difference of 300 Pa (6.2 psf).

2.2 MATERIALS

A. Stainless Steel: ASTM A666, Type 304; formed stainless steel members.

B. Aluminum Extrusions: ASTM B221.

1. Framing Members: Alloy 6063-T5, -T6, or -T52, or alloy 6061-T6; 5 mm (3/16 inch) minimum thickness.
2. Trim and Stops not exposed to forced entry attack: Alloy 6063-T5, -T6, or -T52; 1.5 mm (1/16 inch) minimum thickness.

C. Steel Shapes/Plates/Bars: ASTM A36/A36M, except where another designation is indicated.

D. Bolts and Fasteners: ASTM A320/A320M; Type 300-series stainless steel screws, bolts, nuts, and washers. Non-removable type where accessible from attack side.

E. Window Cleaner's Bolts: Nonmagnetic stainless steel, complying with safety regulations for window cleaning equipment.

F. Glazing Materials: Rated laminated assembly as specified in Section 08 80 00, GLAZING.

2.3 PRODUCTS - GENERAL

A. Provide blast resistant windows from one manufacturer.

B. Sustainable Construction Requirements:

1. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
2. Aluminum Recycled Content: 80 total recycled content, minimum.

2.4 FABRICATION

A. Assemblies: Shop fabricate matching profiles indicated on Drawings. Make welds that comply with AWS standards; exposed welds ground smooth. Provide welded-in-place reinforcements and anchorage devices.

1. Removable Glazing Stops: Applied to room side of window.
   a. Miter and weld removable stops at corners.
   b. Secure removable stops to frames with countersunk screws, spaced as required for specified performance requirements.
2. New Building: Frame system with inner frame, outer frame, and fasteners to connect frames together.
   a. Fabricate continuous outer frame for masonry embedment as exterior wall is constructed.
   b. Preassemble inner frame with glazing for bolting to outer frame.

c. Provide both frames shall be supplied by one manufacturer.
d. Anchorage: Provide anchors to provide the following:
1) Yield strength: 900 MPa (130,000 psi).
2) Tensile strength: 1033 MPa (150,000 psi).
3. Existing Buildings: Fabricate continuous frame for anchoring to existing wall with expansion anchors.
a. Provide both inner and outer frames by one manufacturer.
b. Anchorage: Provide anchors to provide the following:
1) Yield Strength: 900 MPa (130,000 psi).
2) Tensile Strength: 1240 MPa (180,000 psi).
B. Unit Anchorages: Fabricate metal anchorage system complying with performance requirements.
C. Unit Glazing: Laminated glass assembly meeting UFC 4-010-01 and tested according to ASTM F1642, as specified in Section 08 80 00, GLAZING.

2.5 FINISHES

A. General: Finish fabricated units including framing, sub-framing, hardware, and accessories.
1. Color: WHITE.
B. Stainless Steel: NAAMM AMP 500; No. 4 polished finish, except retain manufacturer's standard mill finish on exposed fasteners and similar devices.
C. Blend welds to match adjacent finish.
D. Aluminum Anodized Finish: NAAMM AMP 500.
1. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
E. Aluminum Paint Finish:
1. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.

2.6 ACCESSORIES

A. Bituminous Paint: SSPC Paint 12 (cold-applied asphalt mastic).
B. Welding Materials: Type to suit application for color match, strength and compatibility in fabricated item.
1. Stainless Steel: AWS D1.6/D1.6M, TIG using rods made from alloyed Type 308 stainless steel.
2. Steel: D1.1/D1.1M.
3. Steel Sheet: D1.3/D1.3M-08.
C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Verify opening is correctly sized and located.
   2. Verify substrate is prepared to receive frame anchors.
B. Protect existing construction and completed work from damage.
C. Apply bituminous coating approximately 30 mils dry film thickness, or other suitable permanent separator, on surfaces of dissimilar metals, and metal surfaces in contact with concrete.
   1. Where the metals are exposed to view, provide a plastic or neoprene separator between dissimilar metals.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.
B. Install window units according to manufacturer's installation instructions.
C. Set units accurately, plumb, and level.
D. Securely anchor to masonry, concrete, and partition framing as shown on approved submittal drawings to withstand specified performance.
E. Anchorage to Existing Building:
   1. Spacing: Maximum 300 mm (12 inch) on center through pre drilled bolt holes in structural frame.
   2. Anchor Diameter: 10 mm (3/8 inch) minimum.
   3. Minimum Embedment and Edge Distances:
      a. Embedment in Concrete: 88 mm (3-1/2 inches).
      b. Embedment in Solid Masonry: 150 mm (6 inches).
      c. Edge Distance: 75 mm (3 inches).
   4. Avoid cutting rebar during concrete anchor installation.
F. Touch up damaged factory finishes.
   1. Repair galvanized surfaces with galvanized repair paint.

3.3 CLEANING

A. Clean exposed window surfaces. Remove temporary labels, contaminants, and stains.
B. Clean glazing according to Section 08 80 00, GLAZING.

3.4 PROTECTION

A. Protect window units from construction operations.
B. Remove protective materials immediately before acceptance.

C. Repair damage.

- - E N D - -

SECTION 08 63 00
METAL-FRAMED SKYLIGHTS

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This section specifies field erected aluminum framed skylights.

1.2 RELATED WORK:

B. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.

C. Field Installed Joint Sealants in Connection with Metal Framed Skylights: Section 07 92 00, JOINT SEALANTS.

D. Glazing: Section 08 80 00, GLAZING.

E. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY ASSURANCE:

A. Qualifications:

1. Approval is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:

   a. Manufacturers Qualifications: Manufacturer with five (5) years continuous documented experience in fabrication and installation of metal framed skylights of type and size required for the project.

   b. Installer Qualifications: An experienced installer with five (5) years continuous documented experience who has specialized in installing metal-framed skylights similar to those indicated for this Project and who is acceptable in writing to the manufacturer.

   c. Manufacturers Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of skylights that are similar to those indicated for this Project in material, design, and extent.

   d. Manufacturer's product submitted has been in satisfactory and efficient use on minimum of three (3) installations similar and equivalent to this project for past three (3) years.

e. Testing Agency Qualifications: ISO 9000. Refer to Performance Requirements and Field Quality Control articles for testing requirements.

f. Product Options: Information on construction documents establishes requirements for aesthetic effects and performance characteristics of metal-framed skylights. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, one another, and adjoining construction. Performance characteristics are indicated by criteria subject to verification by one (1) or more methods including preconstruction testing, field-testing, or in-service performance:

1) Do not modify intended aesthetic effects. If modifications are proposed, submit comprehensive explanatory data for review.

g. Welding: Welding is to be performed by certified welders qualified in accordance with AWS D1.2/D1.2M, using procedures, materials and equipment of the type required for this work.

F. Pre-Installation Conference:

1. Prior to starting installation of skylight system schedule conference with Contracting Officer Representative (COR) to ensure (1) a clear understanding of drawings and specifications; (2) onsite inspection and acceptance of structural and pertinent structural details relating to skylight system; and (3) coordination of work of various trades involved in providing related work. Conference is to be attended by Contractor; personnel directly responsible for installation of skylight system, flashing and sheet metal work and skylight manufacturer. Conflicts are to be resolved and confirmed in writing.

1.4 SUBMITTALS:

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Not Used

C. Installer qualifications.

D. Manufacturer's Literature and Product Data:

1. Manufacturers standard details and fabrication methods.
2. Data on finishing, components, and accessories.
3. Instructions: Submit detail specifications and instructions for installation, and adjustments.
4. Recommendations for maintenance and cleaning of exterior surfaces.

E. Shop Drawings: Show elevations of skylights at 1:5 (3″ = 1′0″) scale, metal gages, details of construction, methods of anchorage, glazing details, and details of installation.

F. Metal finish samples.

G. Design Data: Submit structural and thermal calculations for metal-framed skylights. Structural calculations and design shop drawings are to be signed and sealed by a Structural Engineer registered in state in which project is to be located.

H. Quality control test reports.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Refer to AAMA CW 10 for care and handling of architectural aluminum from shop to site.

B. Inspect materials delivered to site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on non-absorptive strips or wood platforms. Do not cover frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method, except that no coatings or lacquers are to be applied to surfaces to which caulking and glazing compounds must adhere.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Where metal-framed skylights are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying Work.

1.7 WARRANTY

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

B. Manufacturer Warranty: Manufacturer shall their metal-framed skylights for a minimum of ten (10) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.8 APPLICABLE PUBLICATIONS:

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

B. American Architectural Manufacturers Association (AAMA):

501-05.....Methods of Test for Exterior Walls

503-08.....Field Testing of Metal Storefronts, Curtain walls and Sloped Glazing Systems

1503-09.....Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

2605-11.....Superior Performing Organic Coatings on Architectural Aluminum Extrusions and Panels

CW 10-04.....Curtain Wall Manual No. 10 Care and Handling of Architectural Aluminum from Shop to Site

CW 13-85.....Curtain Wall Manual #13 Structural Sealant Glazing Systems

C. ASTM International (ASTM):

A36/A36M-12.....Carbon Structural Steel

A123/A123M-13.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-09.....Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A193/A193M-14.....Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service

A307-14.....Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

B209-14.....Aluminum and Aluminum Alloy Sheet and Plate

B209M-14.....Aluminum and Aluminum Alloy Sheet and Plate (Metric)

B211-12.....Aluminum-Alloy Bar, Rod and Wire

B211M-12.....Aluminum-Alloy Bar, Rod and Wire (Metric)
B221-14.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
B221M-13.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes (Metric)
B316/B316M-10.....Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods
C864-05(R2011).....Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers
C920-14a.....Elastomeric Joint Sealants
D1003-13.....Test Method for Haze and Luminous Transmittance of Transparent Plastics
D1187/D1187M-97(R2011)..Asphalt-Base Emulsions for Use as Protective Coatings for Metal
E283-04(R2012).....Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
E330-02(R2010).....Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
E331-00(R2009).....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
E1105-00(R2008).....Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Differences
E1886-13a.....Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
E1996-14a.....Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes

D. American Welding Society (AWS):
D1.2/D1.2M-14.....Structural Welding Code-Aluminum

E. Glass Association of North America (GANA):
2010 Edition.....GANA Glazing Manual
2008 Edition.....GANA Sealant Manual
2009 Edition.....GANA Laminated Glazing Reference Manual
1999 Edition.....GANA Fully Tempered Heavy Glass Door and Entrance Systems Design Guide.

F. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual

G. National Fenestration Rating Council (NFRC):
100-14.....U-factors
200-14.....Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidents.

H. International Organization for Standardization (ISO):
9000.....International Quality Management System Standards and Guidelines

I. Environmental Protection Agency (EPA):
40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION:

A. Design Requirements:
1. Conform with Blast Proof performance requirements indicated in construction documents.
2. Extruded aluminum members with a system of alternate serrations for attachment of exterior caps and glass supports.
3. Integral guttering system within skylight framing members for positive drainage of condensation. Integral weeping system to drain to exterior.
4. Flush glazed exterior joints as indicated on construction documents.
5. All structural silicone is to be factory applied.
6. Glazing Requirement: Refer to Section 08 80 00, GLAZING for glazing requirements.

2.2 PERFORMANCE REQUIREMENTS:

A. Delegated Design: Engage a qualified Professional Engineer, to design metal-framed skylights to conform with Blast Proof performance requirements.

B. Structural Members: Of sizes to support design loads as indicated on structural construction documents and as outlined below.

C. Deflection of framing member in a direction normal to plane of glass when subjected to a uniform load deflection test in accordance with ASTM E330, Procedure B, and the governing dead, live, snow and wind structural design loads of the project, are not to exceed 1/175 nor 25 mm (1 inch) of its clear span for clear spans less than 6096 mm (20 feet) or 1/240 of clear spans greater than 6096 mm (20 feet).

D. Air Infiltration: When tested in accordance with ASTM E283, are not to exceed 0.03 L/S per sq. m (0.04 cfm per square foot) at a static-air-processing of 75 Pa (1.57 psf) and 0.36 L/s per sq. m (0.07 cfm per square foot) at a static-air-pressure of 300 Pa (6.24 psf) of fixed skylight surface.

E. Water Penetration: No water is to penetrate when skylight is tested in accordance with ASTM E331 at a differential static pressure of 20 percent of inward acting design wind pressure, with a minimum of 300 Pa (6.24 psf).

F. Windborne-Debris-Impact-Resistance: Metal-framed skylights are to pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and testing information in ASTM E1996 for Wind Zone 2 .

   1. Large-Missile Test: For glazed openings located within 9.1 m (30 feet) of grade.

      a. Small-Missile Test: For glazed openings located more than 9.1 m (30 feet) above grade.

G. Thermal Movements: Metal-framed skylights are to allow for thermal movements from ambient and surface temperature changes of less than the following:

   1. Temperature Change: 67 degrees C (120 degrees F), ambient; 100 degrees C (180 degrees F), material surfaces.

H. Condensation Resistance: Metal-framed skylights with fixed glazing and framing areas are to have a condensation-resistance

factor (CRF) of not less than 53 when tested according to AAMA 1503.

1. Haze Factor: Greater than 90 percent when tested according to ASTM D1003.

I. Thermal Performance: Provide metal-framed skylights (inclusive of frames and glass) with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:

1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas are to have U-factor of not more than 4.54 W/sq. m x K (0.80 Btu/sq. ft. x h x degrees F) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas are to have a solar heat gain coefficient of no greater than 0.6 as determined according to NFRC 200.

2.3 MATERIALS:

A. Framework:

1. Principle Supporting Members: 3 mm (0.125 inch) minimum thickness extruded aluminum, alloy 6063-T5, 6063-T6, or 6061-T6 per ASTM B221M (B221). Profiles as indicated on construction documents.
2. Snap-on Covers and Miscellaneous Non-supporting Trim: 1.5 mm (0.062 inch) minimum thickness extruded aluminum, alloy 6063-T5 per ASTM B221M (B221).
3. Principle Formed Metal Members: 3 mm (0.125 inch) minimum thickness aluminum, alloy 5052, 5005, or 6061-T6 per ASTM B209M (B209).
4. Internal Reinforcement: ASTM A36/A36M, steel shapes as required for strength and mullion size limitations, hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

B. Embeds (Concrete and Masonry): Stainless steel embed inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Glazing Strips: ASTM C864:

1. Glass and glazing material as specified in Section 08 80 00, GLAZING.

2. Extruded EDPM rubber designed to comply with the following specifications:
   a. Hardness: 55 +/-5 Durometer.
   b. Tensile Strength: 12410 kPa (1800 psi) minimum.
   c. Elongation: 500 percent minimum (of original benchmark distance).
   d. Color: Black
3. Heat Aging Characteristics:
   a. 70 hours at 100 degrees C (212 degrees F).
   b. Hardness Change: +5 Durometer.
   c. Tensile Change: -10 percent (of original benchmark distance).
   d. Elongation Change: -20 percent (of original benchmark distance).
4. Weather resistance at 1 part ozone per million, 500 hours at 20% elongation (of original benchmark distance): No cracks.
5. No visual checks, cracks or breaks after completion of tests.

D. Setting Blocks:
1. Extruded Type II silicone rubber designed to permit adhesion and comply with the following specifications; comply with ASTM C864:
   a. Hardness: 80+/- Durometer
   b. Color: Black

E. Fasteners:
1. For Exterior Cap Retainers: ASTM A193/A193M B8 300 series stainless steel screws.
2. For Framework Connections: ASTM B211M (B211) 2024-T4 aluminum, ASTM A193/A193M B8 300 series stainless steel, and ASTM B316/B316M aluminum rivets, as required by connection.
3. For Anchoring Skylight to Support Structure: ASTM A307 zinc plated steel fasteners.

F. Flashings: Comply with Section 07 60 00, FLASHING AND SHEET METAL.

G. Glass:
1. Refer to requirements of Section 08 80 00, GLAZING.
2. Glass Sizes and Clearances:

a. Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to comply with applicable minimum clearances as recommended by glass manufacturer. Do not nip glass to remove flares or to reduce oversized dimensions. All cutting is to occur in factory.

H. Framing Sealants: Sealants used inside the weatherproofing system are to have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

I. Bituminous Coating: ASTM D1187/D1187M; Cold-applied asphalt mastic, compounded for 0.4 mm (15 mil) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 FABRICATION:

A. Skylight components are to be of materials and thickness indicated in construction documents. Details indicated are representative of required design and profiles. Unless specifically indicated or specified otherwise, methods of fabrication and assembly is to be at discretion of the manufacturer. Perform fitting and assembling of components in shop to maximum extent practicable. Anchorage devices are to permit adjustment in three (3) directions. No exposed fasteners are permitted.

B. Construct skylight(s) using a continuous aluminum curb with expansion joints as required.

C. Insofar as practicable, fit and assemble work in manufacturer's shop. Work that cannot be permanently assembled is to be shop-assembled, marked and disassembled before shipment to job site.

D. Design rafter bars for snap-in type glazing strips.

E. Attach snap-on cap retainers using stainless steel fasteners into a system of alternate serrations, at a maximum spacing of 305 mm (12 inches) on center.

F. Design snap-on cap retainer fasteners to provide not more than 187 g/mm (10 pounds per linear inch) of compression on glazing strips and glass edge.

G. Use snap-on type caps to conceal snap-on cap retainer fasteners.

H. Where applicable, shop rivet or weld aluminum clips to framing members or field bolt at installation.

I. Set glass with exterior EDPM glazing strips.

J. Use silicone setting blocks to support glass and to provide edge clearances and glass bites as outlined below, in accordance with GANA recommendations:

1. Set blocks not less than 152 mm (6 inches) from edge of glass for support of unit.
2. Glass Bite: Not less than 13 mm (1/2 inch) nor more than 16 mm (5/8 inch) on any side of glass unit.
3. Maintain 6 mm (1/4 inch) edge clearance between glass and adjacent metal framework.
4. Use rubber spacers to maintain separation of glass and adjacent metal framework.

K. Locate weep holes in curb to positively drain condensation to exterior of skylight at each rafter connection.

L. Dissimilar Metals: Separate dissimilar metals with bituminous coating or other separator that will prevent galvanic action.

M. Fasteners: Conceal fasteners wherever possible. Countersink heads of exposed fasteners. Exposed fasteners are to have finish to match framing member into which it is installed.

2.4 METAL FINISHES:

A. High-Performance Organic Finish AAMA 2605: Three coat fluoropolymer finish containing not less than 50 percent PVDF resin by weight in both color and clear coat.

1. Color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Sealants:

1. Structural Flush Glazed Joints: High performance silicone sealant applied in accordance with manufacturer's recommendations.
2. Non-structural Flush Glazed Joints and Weather Seal Joints: Silicone sealants applied in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Prior to installation of skylight system, arrange for representative(s) of skylight manufacturer to examine structure

and substrate to determine that they are properly prepared, sized and ready to receive skylight work included herein.

3.2 INSPECTION AND PREPARATION:

A. Contact between aluminum and dissimilar metals is to receive a protective bituminous coating for prevention of electrolytic action and corrosion.

3.3 INSTALLATION:

A. Install skylight frame, glass and accessory items as needed in accordance with manufacturer's instructions.
B. Install skylight system by factory trained mechanics.
C. Erect system plumb and true in proper alignment and relation to established lines and grades as shown on approved shop drawings.
D. Anchor skylight to structure in strict accordance with approved shop drawings.
E. Provide high-performance silicone sealants to seal horizontal joints between glass panels and silicone sealant to wet seal joints between snap-on cap retainers and glass.
F. Apply sealing materials in accordance with sealant manufacturer's instructions. Before application, remove mortar dirt, dust, moisture and other foreign matter from surfaces it will contact. Mask adjoining surfaces to maintain a clean, neat appearance. Tool sealing compounds to fill joint and provide a smooth finish.

3.4 TOLERANCES:

A. All parts of work, when completed, are to be within the following tolerances:
   1. Maximum variation from plane or location shown on approved shop drawings: 3 mm per 3657 mm (1/8 inch per 12 feet) of length, or 10 mm (3/8 inch) in total length.
   2. Maximum offset from true alignment between two members abutting end-to-end, edge-to-edge in line: .75 mm (1/32 inch).

3.5 FIELD QUALITY CONTROL:

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field quality-control tests and to prepare test reports.
B. Sealant Adhesion Tests: Test installed sealant in a minimum of two (2) areas and as follows:
   1. Test weather seal sealant as recommended in writing by sealant manufacturer.

C. Water-Spray Test: Test skylights for compliance with requirements according to procedures in AAMA 501.

D. Water Penetration: Test skylights for compliance with requirements according to AAMA 503, which requires testing according to ASTM E1105: Uniform Static-Air-Pressure Difference: 20 percent of positive design wind load, but not less than 300 Pa (6.24 lbf/sq. ft.).

E. Repair or replace Work that does not meet requirements or that is damaged by testing; repair or replace to comply with specifications.

3.6 CLEANING:

A. Install skylight frame and associated metal to avoid soiling or smudging finish.

B. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings.

C. Remove excess glazing and sealant compounds, dirt, and other substances.

D. Follow recommendations of skylight manufacturer in selection of cleaning agents. Do not use cleaning agents containing ammonia or other compounds that might damage finished metal surfaces.

E. Clean glass just prior to time of final acceptance of building, subsequent to completion of installation.

3.7 PROTECTION:

A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

- - - E N D - - -

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

A. Caulking: Section 07 92 00 JOINT SEALANTS.

B. Application of Hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, Section 32 31 19, DECORATIVE METAL FENCES AND GATES

C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Painting: Section 09 91 00, PAINTING.

E. Card Readers: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.

F. Electrical: Division 26, ELECTRICAL.

G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 GENERAL

A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.

B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).

C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.

D. Hardware for application on metal doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.

E. The following items shall be of the same manufacturer, except as otherwise specified:

1. Mortise locksets.
2. Hinges for hollow metal and wood doors.
3. Surface applied overhead door closers.
4. Exit devices.

5. Floor closers.

1.4 WARRANTY

A. Automatic door operators shall be subject to the terms of FAR Clause 52.246-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:
   1. Locks, latchsets, and panic hardware: 5 years.
   2. Door closers and continuous hinges: 10 years.

1.5 MAINTENANCE MANUALS

A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

1.6 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies (VISN Locksmith if the VAMC does not have a locksmith).

B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

C. Samples and Manufacturers' Literature:
   1. Samples: All hardware items (proposed for the project) that have not been previously approved by Builders Hardware Manufacturers Association shall be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.
   2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.

D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

1.7 DELIVERY AND MARKING

A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to Resident Engineer for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Resident Engineer's office until all other similar items have been installed in project, at which time the Resident Engineer will deliver items on file to Contractor for installation in predetermined locations on the project.

1.8 PREINSTALLATION MEETING

A. Convene a preinstallation meeting not less than 60 days before start of installation of door hardware. Require attendance of parties directly affecting work of this section, including Contractor and Installer, Architect, Project Engineer and VA Locksmith, Hardware Consultant, and Hardware Manufacturer’s Representative. Review the following:

1. Inspection of door hardware.
2. Job and surface readiness.
3. Coordination with other work.
4. Protection of hardware surfaces.
5. Substrate surface protection.
6. Installation.
7. Adjusting.
8. Repair.
9. Field quality control.
10. Cleaning.

1.9 INSTRUCTIONS

A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols. Symbols for hardware sets consist of letters (e.g., "HW") followed by a

number. Each number designates a set of hardware items applicable to a door type.

C. Keying: A new Great Grandmaster key shall be established for this project. The key system shall be small format (Best size and profile) removable core type as previously described. The key blanks shall be protected by a utility patent with a minimum seven years remaining on the patent from the start of construction, and protected by contract-controlled distribution. The manufacturer shall furnish code pattern listings in both paper and electronic formats so keys may be reproduced by code.; provide electronic format in file type required by project's key control software. The manufacturer shall design the new key system with the capacity to rekey the existing system and also provide for 25 percent expansion capability beyond this requirement. Submit a keying chart for approval showing proposed keying layout and listing expansion capacity.

1. Keying information will be furnished to the Contractor by the Resident Engineer.
2. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify Resident Engineer immediately when and to whom keys or keying information is supplied. Return all such keys to the Resident Engineer.

1.10 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.

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

F883-04.....Padlocks

E2180-07.....Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials

C. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):

A156.1-06.....Butts and Hinges

A156.2-03.....Bored and Pre-assembled Locks and Latches

A156.3-08.....Exit Devices, Coordinators, and Auto Flush Bolts
A156.4-08.....Door Controls (Closers)
A156.5-14.....Cylinders and Input Devices for Locks.
A156.6-05.....Architectural Door Trim
A156.8-05.....Door Controls-Overhead Stops and Holders
A156.11-14.....Cabinet Locks
A156.12-05 .....Interconnected Locks and Latches
A156.13-05.....Mortise Locks and Latches Series 1000
A156.14-07 .....Sliding and Folding Door Hardware
A156.15-06.....Release Devices-Closer Holder, Electromagnetic and Electromechanical
A156.16-08.....Auxiliary Hardware
A156.17-04 .....Self-Closing Hinges and Pivots
A156.18-06.....Materials and Finishes
A156.20-06 .....Strap and Tee Hinges, and Hasps
A156.21-09.....Thresholds
A156.22-05.....Door Gasketing and Edge Seal Systems
A156.23-04.....Electromagnetic Locks
A156.24-03.....Delayed Egress Locking Systems
A156.25-07 .....Electrified Locking Devices
A156.26-06.....Continuous Hinges
A156.28-07 .....Master Keying Systems
A156.29-07 .....Exit Locks and Alarms
A156.30-03 .....High Security Cylinders
A156.31-07 .....Electric Strikes and Frame Mounted Actuators
A156.36-10.....Auxiliary Locks
A250.8-03.....Standard Steel Doors and Frames

D. National Fire Protection Association (NFPA):
80-10.....Fire Doors and Other Opening Protectives
101-09.....Life Safety Code

E. Underwriters Laboratories, Inc. (UL):
Building Materials Directory (2008)

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. ANSI A156.1. Provide only three-knuckle hinges, except five-knuckle where the required hinge type is not available in a three-knuckle version (e.g., some types of swing-clear hinges). The following types

of butt hinges shall be used for the types of doors listed, except where otherwise specified:

1. Exterior Doors: Type A2112/A5112 for doors 900 mm (3 feet) wide or less and Type A2111/A5111 for doors over 900 mm (3 feet) wide. Hinges for exterior outswing doors shall have non-removable pins. Hinges for exterior fire-rated doors shall be of stainless steel material.
2. Interior Doors: Type A8112/A5112 for doors 900 mm (3 feet) wide or less and Type A8111/A5111 for doors over 900 mm (3 feet) wide. Hinges for doors exposed to high humidity areas (shower rooms, toilet rooms, kitchens, janitor rooms, etc. shall be of stainless steel material.

B. Provide quantity and size of hinges per door leaf as follows:

1. Doors up to 1210 mm (4 feet) high: 2 hinges.
2. Doors 1210 mm (4 feet) to 2260 mm (7 feet 5 inches) high: 3 hinges minimum.
3. Doors greater than 2260 mm (7 feet 5 inches) high: 4 hinges.
4. Doors up to 900 mm (3 feet) wide, standard weight: 114 mm x 114 mm (4-1/2 inches x 4-1/2 inches) hinges.
5. Doors over 900 mm (3 feet) to 1065 mm (3 feet 6 inches) wide, standard weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
6. Doors over 1065 mm (3 feet 6 inches) to 1210 mm (4 feet), heavy weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
7. Provide heavy-weight hinges where specified.
8. At doors weighing 330 kg (150 lbs.) or more, furnish 127 mm (5 inch) high hinges.

C. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above and continuous hinges specified below.

2.2 CONTINUOUS HINGES

A. ANSI/BHMA A156.26, Grade 1-600.

1. Listed under Category N in BHMA's "Certified Product Directory."

B. General: Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete

C. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a Teflon-coated 6.35mm (0.25-inch) minimum diameter pin that extends entire length of hinge.
   1. Base Metal for Exterior Hinges: Stainless steel.
   2. Base Metal for Interior Hinges: Stainless steel
   3. Base Metal for Hinges for Fire-Rated Assemblies: Stainless steel
   4. Provide with non-removable pin (hospital tip option) at lockable outswing doors.
   5. Where required to clear adjacent casing, trim, and wall conditions and allow full door swing, provide wide throw hinges of minimum width required.
   6. Provide with manufacturer’s cut-outs for separate mortised power transfers and/or mortised automatic door bottoms where they occur.
   7. Where thru-wire power transfers are integral to the hinge, provide hinge with easily removable portion to allow easy access to wiring connections.
   8. Where models are specified that provide an integral wrap-around edge guard for the hinge edge of the door, provide manufacturer’s adjustable threaded stud and machine screw mechanism to allow the door to be adjusted within the wrap-around edge guard.

2.3 DOOR CLOSING DEVICES

A. Closing devices shall be products of one manufacturer for each type specified.

2.4 OVERHEAD CLOSERS

A. Conform to ANSI A156.4, Grade 1.
B. Closers shall conform to the following:
   1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
   2. Where specified, closer shall have hold-open feature.
   3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
   4. Material of closer body shall be forged or cast.
   5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.

6. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
7. Closers shall have full size metal cover; plastic covers will not be accepted.
8. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
10. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
11. Provide parallel arm closers with heavy duty rigid arm.
12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1 ½″ (38mm) minimum piston diameter.

2.5 FLOOR CLOSERS AND FLOOR PIVOT SETS

A. NOT USED

2.6 DOOR STOPS

A. Conform to ANSI A156.16.
B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.

D. Provide floor stops (Type L02141 or L02161 in office areas; Type L02121 x 3 screws into floor elsewhere. Wall bumpers, where used, must be installed to impact the trim or the door within the leading half of its width. Floor stops, where used, must be installed within 4-inches of the wall face and impact the door within the leading half of its width.

E. Where drywall partitions occur, use floor stops, Type L02141 or L02161 in office areas, Type L02121 elsewhere.

F. Provide stop Type L02011, as applicable for exterior doors. At outswing doors where stop can be installed in concrete, provide stop mated to concrete anchor set in 76mm (3-inch) core-drilled hole and filled with quick-setting cement.

G. Omit stops where floor mounted door holders are required and where automatic operated doors occur.

H. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.

I. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.

J. Provide overhead surface applied stop Type C02541, ANSI A156.8 on patient toilet doors in bedrooms where toilet door could come in contact with the bedroom door.

K. Provide door stops on doors where combination closer magnetic holders are specified, except where wall stops cannot be used or where floor stops cannot be installed within 4-inches of the wall.

L. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).

2.7 OVERHEAD DOOR STOPS AND HOLDERS

A. Conform to ANSI Standard A156.8. Overhead holders shall be of sizes recommended by holder manufacturer for each width of door. Set overhead holders for 110 degree opening, unless limited by building construction or equipment. Provide Grade 1 overhead concealed slide type: stop-only at rated doors and security doors, hold-open type with exposed hold-open on/off control at all other doors requiring overhead door stops.

2.8 FLOOR DOOR HOLDERS

A. Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

2.9 LOCKS AND LATCHES

A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than seven pins. Cylinders for all locksets shall be removable core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer’s fire label. Provide temporary keying device or construction core to allow opening and closing during construction and prior to the installation of final cores.

B. In addition to above requirements, locks and latches shall comply with following requirements:

1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13. Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets shall have lever handles fabricated from cast stainless steel. Provide sectional (lever x rose) lever design matching Corbin Russwin ML2000. No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for emergency entrance. All lock cases installed on lead lined doors shall be lead lined before applying final hardware finish. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.
2. Privacy locks shall have an inside thumbturn for privacy and an outside thumbturn for emergency entrance.

2.10 PUSH-BUTTON COMBINATION LOCKS

A. NOT USED

2.11 ELECTROMAGNETIC LOCKS

A. NOT USED

2.12 ELECTRIC STRIKES

A. NOT USED

2.13 KEYS

A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	**Quantity**
Cylinder locks	2 keys each
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

2.15 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

A. Conform to ANSI Standard A156.6.

B. Provide protective plates as specified below:

1. Kick plates, mop plates and armor plates of metal, Type J100 series.
2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches. Mop plates shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
3. Kick plates and/or mop plates are not required on following door sides:
   a. Armor plate side of doors;
   b. Exterior side of exterior doors;
   c. Closet side of closet doors;
   d. Both sides of aluminum entrance doors.
4. Armor plates for doors are listed under Article "Hardware Sets". Armor plates shall be thickness as noted in the hardware set, 875 mm

(35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Provide armor plates beveled on all 4 edges (B4E). Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top of intermediate rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt push bar.

2.16 EXIT DEVICES

A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.

B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.

C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.

D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.

E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.

F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.17 FLUSH BOLTS (LEVER EXTENSION)

A. Conform to ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.

B. Lever extension manual flush bolts shall only be used at non-fire-rated pairs for rooms only accessed by maintenance personnel.

C. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).

D. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.

E. Provide extension rods for top bolt where door height exceeds 2184 mm (7 feet 2 inches).

2.18 FLUSH BOLTS (AUTOMATIC)

A. NOT USED

2.19 DOOR PULLS WITH PLATES

A. Conform to ANSI A156.6. Pull Type J401, 152 mm CTC (6 inches CTC) length by 19 mm (3/4 inches) diameter minimum with plate Type J302, 90 mm by 381 mm (3-1/2 inches by 15 inches), unless otherwise specified. Provide pull with projection of 57.2 mm (2 1/4 inches) minimum and a clearance of 38.1 mm (1 1/2 inches) minimum. Cut plates of door pull plate for cylinders, or turn pieces where required.

2.20 PUSH PLATES

A. Conform to ANSI A156.6. Metal, Type J302, 203 mm (8 inches) wide by 406.4 mm (16 inches) high. Provide metal Type J302 plates 102 mm (4 inches) wide by 406.4 mm (16 inches) high where push plates are specified for doors with stiles less than 203 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.21 COMBINATION PUSH AND PULL PLATES

A. Conform to ANSI 156.6. Type J303, stainless steel 3 mm (1/8 inch) thick, 80 mm (3-1/3 inches) wide by 800 mm (16 inches) high), top and bottom edges shall be rounded. Secure plates to wood doors with 38 mm (1-1/2 inch) long No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Pull shall be mounted down.

2.22 COORDINATORS

A. Conform to ANSI A156.16. Coordinators, when specified for fire doors, shall comply with Underwriters Laboratories, Inc., requirements for fire door hardware. Coordinator may be omitted on exterior pairs of doors where either door will close independently regardless of the position of the other door. Coordinator may be omitted on interior pairs of non-labeled open where open back strike is used. Open back strike shall not be used on labeled doors. Paint coordinators to match door frames, unless coordinators are plated. Provide bar type coordinators, except where gravity coordinators are required at acoustic pairs. For bar type coordinators, provide filler bars for

full width and, as required, brackets for push-side surface mounted closers, overhead stops, and vertical rod panic strikes.

2.23 THRESHOLDS

A. Conform to ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, thresholds shall be installed in a bed of sealant with ¼-20 stainless steel machine screws and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.

B. For thresholds at elevators entrances see other sections of specifications.

C. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.

D. Provide with miter returns where threshold extends more than 12 mm (0.5 inch) beyond face of frame.

2.24 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET FOR LIGHT PROOF OR SOUND CONTROL DOORS

A. Conform to ANSI A156.22. Provide mortise or under-door type, except where not practical. For mortise automatic door bottoms, provide type specific for door construction (wood or metal).

2.25 WEATHERSTRIPS (FOR EXTERIOR DOORS)

A. Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length (0.000774m^3/s/m).

2.26 MISCELLANEOUS HARDWARE

A. Access Doors (including Sheet Metal, Screen and Woven Wire Mesh Types): Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E07213, conforming to ANSI A156.11. 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. Provide cylinders to operate locking devices where specified for following partitions and doors:

1. Folding doors and partitions.
2. Wicket door (in roll-up door assemblies).
3. Slide-up doors.
4. Swing-up doors.
5. Fire-rated access doors-Engineer's key set.

6. Doors from corridor to electromagnetic shielded room.
7. Day gate on vault door.

C. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door. Provide 2 mutes for each edge of sliding door which would contact door frame.

2.27 PADLOCKS FOR VARIOUS DOORS, GATES AND HATCHES

A. NOT USED

2.28 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS

A. Where lock is shown, equip each cabinet door (metal) with lock Type E06213, conforming to ANSI A156.36. Key locks in Key Sets approved by Contracting Officer. See mechanical drawings and specifications for location of cabinets.

B. Cabinet manufacturer shall supply the hinges, bolts and pulls. Ship locks to cabinet manufacturer for installation.

2.29 HINGED WIRE GUARDS (FOR WINDOWS, DOORS AND TRANSOMS) AND WIRE PARTITION DOORS

A. NOT USED

2.30 FINISHES

A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.

B. 630 Satin Stainless Steel: All surfaces on exterior and interior of buildings, except where other finishes are specified.

C. Miscellaneous Finishes:

1. Hinges --exterior doors: 630.
2. Hinges --interior doors: 630.
3. Pivots: Match door trim.
4. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
5. Thresholds: Mill finish aluminum.

6. Cover plates for floor hinges and pivots: 630.
7. Other primed steel hardware: 600.

2.31 BASE METALS

A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	Base Metal
630	Stainless steel

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA Resident Engineer for approval.

A. For new buildings locate hardware on doors at heights specified below, with all hand-operated hardware centered within 864 mm (34 inches) to 1200 mm (48 inches), unless otherwise noted:

B. Hardware Heights from Finished Floor:

1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
3. Deadlocks centerline of strike 1219 mm (48 inches).
4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
5. Centerline of door pulls to be 1016 mm (40 inches).
6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors. At exterior doors, closers shall be mounted on interior side. Where closers are

mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.

B. Hinge Size Requirements:

Door Thickness	**Door Width**	**Hinge Height**
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	125 mm (5 inches)

3.3 FINAL INSPECTION

A. Installer to provide letter to VA Resident/Project Engineer that upon completion, installer has visited the Project and has accomplished the following:
   1. Re-adjust hardware.
   2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
   3. Identify items that have deteriorated or failed.
   4. Submit written report identifying problems.

3.4 DEMONSTRATION

A. Demonstrate efficacy of mechanical hardware and electrical, and electronic hardware systems, including adjustment and maintenance procedures, to satisfaction of Resident/Project Engineer and VA Locksmith.

3.5 HARDWARE SETS

A. Following sets of hardware correspond to hardware symbols shown on drawings. Only those hardware sets that are shown on drawings will be required. Disregard hardware sets listed in specifications but not shown on drawings.

B. Hardware Consultant working on a project will be responsible for providing additional information regarding these hardware sets. The numbers shown in the following sets come from BHMA standards.

Manufacturer List

Code	Name
AU	AssaAbloy Union
BE	Best Access Systems
CR	AssaAbloy Corbin Russwin
HA	Hager
NG	National Guard
TR	Trimco
VD	Von Duprin

Finish List

Code	Description
AL	Aluminum
626	Satin Chromium Plated
630	Satin Stainless Steel
BLCK	Black
US32D	Stainless Steel, Dull

Hardware Sets

SET #1	**Gate Hardware**		
SET #2			
6 Hinges	AB850 4 1/2 X 4 1/2	630	HA
1 Mortise	ML2000	630	CR
2 Door Closer	DC8000	630	CR
4 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
2 Flush Bolt	AL8208 – 225SS	630	AU
6 Door Silencers	1229A	BLCK	TR
SET #3			
3 Hinges	AB850 4 1/2 X 4 1/2	630	HA
1 Mortise	ML2000	630	CR
1 Door Closer	DC8000	630	CR
2 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Floor Bumper	87001SS	630	AU
3 Door Silencers	1229A	BLCK	TR
1 Threshold	513 x WOD SET IN SEALANT	ALUM	NG
SET #4			
3 Hinges	AB850 4 1/2 X 4 1/2	630	HA
1 Mortise-Privacy	ML2000	630	CR
1 Door Closer	DC8000	630	CR
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Coat Hook	8025SS	630	AU
3 Door Silencers	1229A	BLCK	TR
1 Threshold	STONE As Detailed		
SET #5			
3 Hinges	AB850 4 1/2 X 4 1/2	630	HA
1 Mortise-UTILITY	ML2000	630	CR
1 Door Closer	DC8000	630	CR
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	99022SS	630	AU
3 Door Silencers	1229A	BLCK	TR
1 Threshold	513 x WOD SET IN SEALANT	ALUM	NG

SET #6

3 Hinges	AB850 4 1/2 X 4 1/2	630	HA
1 Mortise	ML2000	630	CR
1 Floor Bumper	87001SS	630	AU
3 Door Silencers	1229A	BLCK	TR

SET #7

3 Hinges	AB850 4 1/2 X 4 1/2	630	HA
1 Exit Device	ED8000	630	CR
1 Mortise	ML2000	630	CR
1 Door Closer	DC8000	630	CR
2 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Floor Bumper	87001SS	630	AU
3 Door Silencers	1229A	BLCK	TR

SET #8 **Sectional Door Hardware**

- - - E N D - - -

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies the following:
   1. Glass.
   2. Glazing materials and accessories for both factory and field glazed assemblies.

1.2 RELATED WORK:

A. Factory glazed by manufacturer in following units:
   1. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
   2. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
   3. Aluminum Windows: Section 08 51 13, ALUMINUM WINDOWS.
   4. Section 08 63 00, METAL-FRAMED SKYLIGHTS.

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 label requirements.
   3. Temporary labels are to remain intact until glass is approved by Contracting Officer Representative (COR).

B. Permanent labels:
   1. Locate in corner for each pane.
   2. Label in accordance with ANSI Z97.1 and SGCC label requirements.
      a. Tempered glass.
      b. Laminated glass or have certificate for panes without permanent label.
   3. Bullet resistance glass or plastic assemblies:
      a. Bullet resistance glass or plastic assemblies in accordance with UL 752 requirements for power rating specified.
      b. Identify each security glazing permanently with glazing manufacturer's name, date of manufacture, product number, and DOS Code number inconspicuously located in lower corner on protective side and visible after glazing is framed.
      c. The "attack (threat) side" is to be identified in bold lettering on each side of glazing with removable label.

1.4 PERFORMANCE REQUIREMENTS:

A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing is to withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.

B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

1. Design glass in accordance with ASTM E1300, and for conditions beyond the scope of ASTM E1300, by a properly substantiated structural analysis.

2. Design Wind Pressures: As indicated on construction documents and in accordance with applicable code.

3. Wind Design Data: As indicated on construction documents and in accordance with applicable code.

4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than the structural capacity of the glazing unit, the threshold at which frame engagement is no longer safely assured, 1/100 times the short-side length, or 19 mm (0.75 inch) whichever is less.

C. Ballistic- and Blast- resistant glass or plastic glazing assemblies:

1. For blast-resistant and ballistic-resistant units comply with requirements in UFC 4-010-01, Physical Security Design Manual for VA Facilities, and project-specific criteria provided by VA.

2. Spall Resistance: Laminated glazing is not permitted to produce spall to interior (protected side) when impacted with scheduled ballistics.

3. Tolerances:

a. Outside dimensions: Overall outside dimensions (height and width) of laminated security glazing is to maintain tolerance of ± 3 mm (± 0.12 inch).

b. Warpage: Out-of-flat (warpage or bowing) condition of laminates is not to exceed 2.5 mm per lineal meter (0.10 inch per 3.3 lineal foot). The condition, if present, is to be localized to extent not greater than 0.75 mm (0.03 inch) for any 0.3 meter (0.98 feet) section.

D. Windborne-Debris-Impact Resistance: Comply with enhanced-protection testing requirements in ASTM E1996 for project wind zone when tested according to ASTM E1886, based upon testing of specimens not less than the size required for project and utilizing installation method identical to that specified for project.

1. Project Wind Zone: Wind Zone 2.
2. Large-Missile Test: For glazing located within 9.1 m (30 feet) of grade.
3. Small-Missile Test: For glazing located more than 9.1 m (30 feet) above grade.

E. Building Enclosure Vapor Retarder and Air Barrier:

1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

1.5 SUBMITTALS:

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Certificates:

1. Not Used
2. Certificate on solar heat gain coefficient when value is specified.
3. Certificate on "R" value when value is specified.
4. Not Used
5. Certificate that blast resistant glass meets the specified requirements.

D. Manufacturer Warranty.

E. Manufacturer's Literature and Data:

1. Glass, each kind required.

2. Insulating glass units.
3. Not Used
4. Elastic compound for metal sash glazing.
5. Not Used
6. Glazing cushion.
7. Sealing compound.
8. Bullet resistive material.

F. Samples:
1. Size: 305 mm by 305 mm (12 inches by 12 inches).

G. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer’s test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.

B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":
1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling to comply with manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
2. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary

breather tubes which do not nullify applicable warranties on hermetic seals.

3. Temporary protections: The glass front and polycarbonate back of glazing are to be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the film used on exposed polycarbonate surfaces is to be approved and applied by manufacturer.
4. Edge protection: To cushion and protect glass clad, and polycarbonate edges from contamination or foreign matter, the four (4) edges are to be sealed the depth of glazing with continuous standard-thickness thermoplastic rubber tape. Alternatively, continuous channel shaped extrusion of thermoplastic rubber are to be used, with flanges extending into face sides of glazing.
5. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 degrees C (60 to 75 degrees F), during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

1.7 PROJECT CONDITIONS:

Field Measurements: Field measure openings before ordering tempered glass products to assure for proper fit of field measured products.

1.8 WARRANTY:

A. Construction Warranty: Comply with the FAR clause 52.246-21 “Warranty of Construction”.
B. Manufacturer Warranty: Manufacturer shall warranty their glazing from the date of installation and final acceptance by the Government as follows. Submit manufacturer warranty.
   1. Bullet resistive plastic material to remain visibly clear without discoloration for 10 years.
   2. Insulating glass units to remain sealed for ten (10) years.
   3. Laminated glass units to remain laminated for five (5) years.
   4. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for ten (10) years.

1.9 APPLICABLE PUBLICATIONS:

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

B. American Architectural Manufacturers Association (AAMA):

800.....Test Methods for Sealants

810.1-77.....Expanded Cellular Glazing Tape

C. American National Standards Institute (ANSI):

Z97.1-14.....Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test

D. American Society of Civil Engineers (ASCE):

7-10.....Wind Load Provisions

E. ASTM International (ASTM):

C542-05(R2011).....Lock-Strip Gaskets

C716-06.....Installing Lock-Strip Gaskets and Infill Glazing Materials

C794-10.....Adhesion-in-Peel of Elastomeric Joint Sealants

C864-05(R2011).....Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

C920-14a.....Elastomeric Joint Sealants

C964-07(R2012).....Standard Guide for Lock-Strip Gasket Glazing

C1036-11(R2012).....Flat Glass

C1048-12.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

C1172-14.....Laminated Architectural Flat Glass

C1349-10.....Standard Specification for Architectural Flat Glass Clad Polycarbonate

C1376-10.....Pyrolytic and Vacuum Deposition Coatings on Flat Glass

D635-10.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastic in a Horizontal Position

D4802-10.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

E84-14.....Surface Burning Characteristics of Building Materials

E119-14.....Standard Test Methods for Fire Test of Building Construction and Material

E1300-12a.....Load Resistance of Glass in Buildings

E1886-13a.....Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

E1996-14a.....Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes

E2141-12.....Test Methods for Assessing the Durability of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units

E2190-10.....Insulating Glass Unit

E2240-06.....Test Method for Assessing the Current-Voltage Cycling Stability at 90 Degree C (194 Degree F) of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units

E2241-06.....Test Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units

E2354-10.....Assessing the Durability of Absorptive Electrochromic Coatings within Sealed Insulating Glass Units

E2355-10.....Test Method for Measuring the Visible Light Transmission Uniformity of an Absorptive Electrochromic Coating on a Glazing Surface

F1233-08.....Standard Test Method for Security Glazing Materials and Systems

F1642-12.....Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

E. Code of Federal Regulations (CFR):

16 CFR 1201-10.....Safety Standard for Architectural Glazing Materials

F. Glass Association of North America (GANA):

2010 Edition.....GANA Glazing Manual
2008 Edition.....GANA Sealant Manual
2009 Edition.....GANA Laminated Glazing Reference Manual
2010 Edition.....GANA Protective Glazing Reference Manual

G. International Code Council (ICC):
IBC.....International Building Code

H. Insulating Glass Certification Council (IGCC)

I. Insulating Glass Manufacturer Alliance (IGMA):
TB-3001-13.....Guidelines for Sloped Glazing
TM-3000.....North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use

J. Intertek Testing Services – Warnock Hersey (ITS-WHI)

K. National Fire Protection Association (NFPA):
80-16.....Fire Doors and Windows
252-12.....Fire Tests of Door Assemblies
257-12.....Standard on Fire Test for Window and Glass Block Assemblies

L. National Fenestration Rating Council (NFRC)

M. Safety Glazing Certification Council (SGCC) 2012:
Certified Products Directory (Issued Semi-Annually).

N. Underwriters Laboratories, Inc. (UL):
9-08(R2009).....Fire Tests of Window Assemblies
263-14.....Fire Tests of Building Construction and Materials
752-11.....Bullet-Resisting Equipment.

O. Unified Facilities Criteria (UFC):
4-010-01-03(R2007).....DOD Minimum Antiterrorism Standards for Buildings

P. U.S. Veterans Administration:
Physical Security Design Manual for VA Facilities (VAPSDG); Life Safety Protected
Physical Security Design Manual for VA Facilities (VAPSDG); Mission Critical Facilities
Architectural Design Manual for VA Facilities (VASDM)

Q. Environmental Protection Agency (EPA):
40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCT

2.1 GLASS:

A. Provide minimum thickness stated and as additionally required to meet performance requirements.
   1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.
B. Obtain glass units from single source from single manufacturer for each glass type.

C. Clear Glass:
   1. ASTM C1036, Type I, Class 1, Quality q3.

D. Tinted Heat reflective and low emissivity coated glass:
   1. ASTM C1036, Type I, Class 2, Quality q3.

2.2 HEAT-TREATED GLASS:

A. Roller Wave Limits for Heat-Treated Glass: Orient all roller wave distortion parallel to bottom surface of glazing, and provide units complying with the following limitations:
   1. Measurement Parallel to Line: Maximum peak to valley 0.203 mm (0.008 inch).
   2. Measurement Perpendicular to Line: Maximum 0.0254 mm (0.001 inch).
   3. Bow/Warp: Maximum 50 percent of bow and warp allowed by ASTM C1048.
B. Clear Tempered Glass:
   1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.5 PLASTIC GLAZING:

A. Clear Polycarbonate Sheet:
   1. ASTM C1349, Appendix X1, Type II, (coated mar-resistant, UV stabilized), with coating on both sides. Flame spread of 10 or less when tested per ASTM E84.
   2. Glass Pane Thickness: 0.375 inches.

2.6 LAMINATED GLASS:

A. Laminated Glass: ASTM C1172. Two or more lites of glass bonded with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-

transparent-resin interlayer complying with interlayer manufacturer's written instructions.

B. Interlayer: Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing unless otherwise indicated in construction documents and scheduled.

C. Interlayer: Use 1.5 mm (0.060 inch) thick interlayer for:
   1. Horizontal or sloped glazing.

D. Interlayer Color: Clear, unless otherwise indicated in construction documents and scheduled.

2.7 SECURITY GLAZING ASSEMBLY:

A. Blast Resistance: Provide exterior security glazing units and interior security glazing units providing protection based upon hazard rating as scheduled, in accordance with ASTM F1642, and peak pressure and positive phase impulse indicated.

B. Laminated Glass Security Glazing Units: Fabricate from multiple lites of scheduled glass with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-transparent resin interlayers between the layers of glazing.

2.8 INSULATING GLASS UNITS:

A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.

B. Assemble units using glass types specified in Insulating Glass Schedule.

2.12 GLAZING ACCESSORIES:

A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work are to have a finish that will not corrode or stain while in service.

B. Setting Blocks: ASTM C864:
   1. Silicone type.
   2. Channel shape; having 6 mm (1/4 inch) internal depth.
   3. Shore A hardness of 80 to 90 Durometer.
   4. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.

5. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
6. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.

C. Spacers: ASTM C864:
1. Channel shape having a 6 mm (1/4 inch) internal depth.
2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
3. Lengths: 25 to 76 mm (1 to 3 inches).
4. Shore A hardness of 40 to 50 Durometer.

D. Glazing Tapes:
1. Semi-solid polymeric based closed cell material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
3. Complying with AAMA 800 for the following types:
   a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

H. 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.

I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

J. Glazing Sealants: ASTM C920, silicone neutral cure:
1. Type S.
2. Class 25 or 50 as recommended by manufacturer for application.
3. Grade NS.
4. Shore A hardness of 25 to 30 Durometer.

L. 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.
M. Color:
   1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames to match color of the finished aluminum and be nonstaining.
   2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted are to be black

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verification of Conditions:
   1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
   2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer is approved shop drawings.
B. Review for conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation. Do not proceed with installation until unsatisfactory conditions have been corrected.
C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units.

3.2 PREPARATION:

A. For sealant glazing, prepare glazing surfaces in accordance with GANA Sealant Manual.
B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
D. Verify that components used are compatible.
E. Clean and dry glazing surfaces.
F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION – GENERAL:

A. Install in accordance with GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, and IGMA TM-3000 unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
C. Set glazing without bending, twisting, or forcing of units.
D. Do not allow glass to rest on or contact any framing member.
E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
G. Plastic:
   1. Use dry glazing method.
   2. Use only neoprene or EPDM gaskets.
H. Laminated Glass:
   1. Tape edges to seal interlayer and protect from glazing sealants.
   2. Do not use putty or glazing compounds.
I. Insulating Glass Units:
   1. Glaze in compliance with glass manufacturer's written instructions.
   2. When glazing gaskets are used, they are to be of sufficient size and depth to cover glass seal or metal channel frame completely.
   3. Do not use putty or glazing compounds.
   4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
   5. Install with tape or gunnable sealant in wood sash.

3.5 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING):

A. Cut glazing 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.

3.6 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
C. Place setting blocks at 1/4 points with edge block no more than 152 mm (6 inches) from corners.
D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line. Sealant type is to be compatible with glazing tape.
G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 INSTALLATION - WET METHOD (SEALANT AND SEALANT):

A. Place setting blocks at 1/4 points and install glazing pane or unit.
B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
C. Fill gaps between glazing and stops with sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.
D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.9 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT):

A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line. Sealant type is to be compatible with glazing tape.
F. Trim protruding tape edge.

3.10 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND):

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 600 mm (24 inch) centers, kept 6 mm (1/4 inch) below sight line.
B. Locate and secure glazing pane using spring wire clips.
C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.13 REPLACEMENT AND CLEANING:

A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COR.
B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.14 PROTECTION:

A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.18 INSULATING LAMINATED GLASS SCHEDULE (FORCE PROTECTION AND PHYSICAL SAFETY):

A. Glass Type IL# 01 : Clear insulating laminated glass.
   1. Overall Unit Thickness: 25 mm (1 inch).
   2. Outdoor Lite: Clear polycarbonate.
      a. Minimum Thickness of Outdoor Lite: 6 mm (0.23 inch).
   3. Interspace Content: Air.
   4. Indoor Lite: Clear laminated glass with two lites of fully tempered float glass.
      a. Minimum Thickness of Each Glass Lite: 4 mm (0.16 inch).

b. Interlayer Thickness: 0.76 mm (0.030 inch).

5. Visible Light Transmittance: 100% percent minimum.
6. Solar Heat Gain Coefficient: N/A.

7. Safety glazing label required.

9. Blast Resistance: Provide units meeting the following:
   a. GP Value .

B. Glass Type IL# 02 Low-E-coated, clear insulating laminated glass.
   1. Overall Unit Thickness: 25 mm (1 inch).
   2. Outdoor Lite: Clear tempered float glass.
      a. Minimum Thickness of Each Glass Lite: 4 mm (0.16 inch).
      b. Interlayer Thickness: 0.76 mm (0.030 inch).
   3. Interspace Content: Argon.
   4. Indoor Lite: Clear fully tempered float.
      a. Minimum Thickness of Each Glass Lite: 4 mm (0.16 inch).
      b. Interlayer Thickness: 0.76 mm (0.030 inch).
   5. Low-E Coating: Sputtered on second surface.

   6. Visible Light Transmittance: 100 percent minimum.

   7. Blast Resistance: Provide units meeting the following:
      a. GP Value.

C. Glass Type IL# 03 Low-E-coated, ceramic-coated clear insulating laminated glass for skylights.
   1. Overall Unit Thickness: 30 mm (1-1/4 inch).
   2. Outdoor Lite: Clear laminated tempered float.
      a. Minimum Thickness of Each Glass Lite: 6 mm (0.23 inch).
      b. Interlayer Thickness: 1.52 mm (0.060 inch).
      c. Tint Color: Clear.
   3. Interspace Content: Argon.
   4. Indoor Lite: Clear laminated tempered float.
      a. Minimum Thickness of Each Glass Lite: 6 mm (0.23 inch).
      b. Interlayer Thickness: 1.52 mm (0.060 inch).
   5. Low-E Coating: Sputtered on second surface.

6. Ceramic Coating Color and Frit Pattern: 3 mm (0.12 inch) dot, 30 percent coverage, white as selected from manufacturer's full range.
   a. Coating location: Silk-screened on third surface.

7. Visible Light Transmittance: 95 percent minimum.

9. Safety glazing label required.

10. Windborne debris-resistant glazing unit required.

11. Blast Resistance: Provide units meeting the following:
    a. GP Value.

- - - E N D - - -

SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK:

A. Color of finish: Exterior - WHITE.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:

1. Each type, showing material, finish, size of members, operating devices, method of assembly, and installation and anchorage details.

C. Manufacturer's Literature and Data:

1. Each type of louver and vent.

D. Color samples.

1.4 APPLICABLE PUBLICATIONS:

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

B. The Master Painters Institute (MPI):
Approved Product List – Updated Monthly

C. ASTM International (ASTM):

A240/A240M-14.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A653/A653M-13.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A1008/A1008M-13.....Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability

B209-14.....Aluminum and Aluminum Alloy, Sheet and Plate

B209M-14.....Aluminum and Aluminum Alloy, Sheet and Plate (Metric)

B221-14.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
B221M-13.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
D1187/D1187M-97(R2011)..Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual

E. National Fire Protection Association (NFPA):
90A-15.....Installation of Air Conditioning and Ventilating Systems

G. American Architectural Manufacturers Association (AAMA):
2605-13.....High Performance Organic Coatings on Architectural Extrusions and Panels

H. Air Movement and Control Association, Inc. (AMCA):
500-L-07.....Testing Louvers

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum, Plate and Sheet: ASTM B209M (B209); alloy 3003 or 5005 with temper as required for forming.

B. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or indicated in construction documents, to be toggle or expansion bolts of size and type as required for each specific type of installation and service condition.

1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel or aluminum with same finish as louvers.
3. Fasteners for louvers, louver frames and wire guards within mental health areas to be non-removable/tamper-proof type.

C. Inorganic Zinc Primer: MPI No. 19.

D. Bituminous Coating: ASTM D1187/D1187M; cold applied asphalt mastic emulsion.

2.2 EXTERIOR WALL LOUVERS:

A. General:

1. Provide fixed and operable type louvers of size and design shown.
2. Heads, sills and jamb sections are to have formed caulking slots or be designed to retain caulking. Head sections are to have exterior drip lip, and sill sections an integral water stop.
3. Furnish louvers with sill extension or separate sill as shown.
4. Frame is to be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Performance Characteristics:
1. Weather louvers are to have a minimum of 50 percent free area and to pass 245.1 mm/s (804 fpm) free area velocity at a pressure drop not exceeding 3.05 mm (0.12 inch) water gage when tested per AMCA Standard 500-L.
2. Louvers are to bear AMCA certified rating seals for air performance and water penetration ratings.

C. Aluminum Louvers:
1. General: Frames, blades, sills (sliding interlocking type); 2 mm (0.078-inch) thick extruded 6063-T5 or –T52 aluminum. Blades to be standard type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames are not to exceed 1676 mm (66 inches) wide. When openings exceed 1676 mm (66 inches), provide twin louvers separated by mullion members.
3. Louvers are to withstand the effects or gravity loads and the following wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors.
   a. Wind load acting inward or outward of not less than 1436 Pa (30 lb. per sq. ft.).
4. Louvers, operable: Louver frame opening sizes, single louver sizes and mullion requirements are to be as specified for fixed louvers.
   a. Blades: Attach blades to frame with aluminum pivot pins through nylon bearings. Fasten each blade to stainless steel operation arms that are connected to minimum 3 mm (1/8-inch) thick stainless steel operating bar arranged for simultaneous operation of blades.

b. Motor operation: Motor operated by approved electric motor. Motors are to be removable and located at jambs of louver. Connect motor operator lever arm to operating bar by means of stainless steel connecting rod.

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

A. Fabricate from 2 mm (0.078-inch) thick stainless steel or aluminum.

B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.

C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as indicated in construction documents.

2.4 WIRE GUARDS:

A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.

B. Fabricate frames from 2 mm (0.078-inch) thick extruded or sheet aluminum designed to retain wire mesh.

C. Wire mesh to be woven from not less than 1.3 mm (0.05-inch) diameter stainless steel wire in 13 mm (1/2-inch) square mesh.

D. Miter corners and join by concealed corner clips or locks extending not less than 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over 1219 mm (4 feet) in height with a mid-rail constructed as specified for frame components.

E. Fasten frames to outside of louvers with aluminum or stainless steel devices of same finish as louvers designed to allow removal and replacement without damage to the wire guard or the louver.

2.11 FINISH:

A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505

B. Aluminum Louvers, Wire Guards:

1. Organic Finish: AAMA 2605 (Fluorocarbon coating) with total dry film thickness of not less than 0.03 mm (1.2 mil), color: WHITE.

2.12 PROTECTION:

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous coating (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.

B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.

C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on organic finish is not approved.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set work accurately, in alignment and where indicated in construction documents. Install plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.

C. Provide anchoring devices including continuous stainless steel 2″ angle frames and fasteners as shown and as necessary for securing louvers to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.

D. Set wall louvers in masonry walls during progress of the work. If wall louvers are not delivered to job in time for installation in prepared openings, make provision for later installation.

3.2 CLEANING AND ADJUSTING:

A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum are to be cleaned as recommended by the manufacturer and protected from damage until completion of the project.

B. All movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Contracting Officer Representative (COR) damaged units and replace with new units.

- - - E N D - - -

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.

B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.

C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.

D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS, Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.

B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.

C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Studs, runners and accessories.
2. Hanger inserts.
3. Channels (Rolled steel).
4. Furring channels.
5. Screws, clips and other fasteners.

C. Shop Drawings:

1. Typical ceiling suspension system.

2. Typical metal stud and furring construction system including details around openings and corner details.
3. Typical shaft wall assembly
4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

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

B. American Society For Testing And Materials (ASTM)

A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire

A653/653M-11.....Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

C11-10.....Terminology Relating to Gypsum and Related Building Materials and Systems

C635-07.....Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings

C636-08.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

C645-09.....Non-Structural Steel Framing Members

C754-11.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

C841-03(R2008).....Installation of Interior Lathing and Furring

C954-10.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

E580-11.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

PART 2 - PRODUCTS

2.1 PROTECTIVE COATING

Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

2.2 STEEL STUDS AND RUNNERS (TRACK)

A. ASTM C645, modified for thickness specified and sizes as shown.
   1. Use C 645 steel, 0.75 mm (0.0296-inch) minimum base-metal (30 mil).
   2. Runners same thickness as studs.
B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
C. Doubled studs for openings and studs for supporting concrete backer-board.
D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
E. Shaft Wall Framing:
   1. Conform to rated wall construction.
   2. C-H Studs or C-T Studs.

2.3 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.
B. Resilient furring channels:
   1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
   2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.
C. "Z" Furring Channels:
   1. Not less than 0.45 mm (0.0179-inch)-thick base metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
   2. Web furring depth to suit thickness of insulation.
D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.
B. For fire rated construction: Type and size same as used in fire rating test.

C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:

1. ASTM A641, soft temper, Class 1 coating.
2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:

1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened. Do Not Use Power Actuated Fasteners on Clay Tile.

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 – SEE ALSO DRAWINGS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than 16 inches on center.

C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.

D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.

E. Extend studs to underside of structure overhead for all partitions.

G. Openings:

1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.

H. Fastening Studs:

1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.

I. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.

K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 16 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 16 inches on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 16 inches on center.
3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

A. Conform to UL Design No. U438 for two-hour fire rating. Provide one hour fire rating Shaft wall where shown.

B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.

C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.

D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.

E. Suitably frame all openings to maintain structural support for wall:

1. Provide necessary liner fillers and shims to conform to label frame requirements.
2. Frame openings cut within a liner panel with E studs around perimeter.
3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

3.6 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.

1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
2. Space framing at 400 mm (16 inches) centers for gypsum board anchorage.

B. New exposed concrete slabs:

1. Use metal inserts required for attachment and support of hangers or hanger wires with tied wire loops for embedding in concrete.
2. Furnish for installation under Division 3, CONCRETE.
3. Suspended ceilings under concrete rib construction shall have runner channels at right angles to ribs and be supported from ribs with hangers at ends and at 1200 mm (48-inch) maximum intervals along channels. Stagger hangers at alternate channels.

C. Concrete slabs on steel decking composite construction:

1. Use pull down tabs when available.

2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.

D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.

E. Existing concrete construction exposed or concrete on steel decking:

1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.

F. Steel decking without concrete topping:

1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.

G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):

1. Install only for ceilings to receive screw attached gypsum board.
2. Install in accordance with ASTM C636.
   a. Install main runners spaced 1200 mm (48 inches) on center.
   b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
   c. Install wall track channel at perimeter.

H. Installing Ceiling Bracing System:

1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.
2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

3.7 TOLERANCES

A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.

B. Plumb and align vertical members within 3 mm (1/8-inch.)

C. Level or align ceilings within 3 mm (1/8-inch.)

- - - E N D - - -

SECTION 09 30 13
CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies ceramic, porcelain and quarry tile, marble thresholds and window stools, crack isolation membranes, tile backer board.

1.2 RELATED WORK

A. Preformed sealant joints in tile flooring: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.

B. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.

C. Color, texture and pattern of field tile and trim shapes, size of field tile, trim shapes, and color of grout specified: See Drawing # AF-201 for Finish schedule.

D. Metal and resilient edge strips at joints with new resilient flooring, and carpeting: Section 09 65 19, RESILIENT TILE FLOORING Section 09 68 00, CARPETING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:

1. Porcelain tile, each type, color, patterns and size.
2. Wall tile, each color, size and pattern.
3. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.

C. Product Data:

1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
2. Cementitious backer unit.
3. Dry-set Portland cement mortar and grout.
4. Divider strip.
5. Elastomeric membrane and bond coat.
6. Reinforcing tape.
7. Leveling compound.
8. Latex-Portland cement mortar and grout.
9. Commercial Portland cement grout.
10. Organic adhesive.

11. Slip resistant tile.
12. Waterproofing isolation membrane.
13. Fasteners.

D. Certification:

1. Master grade, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:

   a. Modified epoxy emulsion.
   b. Commercial Portland cement grout.
   c. Cementitious backer unit.
   d. Dry-set Portland cement mortar and grout.
   e. Elastomeric membrane and bond coat.
   f. Reinforcing tape.
   g. Latex-Portland cement mortar and grout.
   h. Leveling compound.
   i. Organic adhesive.
   j. Waterproof isolation membrane.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

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

B. American National Standards Institute (ANSI):

1.	A10.20-05	Safety Requirements for Ceramic Tile, Terrazzo, and Marble Works
2.	A108.1A-05	Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar
3.	A108.1B-05	Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with dry-Set or latex-Portland Cement Mortar
4.	A108.1C-05	Contractors Option; Installation of Ceramic Tile in the Wet-Set method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar
5.	A108.4-05	Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesives
6.	A108.5-05	Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
7.	A108.6-05	Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy

8. A108.8-05 Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout
9. A108.10-05 Installation of Grout in Tilework
10. A108.11-05 Interior Installation of Cementitious Backer Units
11. A108.13-05 Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone
12. A118.1-05 Dry-Set Portland Cement Mortar
13. A118.3-05 Chemical Resistant, Water Cleanable Tile-Setting Epoxy and Water Cleanable Tile-Setting and Grouting Epoxy Adhesive
14. A118.4-05 Latex-Portland Cement Mortar
15. A118.5-05 Chemical Resistant Furan Mortars and Grouts for Tile Installation
16. A118.6-05 Standard Cement Grouts for Tile Installation
17. A118.9-05 Cementitious Backer Units
18. A118.10-05 Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation
19. A136.1-05 Organic Adhesives for Installation of Ceramic Tile
20. A137.1-88 Ceramic Tile

C. American Society For Testing And Materials (ASTM):

1. A185-07 Steel Welded Wire Fabric, Plain, for Concrete Reinforcing
2. C109/C109M-07 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or (50-mm) Cube Specimens)
3. C241-90 (R2005) Abrasion Resistance of Stone Subjected to Foot Traffic
4. C348-02 Standard Test Method for Flexural Strength of Hydraulic- Cement Mortars
5. C627-93(R2007) Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
6. C954-07 Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 in thickness
7. C979-05 Pigments for Integrally Colored Concrete
8. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Panel Products
9. C1027-99(R2004) Determining "Visible Abrasion Resistance on Glazed Ceramic Tile"
10. C1028-07 Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull Meter Method
11. C1127-01 Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
12. C1178/C1178M-06 Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
13. D4397-02 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
14. D5109-99(R2004) Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards

D. Marble Institute of America (MIA):

1. Design Manual III-2007

E. Tile Council of America, Inc. (TCA):

1. 2007 Handbook for Ceramic Tile Installation

PART 2 - PRODUCTS

2.1 TILE

A. Comply with ANSI A137.1, Standard Grade, except as modified:

1. Inspection procedures listed under the Appendix of ANSI A137.1.
2. Abrasion Resistance Classification:

a. Tested in accordance with values listed in Table 1, ASTM C 1027.
b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms
c. Class IV, 6000 revolutions for remaining areas.

3. Slip Resistant Tile for Floors:

a. Coefficient of friction, when tested in accordance with ASTM C1028, required for level of performance:

1) Not less than 0.7 (wet condition) for bathing areas.
2) Not less than 0.8 on ramps for wet and dry conditions.
3) Not less than 0.6, except 0.8 on ramps as stated above, for wet and dry conditions for other areas.

b. Porcelain Paver Tile: Matte surface finish.

4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.
5. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
6. Factory-Applied Temporary Protective Coating:

a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax, applied hot.
b. Do not coat unexposed tile surfaces.
c. Pre-wax tiles set or grouted with latex modified mortars.

B. Glazed Wall Tile: Cushion edges, glazing, as specified on the drawings .

C. Porcelain Paver Tile: Nominal 8 mm (3/8 inch) thick, with cushion

edges. Porcelain tile produced by the dust pressed method shall be made of approximately 50% feldspar; the remaining 50% shall be made up of various high-quality light firing ball clays yielding a tile with a water absorption rate of 0.5% or less and a breaking strength of between 390 to 400 pounds.

D. Trim Shapes:

1. Conform to applicable requirements of adjoining floor and wall tile.
2. Use trim shapes sizes conforming to size of adjoining field wall tile.
3. Internal and External Corners:

   a. Square internal and external corner joints are not acceptable.
   b. External corners including edges: Use bullnose shapes.
   c. Internal corners: Use cove shapes.
   d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
   e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
   f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
   g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.
   h. For unglazed ceramic mosaic and glazed wall tile installed in Portland cement mortar setting bed, use cove and bullnose shapes as applicable. When ceramic mosaic wall and base tile is required, use C Series cove and bullnose shapes.
   i. For unglazed ceramic mosaic and glazed wall tile installed in dry-set Portland cement mortar, latex-Portland cement mortar, and organic adhesive (thin set methods), use cove and surface bullnose shapes as applicable.
   j. Provide cove and bullnose shapes where shown, and required to complete tile work.

2.2 CEMENTITIOUS BACKER UNITS

A. Use in showers or wet areas.

B. ANSI A118.9.

C. Use Cementitious backer units in maximum available lengths.

D. Backer unit meet or exceed the following additional physical properties:

Property	Test Method	Value
Water absorption	ASTM C948	Less than 20 percent by weight

2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS

A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) Tape with pressure sensitive adhesive backing will not be permitted.

B. Joint material, including reinforcing tape, and tape embedding material, shall be as specifically recommended by the backer unit manufacturer.

2.4 GLASS MAT WATER RESISTANT GYPSUM BACKER BOARD

A. Confirm to ASTM C1178/C1178M, Optional System for Cementitious Backer Units.

2.5 SETTING MATERIALS OR BOND COATS

A. Conform to TCA Handbook for Ceramic Tile Installation.

B. Latex-Portland Cement Mortar: ANSI A118.4.

1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.
2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of Portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

C. Organic Adhesives: ANSI A136.1, Type 1.

D. Waterproofing Isolation Membrane:

1. Sheet System TCA F122-02.
2. Optional System to elastomeric waterproof membrane.
3. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene sheet reinforced on both sides with a non-woven polyester fiber.
4. Designed for use in wet areas as an isolation and positive waterproofing membranes for thin-set bonding of sheet to substrate and thin-set bonding of ceramic and porcelain tile or marble to sheet. Suited for both horizontal and vertical applications.

5. Manufacturer’s standard sheet size with prefabricated or preformed inside and outside corners.
6. Sheet manufacturer’s solvent welding liquid or xylene and edge sealant.

2.6 GROUTING MATERIALS

A. White Portland Cement Grout:

1. ANSI A118.6.
2. Use one part white Portland cement to one part white sand passing a number 30 screen.
3. Color additive not permitted.

B. Latex-Portland Cement Grout: ANSI A118.6 color as specified.

1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.
2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.

2.7 PATCHING AND LEVELING COMPOUND

A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

B. Shall have minimum following physical properties:

1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.
2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).
3. Tensile strength - 600 psi per ANSI 118.7.
4. Density – 1.9.

C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 100 mm (four inches) thick with fillers, being brought to a feather edge, and being trowelled to a smooth finish.

D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.

E. Ready for use in 48 hours after application.

2.8 METAL DIVIDER STRIPS

A. Terrazzo type divider strips.

B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1-1/2 inch) long leg.

C. Embedded leg perforated and deformed for keying to mortar.

D. Aluminum or brass as specified see drawing AF-201.

2.9 WATER

A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.10 CLEANING COMPOUNDS

A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

B. Materials containing acid or caustic material not acceptable.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three days after installation.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.

C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).

D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).

E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after fourth day of completion of tile work.

3.2 ALLOWABLE TOLERANCE

A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:

1. Not more than 1 in 500 (1/4 inch in 10 feet) from required elevation where Portland cement mortar setting bed is used.
2. Not more than 1 in 1000 (1/8 inch in 10 feet) where dry-set Portland cement, and latex-Portland cement mortar setting beds and chemical-resistant bond coats are used.

B. Variation in Plane of Wall Surfaces:

1. Not more than 1 in 400 (1/4 inch in eight feet) from required plane where Portland cement mortar setting bed is used.
2. Not more than 1 in 800 (1/8 inch in eight feet) where dry-set or latex-Portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

A. Patching and Leveling:

1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.

    a. Thickness of compound as required to bring finish tile system to elevation shown.
    b. Float finish.
    c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

B. Walls:

1. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

C. Existing Floors and Walls:

1. Remove existing composition floor finishes and adhesive. Prepare surface by grinding, chipping, self-contained power blast cleaning or other suitable mechanical methods to completely expose uncontaminated concrete or masonry surfaces. Follow safety requirements of ANSI A10.20.
2. Remove existing concrete fill or topping to structural slab. Clean and level the substrate for new setting bed and waterproof membrane or cleavage membrane.

3.4 CEMENTITIOUS BACKER UNITS

A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.

B. Install in accordance with ANSI A108.11 except as specified otherwise.

C. Install units horizontally or vertically to minimize joints with end joints over framing members. Units with rounded edges; face rounded edge away from studs to form a V joint for joint treatment.

D. Secure cementitious backer units to each framing member with screws spaced not more than 200 mm (eight inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.

E. Where backer unit joins shower pans or waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top

one-inch of turned up waterproof systems.

F. Do not install joint treatment for seven days after installation of cementitious backer unit.

G. Joint Treatment:

1. Fill horizontal and vertical joints and corners with latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.
2. Leave 6 mm (1/4 inch) space for sealant at lips of tubs, sinks, or other plumbing receptors.

3.5 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD

A. Install in accordance with manufacturer’s instructions. TCA Systems W245-01.

B. Treat joints with tape and latex-Portland cement mortar or adhesive.

3.6 METAL DIVIDER STRIPS

A. Install metal divider strips in floor joints between ceramic and quarry tile floors and between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise.

B. Set divider strip in mortar bed to line and level centered under doors or in openings.

C. At preformed sealant joint: Refer to Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.

1. Comply with recommendations in TCA "Handbook for Ceramic Tile Installation" Vertical and Horizontal Joint Design Essentials. TCA System EJ 171-02.

   a. Locate joint in tile surfaces directly above joint in sub-floor or where indicated when used with isolation membranes to allow off-setting of joint location from sub-floor joint.
   b. Fasten full length to sub-floor using a construction adhesive.
   c. Trowel setting material with full coverage over the entire leg.

2. Set tile up against the joint ensuring that the top edge of the joint is flush or slightly below the top of the tile.

3.7 CERAMIC TILE - GENERAL

A. Comply with ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" applicable to methods of installation.

B. Comply with TCA Installation Guidelines:

C. Setting Beds or Bond Coats:

1. Set floor tile in elastomeric bond coat over elastomeric membrane ANSI 108. 13, TCA System F122all toilet and where shown.
   a.
2. Set wall tile installed over concrete backer board in latex-Portland cement mortar, ANSI A108.1B.
3. Set tile installed over gypsum board and gypsum plaster in organic adhesive, ANSI A108.4, TCA System W242-02.
4. Set trim shapes in same material specified for setting adjoining tile.

D. Workmanship:

1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.
3. Form intersections and returns accurately.
4. Cut and drill tile neatly without marring surface.
5. Cut edges of tile abutting penetrations, finish, or built-in items:

   a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
   b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.

6. Completed work shall be free from hollow sounding areas and loose, cracked or defective tile.
7. Remove and reset tiles that are out of plane or misaligned.
8. Floors:

   a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.
   b. Align finish surface of new tile work flush with other and existing adjoining floor finish where shown.
   c. In areas where floor drains occur, slope to drains where shown.
   d. Shove and vibrate tiles over 200 mm (8 inches) square to achieve full support of bond coat.

9. Walls:

   a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights shown with tile.
   b. Finish reveals of openings with tile, except where other finish materials are shown or specified.
   c. At window openings, provide tile stools and reveals, except where other finish materials are shown or specified.

d. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.

10. Joints:

a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise.
b. Make joints 2 mm (1/16 inch) wide for glazed wall tile and mosaic tile work.
c. Make joints in Paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.

11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

a. Tile wall installations in wet areas, including showers, tub enclosures, laundries and swimming pools.
b. Tile wall installations composed of tiles 200 by 200 mm (8 by 8 inches or larger.

3.8 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDING MORTAR

A. Due to the denseness of porcelain tile use latex Portland cement bonding mortar that meets the requirements of ANSI A118.4. Bonding mortars shall be mixed in accordance with manufacturer’s instructions. Improper liquid ratios and dwell time before placement of bonding mortar and tile shall affect bond.

3.9 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE

A. Installation of Tile: ANSI A108.4.

3.10 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT

A. Surface Preparation: Prepare surfaces as specified in paragraph 3.3G

B. Installation of Elastomeric Membrane: ANSI A108.13 and TCA F122-02.

1. Prime surfaces, where required, in accordance with manufacturer's instructions.
2. Install first coat of membrane material in accordance with manufacturer's instructions, in thickness of 0.75 to 1.3 mm (30 to 50 mils).
3. Extend material over flashing rings of drains and turn up vertical surfaces not less than 100 mm (four inches) above finish floor surface.
4. When material has set, recoat areas with a second coat of elastomeric membrane material for a total thickness of 1.3 to 1.9 mm (50 to 75 mils).
5. After curing test for leaks with 25 mm (one inch) of water for 24

hours.

C. Installation of Tile in Elastomeric Membrane:

1. Spread no more material than can be covered with tile before material starts to set.
2. Apply tile in second coat of elastomeric membrane material in accordance with the coating manufacturer's instructions in lieu at aggregate surfacing specified in ASTM C1127. Do not install top coat over tile.

3.11 GROUTING

A. Grout Type and Location:

1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile Portland cement grout, latex-Portland cement grout, dry-set grout, or commercial Portland cement grout.

B. Workmanship:

1. Install and cure grout in accordance with the applicable standard.
2. Portland Cement grout: ANSI A108.10.
3. Epoxy Grout: ANSI A108.6.
4. Dry-set grout: ANSI A108.5.

3.12 MOVEMENT JOINTS

A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.

B. TCA details EJ 171-02.

C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.

D. Rake out grout at joints between tile, at toe of base, and where shown not less than 6 mm (1/4 inch) deep.

3.13 CLEANING

A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.

B. Methods and materials used shall not damage or impair appearance of tile surfaces.

C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.

D. Clean tile grouted with epoxy, furan and commercial Portland cement

grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

3.14 PROTECTION

A. Keep traffic off tile floor, until grout and setting material is firmly set and cured.

B. Where traffic occurs over tile floor, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive and stains.

3.15 TESTING FINISH FLOOR

A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

B. Test kitchen and storage rooms.

- - - E N D - - -

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Metal ceiling suspension system for acoustical ceilings.

B. Acoustical units.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:

1. Acoustical units, each type, with label indicating conformance to specification requirement, including units specified to match existing.
2. Colored markers for units providing access.

C. Manufacturer's Literature and Data:

1. Ceiling suspension system, each type, showing complete details of installation, including suspension system specified to match existing and upward access system details for concealed grid systems.
2. Acoustical units, each type
3. Runners designed for snap-in attachment of metal pans.

D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.

1.3 DEFINITIONS

A. Standard definitions as defined in ASTM C634.

B. Terminology as defined in ASTM E1264.

1.4 APPLICABLE PUBLICATIONS

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

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

1. A641/A641M-03 Zinc-coated (Galvanized) Carbon Steel Wire

2.	A653/A653M-07	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process
3.	C423-07	Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
4.	C634-02 (E2007)	Standard Terminology Relating to Environmental Acoustics
5.	C635-04	Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6.	C636-06	Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7.	E84-07	Surface Burning Characteristics of Building Materials
8.	E119-07	Fire Tests of Building Construction and Materials
9.	E413-04	Classification for Rating Sound Insulation.
10.	E580-06	Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint
11.	E1264-(R2005)	Classification for Acoustical Ceiling Products

PART 2 - PRODUCTS

2.1 METAL SUSPENSION SYSTEM

A. ASTM C635, heavy-duty system, except as otherwise specified.

1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.

   a. Galvanized cold-rolled steel, bonderized.
   b. Extruded aluminum.
   c. Fire resistant plastic (glass fiber) having a flame spread and smoke developed rating of not more than 25 when tested in accordance with ASTM E84.

2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
3. Use aluminum suspension in kitchens and aluminum or fire resistant plastic in toilets adjacent to shower areas, hydrotherapy, and swimming pools.

B. Exposed grid suspension system for support of lay-in panels:

1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in , SCHEDULE FOR FINISHES.

C. Suspension system for support of Metal Type V, VI, and VII tiles:

Concealed grid type having runners designed for the snap-in attachment of metal tile (pans).

2.2 PERIMETER SEAL

A. Vinyl, polyethylene or polyurethane open cell sponge material having density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.

B. Thickness as required to fill voids between back of wall molding and finish wall.

C. Not less than 9 mm (3/8 inch) wide strip.

2.3 WIRE

A. ASTM A641.

B. For wire hangers: Minimum diameter 2.68 mm (0.1055 inch).

C. For bracing wires: Minimum diameter 3.43 mm (0.1350 inch).

2.4 ANCHORS AND INSERTS

A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.

B. Hanger Inserts:

1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).

C. Clips:

1. Galvanized steel.
2. Designed to rigidly secure framing members together.
3. Designed to sustain twice the loads imposed by hangers or items supported.

2.5 ACOUSTICAL UNITS

A. General:

1. ASTM E1264, weighing 3.6 kg/m2 (3/4 psf) minimum for mineral fiber panels or tile.
2. Class A Flame Spread: ASTM 84
3. Minimum NRC (Noise Reduction Coefficient): 0.55 unless specified otherwise: ASTM C423.
4. Minimum CAC (Ceiling Attenuation Class): 40-44 range unless

specified otherwise: ASTM E413.

5. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.75 on the exposed surfaces, except as specified otherwise on the drawings.
6. Lay-in panels: Sizes as shown, with reveal edges.

B. Type III Units - Mineral base with water-based painted finish less than 10 g/l VOC, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Mineral base to contain minimum 65 percent recycled content.

C. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted, minimum 16 mm (5/8 inch) thick; with vinyl overlay on face, back, and sealed edges.

D. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply over the paint coat on the face of the unit a poly (vinyl) chloride overspray having a flame spread index of 25 or less when tested in accordance with ASTM E84.

2.6 ACCESS IDENTIFICATION

A. Markers:

1. Use colored markers with pressure sensitive adhesive on one side.
2. Make colored markers of paper of plastic, 6 to 9 mm (1/4 to 3/8 inch) in diameter.

B. Use markers of the same diameter throughout building.

C. Color Code: Use following color markers for service identification:

	Color	Service
1.	Color	Service
2.	Red	Sprinkler System: Valves and Controls
3.	Green	Domestic Water: Valves and Controls
4.	Yellow	Chilled Water and Heating Water
5.	Orange	Ductwork: Fire Dampers
6.	Blue	Ductwork: Dampers and Controls
7.	Black	Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 CEILING TREATMENT

A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.

B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.

C. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

D. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

E. Existing ceiling:

1. Where extension of existing ceilings occur, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

3.2 CEILING SUSPENSION SYSTEM INSTALLATION

A. General:

1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
3. Support a maximum area of 1.48 m2 (16 sf) of ceiling per hanger.
4. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
5. Provide extra hangers, minimum of one hanger at each corner of each item of mechanical, electrical and miscellaneous equipment supported by ceiling suspension system not having separate support or hangers.
6. Provide not less than 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown,
7. Use main runners not less than 1200 mm (48 inches) in length.
8. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.

B. Anchorage to Structure:

1. Concrete:

a. Install hanger inserts and wire loops required for support of hanger and bracing wire in concrete forms before concrete is

placed. Install hanger wires with looped ends through steel deck if steel deck does not have attachment device.

b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.

C. Direct Hung Suspension System:

1. As illustrated in ASTM C635.
2. Support main runners by hanger wires attached directly to the structure overhead.
3. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.

D. Seismic Ceiling Bracing System:

1. Construct system in accordance with ASTM E580.
2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner of suspended ceiling at bottom.

3.3 ACOUSTICAL UNIT INSTALLATION

A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.

B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.

1. Install tile to lay level and in full contact with exposed grid.
2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

C. Markers:

1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.
2. Attach colored markers to exposed grid on opposite sides of the units providing access.
3. Attach marker on exposed ceiling surface of upward access acoustical unit.

3.4 CLEAN-UP AND COMPLETION

A. Replace damaged, discolored, dirty, cracked and broken acoustical units.

B. Leave finished work free from defects.

- - - E N D - - -

SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies the installation of sheet rubber flooring without backing and integral cove base.

B. Installation of sheet flooring including following:

1. Cold welded seams.
2. Integral cove base: Installed at intersection of floor and vertical surfaces.

1.2 RELATED WORK

A. Resilient base required over base of casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.

1.3 QUALITY CONTROL - QUALIFICATIONS:

A. The Contracting Officer shall approve products or service of proposed manufacturer, suppliers, and installers, and the Contractor shall submit certification that:

1. Installer is approved by manufacturer of materials and has technical qualifications, experience, trained personnel, and facilities to install specified items.
2. Manufacturer's product submitted has been in satisfactory operation, on three installations similar and equivalent in size to this project for three years. Submit list of installations.

B. The sheet rubber floor coverings shall meet fire performance characteristics as determined by testing products, per ASTM test method, indicated below by Underwriters Laboratories, Inc. or another recognized testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
2. Smoke Density: Less than 450 per ASTM E662.

C. The floor covering manufacturer shall certify that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC’s).

1.4 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND

SAMPLES, submit following:

B. Manufacturer's Literature and Data:

1. Description of resilient material and accessories to be provided.
2. Resilient material manufacturer's recommendations for adhesives, weld rods, sealants, and underlayment.
3. Application and installation instructions.

C. Samples:

1. Sheet material, 300 mm (12 inches) square for each type, pattern and color.
2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
5. Edge strips: 150 mm (6 inches) long each type.
6. Adhesive, underlayment and primer: Pint container, each type.

1.5 PROJECT CONDITIONS

A. Maintain temperature of floor materials and room, where work occurs, above 18° C (65° F) and below 38° C (100° F) for 48 hours before, during and for 48 hours after installation. After above period, room temperature shall not fall below 13° C (55° F).

B. Construction in or near areas to receive flooring work shall be complete, dry and cured. Do not install resilient flooring over slabs until they have been cured and are sufficiently dry to achieve a bond with adhesive. Follow flooring manufacturer’s recommendations for bond and moisture testing.

C. Building shall be permanently enclosed. Schedule construction so that floor receives no construction traffic when completed.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in original sealed packages or containers; labeled for identification with manufacturer's name and brand.

B. Deliver sheet flooring full width roll, completely enclosed in factory wrap, clearly marked with the manufacturer's number, type and color, production run number and manufacture date.

C. Store materials in weathertight and dry storage facility. Protect from damage due to handling, weather, and construction operations before, during and after installation. Store sheet flooring on end with ambient temperatures maintained as recommended by manufacturer.

D. Store sheet flooring on end.

E. Move sheet vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.7 APPLICABLE PUBLICATIONS

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

B. American Society For Testing Materials (ASTM):

1. E648-06 Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source.
2. E662-06 Specific Optical Density of Smoke Generated by Solid Materials.
3. E1907-06 Evaluating Moisture Conditions of Concrete Floors to Receive Resilient Floor Coverings
4. F710-05 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

C. Resilient Floor Covering Institute (RFCI):

1. Recommended Work Practices for Removal of Resilient Floor Coverings.

1.8 SCHEDULING

A. Interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work shall be complete and dry before installation. Mechanical, electrical, and other work above ceiling line shall be completed. Heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

1.9 WARRANTY:

A. Submit written warranty, in accordance with FAR clause 52.246-21, Warranty of Construction requirements except that warranty period shall be extended to include two (2) years.

PART 2 - PRODUCTS

2.1 RUBBER SHEET FLOOR COVERING

A. Unbacked Rubber Sheet Floor Covering: ASTM F 1859.

1. Type: Type I (homogeneous rubber sheet).
2. Thickness: As standard with manufacturer

B. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240.

C. Wearing Surface: Textured.

D. Colors and Patterns: As indicated by manufacturer's designations on the drawings.

2.2 WELDING ROD:

A. Product of floor covering manufacturer in color shall match field color of sheet rubber covering.

2.3 APPLICATION MATERIALS AND ACCESSORIES

A. Floor and Base Adhesive: Type recommended by sheet flooring material manufacturer for conditions of use.

B. Mastic Underlayment (for concrete floors): Provide products with latex or polyvinyl acetate resins in mix. Condition to be corrected shall determine type of underlayment selected for use.

C. Base Accessories:

1. Fillet Strip: 19 mm (3/4 inch) radius fillet strip compatible with resilient sheet material.
2. Cap Strip: Extruded flanged zero edge vinyl reducer strip approximately 25 mm (one inch) exposed height with 13 mm (1/2 inch) flange.

2.4 SHEET FLOORING

A. ASTM F1859, Type I, Grade 1.

B. Minimum nominal thickness 2 mm (0.08 inch); 1800 mm (6 ft) minimum width.

C. Critical Radiant Flux: 0.45 watts per sq.cm or more, Class I, per ASTM E648.

D. Smoke density: less than 450 per ASTM E662.

E. Color and pattern of sheet flooring of the same production run.

2.5 ADHESIVES

A. Water resistant type recommended by the sheet flooring manufacturer for the conditions of use.

2.6 BASE CAP STRIP AND COVE STRIP

A. Extruded vinyl compatible with the sheet flooring.

B. Cap strip "J" shape with feathered edge flange approximately 25 mm (one inch) wide; top designed to receive sheet flooring with 13 mm (1/2 inch) flange lapping top of flooring

C. Cove strip 70 mm (2-3/4 inch) radius.

2.7 LEVELING COMPOUND (FOR CONCRETE FLOORS)

A. Provide cementitious products with latex or polyvinyl acetate resins in the mix.

2.8 PRIMER (FOR CONCRETE SUBFLOORS)

A. As recommended by the adhesive or sheet flooring manufacturer.

2.9 EDGE STRIPS

A. Extruded aluminum, mill finish, mechanically cleaned.

B. 28 mm (1-l/8 inch) wide, 6 mm (1/4 inch) thick, bevel one edge to 3 mm (1/8 inch) thick.

C. Drill and counter sink edge strips for flat head screws. Space holes near ends and approximately 225 mm (9 inches) on center in between.

2.10 SEALANT

A. As specified in Section 07 92 00, JOINT SEALANTS.

B. Compatible with sheet flooring.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Maintain temperature of sheet flooring above 36 °C (65 °F), for 48 hours before installation.

B. Maintain temperature of rooms where sheet flooring work occurs above 36° C (65° F), for 48 hours, before installation and during installation.

C. After installation, maintain temperature at or above 36° C /65° F.

D. Building is permanently enclosed.

E. Wet construction in or near areas to receive sheet flooring is complete, dry and cured.

3.2 SUBFLOOR PREPARATION

A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710.

1. Installer shall examine surfaces on which resilient sheet flooring is to be installed, and shall advise Contractor, in writing, of areas which are unacceptable for installation of flooring material. Installer shall advise Contractor which methods are to be used to correct conditions that will impair proper installation. Installation shall not proceed until unsatisfactory conditions have been corrected.
2. Slab substrates dry, free of curing compounds, sealers, hardeners, and other materials which would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by Resilient Floor Covering Institute recommendations in manual RFCI-MRP.

B. Broom or vacuum clean substrates to be covered by sheet vinyl floor coverings immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust.

C. Primer: If recommended by flooring manufacturer, prior to application of adhesive, apply concrete slab primer in accordance with manufacturer’s directions.

D. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.

E. Fill cracks, joints, depressions, and other irregularities in concrete with leveling compound.

1. Do not use adhesive for filling or leveling purposes.
2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.

F. Clean floor of oil, paint, dust and deleterious substances. Leave floor dry and cured free of residue from existing curing or cleaning agents.

G. Concrete Subfloor Testing:

1. Determine adhesion and dryness of the floor by bond and moisture tests as recommended by RFCI manual MPR.

H. Preparation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives. Coordinate with Asbestos Abatement Section if asbestos abatement procedures will be involved.

I. Remove existing resilient flooring and adhesive completely in accordance with Resilient Floor Covering Institute recommendations in manual RFCI-WP. Solvents shall not be used.

3.3 INSTALLATION OF FLOORING

A. Install work in strict compliance with manufacturer's instructions and approved layout drawings.

B. Maintain uniformity of sheet vinyl floor covering direction and avoid cross seams.

C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 150 mm (6 inches) away from parallel joints in flooring substrates.

D. Match edges of resilient floor coverings for color shading and pattern at seams.

E. Where resilient sheet flooring abuts other flooring material floors shall finish level.

F. Extend sheet rubber floor coverings into toe spaces, door reveals, closets, and similar openings.

G. Inform the Resident Engineer of conflicts between this section and the manufacturer's instructions or recommendations for auxiliary materials, or installation methods, before proceeding.

H. Install sheet in full coverage adhesives.

1. Air pockets or loose edges will not be accepted.
2. Trim sheet materials to touch in the length of intersection at pipes and vertical projections; seal joints at pipe with waterproof cement or sealant.

I. Keep joints to a minimum; avoid small filler pieces or strips.

J. Follow manufacturer’s recommendations for seams at butt joints. Do not leave any open joints that would be readily visible from a standing position.

K. Follow manufacturer’s recommendations regarding pattern match, if applicable.

L. Installation of Edge Strips:

1. Locate edge strips under center lines of doors unless otherwise indicated.
2. Set aluminum strips in adhesive, anchor with lead anchors and stainless steel Phillips screws.

M. Integral Cove Base Installation:

1. Set preformed fillet strip to receive base.

2. Install the base with adhesive, terminate expose edge with the cap strip.
3. Form internal and external corners to the geometric shape generated by the cove at either straight or radius corners.
4. Solvent weld joints as specified for the flooring. Seal cap strip to wall with an adhesive type sealant.
5. Unless otherwise specified or shown where sheet flooring is scheduled, provide integral base at intersection of floor and vertical surfaces. Provide sheet flooring and base scheduled for room on floors and walls under and behind areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.

3.4 INSTALLATION OF INTEGRAL COVED BASE

A. Set preformed cove to receive base. Install base material with adhesive and terminate exposed edge with cap strip. Integral base shall be 300 mm (12 inches) high.

B. Internal and external corners shall be formed to geometric shape generated by cove at either square or radius corners.

3.5 WELDING

A. Cold weld all joints of flooring and base using equipment and procedures recommended by flooring manufacturer.

B. Upon completion of welding, surface across joint shall finish flush, free from voids, and recessed or raised areas.

C. Fusion of Material: Joint shall be fused a minimum of 65 percent through thickness of material, and after welding shall meet specified characteristics for flooring.

3.6 CLEANING

A. Clean small adhesive marks during application of sheet flooring and base before adhesive sets, excessive adhesive smearing will not be accepted.

B. Remove visible adhesive and other surface blemishes using methods and cleaner recommended by floor covering manufacturers.

C. Clean and polish materials per flooring manufacturer’s written recommendations.

D. Vacuum floor thoroughly.

E. Do not wash floor until after period recommended by floor covering manufacturer and then prepare in accordance with manufacturer’s recommendations.

F. Upon completion, Resident Engineer shall inspect floor and base to

ascertain that work was done in accordance with manufacturer's printed instructions.

G. Perform initial maintenance according to flooring manufacturer’s written recommendations.

3.7 PROTECTION:

A. Protect installed flooring as recommended by flooring manufacturer against damage from rolling loads, other trades, or placement of fixtures and furnishings.

B. Keep traffic off sheet flooring for 24 hours after installation.

C. Where construction traffic is anticipated, cover sheet flooring with reinforced kraft paper properly secured and maintained until removal is authorized by the Resident Engineer.

D. Where protective materials are removed and immediately prior to acceptance, repair any damage, re-clean sheet flooring, lightly re-apply polish and buff floor.

- - - E N D - - -

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies field painting.

B. Section specifies prime coats which may be applied in shop under other sections.

C. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.

1.2 RELATED WORK

A. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS, Division 10 - SPECIALTIES, Division 12 - FUNISHINGS, Division 13 – SPECIAL CONSTRUCTION, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY sections.

B. Contractor option: Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.

C. Type of Finish, Color, and Gloss Level of Finish Coat: as indicated on finish drawings.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Before work is started, or sample panels are prepared, submit manufacturer's literature, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of Contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one list may be used for the entire Contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

C. Sample Panels:

1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
2. Panels to show color: Composition board, 100 by 250 by 3 mm (4 inch by 10 inch by 1/8 inch).
3. Panel to show transparent finishes: Wood of same species and grain pattern as wood approved for use, 100 by 250 by 3 mm (4 inch by 10 inch face by 1/4 inch) thick minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 by 50 mm (2 by 2 inch) minimum or actual wood member to show complete finish.
4. Attach labels to panel stating the following:

    a. Federal Specification Number or manufacturers name and product number of paints used.
    b. Specification code number specified on drawing AF-201.
    c. Product type and color.
    d. Name of project.

5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

D. Sample of identity markers if used.

E. Manufacturers' Certificates indicating compliance with specified requirements:

1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
2. High temperature aluminum paint.
3. Epoxy coating.
4. Intumescent clear coating or fire retardant paint.
5. Plastic floor coating.

1.4 DELIVERY AND STORAGE

A. Deliver materials to site in manufacturer's sealed container marked to show following:

1. Name of manufacturer.
2. Product type.
3. Batch number.
4. Instructions for use.
5. Safety precautions.

B. In addition to manufacturer's label, provide a label legibly printed as following:

1. Federal Specification Number, where applicable, and name of material.
2. Surface upon which material is to be applied.
3. If paint or other coating, state coat types; prime, body or finish.

C. Maintain space for storage, and handling of painting materials and

equipment in a neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.

D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

1.5 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):

1. ACGIH TLV-BKLT-2008 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
2. ACGIH TLV-DOC-2008 Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)

C. American National Standards Institute (ANSI):

1. A13.1-96 Scheme for the Identification of Piping Systems

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

1. D260-86 Boiled Linseed Oil

E. Commercial Item Description (CID):

1. A-A-1555 Water Paint, Powder (Cementitious, White and Colors) (WPC) (cancelled)
2. A-A-3120 Paint, For Swimming Pools (RF) (cancelled)

F. Federal Specifications (Fed Spec):

1. TT-P-1411A Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)

G. Master Painters Institute (MPI):

1. 18-07 Organic Zinc Rich Primer
2. 43-07 Interior Satin Latex, MPI Gloss Level 4
3. 44-07 Interior Low Sheen Latex, MPI Gloss Level 2

4. 45-07 Interior Primer Sealer
5. 46-07 Interior Enamel Undercoat
6. 47-07 Interior Alkyd, Semi-Gloss, MPI Gloss Level 5 (AK)
7. 48-07 Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
8. 49-07 Interior Alkyd, Flat, MPI Gloss Level 1 (AK)
9. 50-07 Interior Latex Primer Sealer
10. 51-07 Interior Alkyd, Eggshell, MPI Gloss Level 3
11. 52-07 Interior Latex, MPI Gloss Level 3 (LE)
12. 53-07 Interior Latex, Flat, MPI Gloss Level 1 (LE)
13. 54-07 Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)
14. 59-07 Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE)
15. 60-07 Interior/Exterior Latex Porch & Floor Paint, Low Gloss
16. 66-07 Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC)
17. 67-07 Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR)
18. 68-07 Interior/ Exterior Latex Porch & Floor Paint, Gloss
19. 74-07 Interior Alkyd Varnish, Semi-Gloss
20. 77-07 Epoxy Cold Cured, Gloss (EC)
21. 90-07 Interior Wood Stain, Semi-Transparent (WS)
22. 91-07 Wood Filler Paste
23. 95-07 Fast Drying Metal Primer
24. 98-07 High Build Epoxy Coating
25. 101-07 Epoxy Anti-Corrosive Metal Primer
26. 108-07 High Build Epoxy Coating, Low Gloss (EC)
27. 114-07 Interior Latex, Gloss (LE) and (LG)
28. 135-07 Non-Cementitious Galvanized Primer
29. 138-07 Interior High Performance Latex, MPI Gloss Level 2 (LF)
30. 139-07 Interior High Performance Latex, MPI Gloss Level 3 (LL)
31. 140-07 Interior High Performance Latex, MPI Gloss Level 4
32. 141-07 Interior High Performance Latex (SG) MPI Gloss Level 5

H. Steel Structures Painting Council (SSPC):

1. SSPC SP 1-04 (R2004) Solvent Cleaning
2. SSPC SP 2-04 (R2004) Hand Tool Cleaning
3. SSPC SP 3-04 (R2004) Power Tool Cleaning

PART 2 - PRODUCTS

2.1 MATERIALS

A. Identity markers options:

1. Pressure sensitive vinyl markers.
2. Snap-on coil plastic markers.

B. Interior Primer Sealer: MPI 45.

C. Interior Enamel Undercoat: MPI 47.

D. Interior Latex Primer Sealer: MPI 50.

E. Interior Alkyd, Eggshell: MPI 51

F. Interior Latex, Flat, MPI Gloss Level 1 (LE): MPI 53.

G. Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE): MPI 54.

H. Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC): MPI 66.

I. Epoxy Cold Cured, Gloss (EC): MPI 77.

J. Fast Drying Metal Primer: MPI 95.

K. High Build Epoxy Coating: MPI 98.

2.2 PAINT PROPERTIES

A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.

B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

2.3 REGULATORY REQUIREMENTS/QUALITY ASSURANCE

A. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

B. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.

1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
2. Lead-Base Paint:

   a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.

b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
c. For lead-paint removal and disposal, see drawing ASB-101.

3. Asbestos: Materials shall not contain asbestos.
4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc- chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
6. Use high performance acrylic paints in place of alkyd paints, where possible.
7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.

1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each days work.

B. Atmospheric and Surface Conditions:

1. Do not apply coating when air or substrate conditions are:

a. Less than 3 degrees C (5 degrees F) above dew point.
b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

2. Maintain interior temperatures until paint dries hard.
3. Do no exterior painting when it is windy and dusty.
4. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
5. Apply only on clean, dry and frost free surfaces except as follows:

a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces where allowed by manufacturer's printed

instructions.

b. Dampened with a fine mist of water on hot dry days concrete and masonry surfaces to which water thinned acrylic and cementitious paints are applied to prevent excessive suction and to cool surface.

3.2 SURFACE PREPARATION

A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.

B. General:

1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried.
2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
3. See other sections of specifications for specified surface conditions and prime coat.
4. Clean surfaces for painting with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry.

C. Wood:

1. Sand to a smooth even surface and then dust off.
2. Wipe surface with a tack rag prior to applying finish.
3. Surface painted with an opaque finish:

   a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
   b. Apply two coats of MPI 36 (Knot Sealer) over large knots.

4. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.

D. Ferrous Metals:

1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Exception: where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two- Component

Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.

a. This includes flat head countersunk screws used for permanent anchors.
b. Do not fill screws of item intended for removal such as glazing beads.

4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

E. Gypsum Plaster and Gypsum Board:

1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A Gypsum (Spackling Compound) finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.3 PAINT PREPARATION

A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.

B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.

C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.

D. Mix two component and two part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.

E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.4 APPLICATION

A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.

B. Unless otherwise specified, apply paint in three coats; prime, body, and finish. When two coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.

C. Apply each coat evenly and cover substrate completely.

D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by Resident Engineer.

E. Finish surfaces to show solid even color, free from runs, lumps, brushmarks, laps, holidays, or other defects.

F. Apply by brush, roller or spray, except as otherwise specified.

G. Do not spray paint in existing occupied spaces unless approved by Resident Engineer, except in spaces sealed from existing occupied spaces.

1. Apply painting materials specifically required by manufacturer to be applied by spraying.
2. In areas, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.

H. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.5 PRIME PAINTING

A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.

B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.

C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.

D. Prime rebates for stop and face glazing of wood, and for face glazing of steel.

E. Wood and Wood Particleboard:

1. Use same kind of primer specified for exposed face surface.

a. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.

2. Apply two coats of primer sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.

F. Metals except boilers, incinerator stacks, and engine exhaust pipes:

1. Steel and iron: MPI 95 (Fast Drying Metal Primer) finish is specified.
2. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
3. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel (EO)).

G. Gypsum Board:

1. Surfaces scheduled to have MPI 53 (Interior Latex, Flat) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE)) MPI 53 (Interior Latex, MPI Gloss Level 3 (LE)) .
2. Primer: MPI 50(Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) in shower and bathrooms.
3. Surfaces scheduled to receive vinyl coated fabric wallcovering: Use MPI 45 (Interior Primer Sealer).

H. Concrete Floors: MPI 60 (Interior/ Exterior Latex Porch & Floor Paint, Low Gloss).

3.6 INTERIOR FINISHES

A. Apply following finish coats over prime coats in spaces or on surfaces specified on finish drawings.

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. Two coats of MPI 48 (Interior Alkyd Gloss (AK)) MPI 51 (Interior Alkyd, Eggshell (AK0).
b. Machinery: One coat MPI 9 (Exterior Alkyd Enamel (EO)).

C. Gypsum Board:

1. One coat of MPI 45 (Interior Primer Sealer) plus two coats of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE) or MPI 114 (Interior Latex, Gloss (LE) and (LG)).

D. Wood:

1. Sanding:

a. Use 220-grit sandpaper.
b. Sand sealers and varnish between coats.
c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as

well as dust particles.

2. Sealers:

a. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
b. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
c. Sand as specified.

3. Paint Finish:

a. One coat of MPI 45 (Interior Primer Sealer) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK) (SG)).

E. Concrete Floors: One coat of MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss (FE)).

F. Miscellaneous:

1. Apply where specified on finish drawings.
2. MPI 1 (Aluminum Paint): Two coats of aluminum paint.
3. Gold Paint (GP): Two coats of gold paint.
4. Existing acoustical units scheduled to be repainted except acoustical units with a vinyl finish:

a. Clean units free of dust, dirt, grease, and other deterrents to paint adhesion.
b. Mineral fiber units: One coat of MPI 53 (Interior Latex, Flat, MPI Gloss Level 1 (LE)).
c. Units of organic fiber or other material not having a class A rating: One coat of MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC)) MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR)) fire retardant paint.

3.7 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. In existing rooms and areas where alterations occur, clean existing stained and natural finished wood retouch abraded surfaces and then give entire surface one coat of MPI 31 (Polyurethane, Moisture Cured, Clear Gloss) MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV)) to match existing.

G. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.

H. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.

I. Sand or dull glossy surfaces prior to painting.

J. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.8 PAINT COLOR

A. For additional requirements regarding color see Articles, REFINISHING EXISTING PAINTED SURFACE and MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE.

B. 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.

C. Painting, Caulking, Closures, and Fillers Adjacent to Casework:

1. Paint to match color of casework where casework has a paint finish.
2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.9 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 on finish drawings paint as specified under paragraph H, colors.

C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.

D. Paint after tests have been completed.

E. Omit prime coat from factory prime-coated items.

F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Omit field painting of items specified in paragraph, Building and Structural WORK NOT PAINTED.

H. Color:

1. Paint colors as specified on finish drawings except for following:

a. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
b. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
c. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.
d. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
e. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

I. Apply paint systems on properly prepared and primed surface as follows:

1. Interior Locations:

a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:

1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.
2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.

b. Ferrous metal exposed in hydrotherapy equipment room and chlorinator room of water and sewerage treatment plants: One coat of MPI 101 (Cold Curing Epoxy Primer) and one coat of MPI 77 (Epoxy Cold Cured, Gloss (EC)).
c. Apply one coat of MPI 50 (Interior Latex Primer Sealer) and

one coat of MPI 53 (Interior Latex, Flat, MPI Gloss Level 1 (LE)) on finish of insulation on boiler breeching and uptakes inside boiler house, drums, drumheads, oil heaters, feed water heaters, tanks and piping.

d. Paint electrical conduits containing cables rated 600 volts or more using two coats of MPI 9 (Exterior Alkyd Enamel (EO) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

2. Other exposed locations:

a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two coats of MPI 1 (Aluminum Paint (AP).

b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of MPI 10 (Exterior Latex, Flat).

3.10 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 12000 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 BACK-GROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Yellow	Black	Blow-off
Boiler Feedwater		Yellow	Black	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup

A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Yellow	Black	H.P. _____*
High Pressure Condensate Return		Yellow	Black	H.P. Ret ____*
Medium Pressure Steam		Yellow	Black	M. P. Stm ____*
Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*
High Temperature Water Supply		Yellow	Black	H. Temp Wtr Sup
High Temperature Water Return		Yellow	Black	H. Temp Wtr Ret
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Fuel Oil - Grade __*		Green	White	Fuel Oil-Grade
Boiler Water Sampling		Yellow	Black	Sample
Chemical Feed		Yellow	Black	Chem Feed
Continuous Blow-Down		Yellow	Black	Cont. B D
Pumped Condensate			Black	Pump Cond
Pump Recirculating		Yellow	Black	Pump-Recirc.
Vent Line		Yellow	Black	Vent
Alkali		Yellow		Black Alk
Bleach		Yellow	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Yellow	Black	Acid Waste
Vent		Yellow	Black	Acid Vent
Atmospheric Vent		Green	White	ATV
Silver Recovery		Green	White	Silver Rec
Oral Evacuation		Green	White	Oral Evac
Fuel Gas		Yellow	Black	Gas
Fire Protection Water				
Sprinkler		Red	White	Auto Spr

Standpipe	Red	White	Stand
Sprinkler	Red	White	Drain
Hot Water Supply Domestic/Solar Water	H.W. Sup Dom/SW		
Hot Water Return Domestic/Solar Water	H.W. Ret Dom/SW		

7. See Sections for methods of identification, legends, and abbreviations of the following:
   a. Laboratory gas and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
   b. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.

B. Fire and Smoke Partitions:

1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
3. Locate not more than 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
4. Use semigloss paint of color that contrasts with color of substrate.

C. Identify columns in pipe basements and interstitial space:

1. Apply stenciled number and letters to correspond with grid numbering and lettering shown.
2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.
3. Apply on four sides of interior columns and on inside face only of exterior wall columns.
4. Color:

   a. Use black on concrete columns.
   b. Use white or contrasting color on steel columns.

3.11 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.

APPENDIX

Paint or coating	Abbreviation
Acrylic Emulsion	AE (MPI 10 – flat/MPI 11 – semigloss/MPI 119 - gloss)
Alkyd Flat	Ak (MPI 49)
Alkyd Gloss Enamel	G (MPI 48)
Alkyd Semigloss Enamel	SG (MPI 47)
Aluminum Paint	AP (MPI 1)
Cementitious Paint	CEP (TT-P-1411)
Exterior Latex	EL??(MPI 10 / 11 / 119)??
Exterior Oil	EO (MPI 9 – gloss/MPI 8 – flat/MPI 94 – semigloss)
Epoxy Coating	EC (MPI 77 – walls, floors/MPI 108 – CMU, concrete)
Fire Retardant Paint	FR (MPI 67)
Fire Retardant Coating (Clear)	FC (MPI 66, intumescent type)
Floor Enamel	FE (MPI 27 – gloss/MPI 59 – eggshell)
Heat Resistant Paint	HR (MPI 22)
Latex Emulsion	LE (MPI 53, flat/MPI 52, eggshell/MPI 54, semigloss/MPI 114, gloss Level 6
Latex Flat	LF (MPI 138)
Latex Gloss	LG (MPI 114)
Latex Semigloss	SG (MPI 141)
Latex Low Luster	LL (MPI 139)
Plastic Floor Coating	PL
Polyurethane Varnish	PV (MPI 31 – gloss/MPI 71 - flat)
Rubber Paint	RF (CID-A-A-3120 - Paint for Swimming Pools (RF).
Water Paint, Cement	WPC (CID-A-A-1555 - Water Paint, Powder).
Wood Stain	WS (MPI 90)

- - - E N D -

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies interior signage for room numbers, directional signs exterior signage, code required signs and temporary signs.

B. This section specifies exterior signage.

1.2 RELATED WORK:

A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Electrical Work: Division 26, ELECTRICAL.

C. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.

D. Color and Finish of Interior Signs: Section 09 06 00, SCHEDULE FOR FINISHES.

E. Structural Steel Supports: Section 05 12 00, STRUCTURAL STEEL FRAMING.

1.3 QUALITY ASSURANCE:

A. Manufacturer’s Qualifications: Provide signage that is the product of one manufacturer, who has provided signage as specified for a minimum of three (3) years. Submit manufacturer’s qualifications.

B. Installer’s Qualifications: Minimum three (3) years’ experience in the installation of signage of the type as specified in this Section. Submit installer’s qualifications.

1.4 SUBMITTALS:

A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Sustainable Design Submittals, as described below:

1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Interior Sign Samples: Sign panels and frames, with letters and symbols, for each sign type.

1. Sign Panel, 203 x 254 mm (8 x 10 inches), with letters.
2. Color samples of each color, 152 x 152 mm (6 x 6 inches. Show anticipated range of color and texture.
3. Sample of typeface, arrow and symbols in a typical full size layout.

D. Exterior Sign Samples: 152 x 152 mm (6 x 6 inches) samples of each color and material.

E. Manufacturer's Literature:

1. Showing the methods and procedures proposed for the anchorage of the signage system to each surface type.
2. Manufacturer’s printed specifications and maintenance instructions.

F. Sign Location Plan, showing location, type and total number of signs required.

G. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.

H. Full size layout patterns for dimensional letters.

I. Manufacturer’s qualifications.

J. Installer’s qualifications.

1.5 DELIVERY AND STORAGE:

A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.

B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.

C. Deliver signs only when the site and mounting services are ready for installation work to proceed.

D. Store products in dry condition inside enclosed facilities.

1.6 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21, “Warranty of Construction”.

1.7 APPLICABLE PUBLICATIONS:

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

B. American Architectural Manufacturers Association (AAMA):
611-14.....Anodized Architectural Aluminum
2603-13.....Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

C. American National Standards Institute (ANSI):
A117.1-09.....Accessible and Usable Buildings and Facilities

D. ASTM International (ASTM):
A36/A36M-14.....Carbon Structural Steel

A240/A240M-15.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

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

A1011/A1011M-14.....Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

B36/B36M-13.....Brass Plate, Sheet, Strip, and Rolled Bar

B152/B152M-13.....Copper Sheet, Strip, Plate, and Rolled Bar

B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate

B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

C1036-11(R2012).....Flat Glass

C1048-12.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass

C1349-10.....Architectural Flat Glass Clad Polycarbonate

D1003-13.....Test Method for Haze and Luminous Transmittance of Transparent Plastics

D4802-10.....Poly(Methyl Methacrylate) Acrylic Plastic Sheet

D. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

E. Federal Specifications (Fed Spec):

MIL-PRF-8184F.....Plastic Sheet, Acrylic, Modified.

MIL-P-46144C.....Plastic Sheet, Polycarbonate

F. National Fire Protection Association (NFPA):

70-14.....National Electrical Code

PART 2 - PRODUCTS

2.1 SIGNAGE GENERAL:

A. Provide signs of type, size and design shown on the construction documents.

B. Provide signs complete with lettering, framing and related components for a complete installation.

C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

D. Do not scale construction documents for dimensions. Verify dimensions and coordinate with field conditions. Notify Contracting Officer Representative (COR) of discrepancies or changes needed to satisfy the requirements of the construction documents.

2.2 EXTERIOR SIGNAGE PERFORMANCE REQUIREMENTS:

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes 67 degrees C (120 degrees F) ambient and 100 degrees C (180 degrees F) material surfaces.

B. Provide installed electrical components and sign installations bearing the label and certifications of Underwriter’s Laboratories, Inc., and comply with NFPA 70 as well as applicable federal codes for installation techniques, fabrication methods and general product safety.

2.3 INTERIOR SIGN MATERIALS:

A. Aluminum:

1. Sheet and Plate: ASTM B209M (B209).
2. Extrusions and Tubing: ASTM B221M (B221).

E. Adhesives:

1. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by signage manufacturer.
2. Adhesives to have VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

F. Typography: Comply with VA Signage Design Guide.

1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps, as indicated in Sign Message Schedule
2. Arrow: Comply with graphic standards in construction documents.

3. Letter spacing: Comply with graphic standards in construction documents.
4. Letter spacing: Comply with graphic standards in construction documents.
5. Provide text, arrows, and symbols in size, colors, typefaces and letter spacing shown in construction documents. Text shall be a true, clean, accurate reproduction of typeface(s). Text shown in construction documents is for layout purposes only; final text for signs is listed in Sign Message Schedule

2.4 EXTERIOR SIGN MATERIALS:

A. Aluminum Sheet and Plate: ASTM B209M (B209).
B. Aluminum Extrusions: ASTM B221M (B221).
C. Finish:
1. Aluminum Finishes:
a. Clear Anodic Finish: AAMA 611.

2.5 INTERIOR SIGN TYPES:

A. Conform to the VA Signage Design Guide.
B. Provide engraved plate with recessed color system.

2.6 EXTERIOR SIGN TYPES:

A. General:
1. Fabricate signs that comply with VA Signage Design Guide.
B. Text and Graphics:
1. Provide cut out aluminum letters which are mill cut (vertical sides) out of 12 mm (0.5 inch) plate as required by sign type.
2. Letters: Studded and mounted with 9 mm (.375 inch) spacers to wall surface using adhesive appropriate to the surface.

2.7 FABRICATION:

A. Design interior signage components to allow for expansion and contraction for a minimum material temperature range of 38 degrees C (100 degrees F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Provide concealed fasteners wherever possible.
C. Shop fabricate so far as practicable. Fasten joints flush to conceal reinforcement, or weld joints, where thickness or section permits.

D. Level and assemble contract surfaces of connected members so joints will be tight and practically unnoticeable, without applying filling compound.

E. Signs: Fabricate with fine, even texture to be flat and sound.

1. Maintain lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern.
2. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
3. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.

F. Finish extruded members to be free from extrusion marks. Fabricate square turns, sharp corners, and true curves.

G. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Mitere edge joints to give appearance of solid material.

H. Do not manufacture signs until final sign message schedule and location review has been completed by the COR and forwarded to contractor.

I. Drill holes for bolts and screws. Mill smooth exposed ends and edges with corners slightly rounded.

J. Form joints exposed to weather to exclude water.

K. Movable Parts, Including Hardware: Cleaned and adjusted to operate as designed without binding or deformation of members. Center doors and covers in opening or frame.

1. Align contact surfaces fit tight and even without forcing or warping components.

L. Pre-assemble items in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

M. Prime painted surfaces as required. Apply finish coating of paint for complete coverage with no light or thin applications allowing substrate or primer to show.

1. Finish surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Locate signs as shown on the Sign Location Plans.

B. Conform to the VA Signage Design Guide for installation requirements.

C. At each sign location there are no utility lines behind each sign location that will be affected by installation of signs.
   1. Correct and repair damage done to utilities during installation of signs at no additional cost to Government.
D. Provide inserts and anchoring devices which must be set in concrete or other material for installation of signs. Submit setting drawings, templates, instructions and directions for installation of anchorage devices, which may involve other trades.
E. Refer to Sign Message Schedule for mounting method. Mount signs in proper alignment, level and plumb according to the Sign Location Plan and the dimensions given on elevation and Sign Location Plans. When exact position, angle, height or location is not clear, contact COR for resolution.
F. Touch up exposed fasteners and connecting hardware to match color and finish of surrounding surface.
G. At completion of sign installation, clean exposed sign surfaces. Clean and repair adjoining or adjacent surfaces that became soiled or damaged as a result of installation of signs.

- - - END - - -

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies wall guards (crash rails or bumper guards), handrail/wall guard combinations, corner guards and door protectors and high impact wall covering.

1.2 RELATED WORK

A. Structural steel corner guards: Section 05 50 00, METAL FABRICATIONS.

B. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.

C. Color and texture of aluminum and resilient material: See finish drawing AF-201.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: show design and installation details.

C. Manufacturer's Literature and Data:

1. Handrail/Wall Guard Combinations.
2. Wall Guards.
3. Corner Guards.
4. High Impact Wall covering.

D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

1.4 DELIVERY AND STORAGE

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

B. Protect from damage from handling and construction operations before, during and after installation.

C. Store in a dry environment of approximately 21° C (70 degrees F) for at least 48 hours prior to installation.

1.5 APPLICABLE PUBLICATIONS

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

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

1. A167-99(R2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
2. B221-07 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
3. D256-06 Impact Resistance of Plastics
4. D635-06 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
5. E84-07 Surface Burning Characteristics of Building Materials

C. The National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500 Series Metal Finishes Manual

D. National Fire Protection Association (NFPA):

1. 80-06 Standard for Fire Doors and Windows

E. Society of American Automotive Engineers (SAE):

1. J 1545-05 Instrumental Color Difference Measurement for Exterior Finishes.

F. Underwriters Laboratories Inc. (UL):

1. Annual Issue Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A167, Type 302B.

B. Aluminum Extruded: ASTM B221, Alloy 6063, Temper T5 or T6.

2.2 CORNER GUARDS

A. Stainless Steel Corner Guards: Fabricate of 1.6 mm (0.0625-inch) thick stainless steel. Form guards of dimensions and to contour shown.

2.3 WALL GUARDS AND HANDRAILS

A. Stainless Steel Wall Guards and Handrails: Fabricate of 1.6 mm

(0.0625-inch) thick stainless steel. Form guards of dimensions and to contour shown.

2.4 HIGH IMPACT WALL COVERING

A. Fabricate from vinyl acrylic or polyvinyl chloride resilient material minimum 6mm (0.20 inch) thick designed specially for interior use.

B. Coordinate with door protection material and supplier for proper fit, installation and color.

C. Provide adhesive as recommended by the wall covering manufacturer.

2.5 FASTENERS AND ANCHORS

A. Provide fasteners and anchors as required for each specific type of installation.

B. Where type, size, spacing or method of fastening is not shown or specified, submit shop drawings showing proposed installation details.

2.6 FINISH

A. In accordance with NAAMM AMP 500 series.

B. Stainless Steel: NAAMM finish Number 4.

C. Resilient Material: Embossed texture and color in accordance with SAE J 1545 and as specified on the drawings.

PART 3 - INSTALLATION

3.1 STAINLESS STEEL CORNER GUARDS

A. Mount guards on external corners of all interior walls, partitions and columns and as shown.

B. Where corner guards are installed on gypsum board, clean surface and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from around edge of guard and allow to cure undisturbed for 24 hours.

3.2 STAINLESS STEEL WALL GUARDS

A. Space brackets at not more than three feet on centers and anchor to the wall in accordance with manufacturer's installation instructions.

3.3 HIGH IMPACT WALL COVERING

A. Surfaces to receive protection shall be clean, smooth and free of obstructions.

B. Apply with adhesive in controlled environment according to manufacturer’s recommendations.

- - - E N D - - -

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies manufactured items usually used in dressing rooms, toilets, baths, locker rooms and at sinks in related spaces.

B. Items Specified:

1. Paper towel dispenser.
2. Waste receptacles.
3. Toilet tissue dispenser.
4. Grab Bars.
5. Clothes hooks, robe or coat.
6. Metal framed mirror.

C. This section also specifies custom fabricated items used in toilets and related spaces.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:

1. Each product specified.
2. Metal framed mirrors, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
3. Grab bars, showing design and each different type of anchorage.
4. Show material and finish, size of members, and details of construction, installation and anchorage of mop racks.

C. Samples:

1. One of each type of accessory specified.
2. After approval, samples may be used in the work.

D. Manufacturer's Literature and Data:

1. All accessories specified.
2. Show type of material, gages or metal thickness in inches, finishes, and when required, capacity of accessories.
3. Show working operations of spindle for toilet tissue dispensers.
4. Mop racks.

E. Manufacturer's Certificates:

1. Attesting that soap dispensers are fabricated of material that

will not be affected by liquid soap or aseptic detergents, Phisohex and solutions containing hexachlorophene.

2. Anodized finish as specified.

1.3 QUALITY ASSURANCE

A. Each product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each accessory type shall be the same and be made by the same manufacturer.

C. Each accessory shall be assembled to the greatest extent possible before delivery to the site.

D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.4 PACKAGING AND DELIVERY

A. Pack accessories individually to protect finish.

B. Deliver accessories to the project only when installation work in rooms is ready to receive them.

C. Deliver inserts and rough-in frames to site at appropriate time for building-in.

D. Deliver products to site in sealed packages of containers; labeled for identification with manufacturer's name, brand, and contents.

1.5 STORAGE

A. Store products in weathertight and dry storage facility.

B. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.

1.6 APPLICABLE PUBLICATIONS

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

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

1. A167-99(R2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

2. A176-99(R2004) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
3. A269-07 Seamless and Welded Austenitic Stainless Steel Tubing for General Service
4. A312/A312M-06 Seamless and Welded Austenitic Stainless Steel Pipes
5. A653/A653M-07 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
6. B221-06 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
7. B456-03 Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
8. C1036-06 Flat Glass
9. C1048-04 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass
10. D635-06 Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position
11. F446-85 (R2004) Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
12. A269-07 Seamless and Welded Austenitic Stainless Steel Tubing for General Service
13. D3453-01 Flexible Cellular Materials - Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications
14. D3690-02 Vinyl-Coated and Urethane-Coated Upholstery Fabrics

C. The National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500 Series Metal Finishes Manual
2. AMP 500-505-88 Stainless Steel Metal Finishes Manual and Finishes for

D. American Welding Society (AWS):

1. D10.4-86 (R2000) Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing

E. Federal Specifications (Fed. Specs.):

1. A-A-3002 Mirrors, Glass
2. FF-S-107C (2) Screw, Tapping and Drive
3. FF-S-107C Screw, Tapping and Drive.
4. WW-P-541E(1) Plumbing Fixtures (Accessories, Land Use) Detail Specification

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel:

1. Plate or sheet: ASTM A167, Type 302, 304, or 304L, except ASTM A176 where Type 430 is specified, 0.0299-inch thick unless otherwise specified.

B. Stainless Steel Tubing: ASTM A269, Grade 304 or 304L, seamless or welded.

C. Stainless Steel Pipe: ASTM A312; Grade TP 304 or TP 304L.

D. Steel Sheet: ASTM A653, zinc-coated (galvanized) coating designation G90.

E. Glass:

1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors, and for mirror doors in medicine cabinets.

F. Foam Rubber: ASTM D3453, Grade BD, Type 2.

2.2 FASTENERS

A. Exposed Fasteners: Stainless steel or chromium plated brass, finish to match adjacent surface.

B. Concealed Fasteners: Steel, hot-dip galvanized (except in high moisture areas such as showers or bath tubs use stainless steel).

C. Toggle Bolts: For use in hollow masonry or frame construction.

D. Hex bolts: For through bolting on thin panels.

E. Expansion Shields: Lead or plastic as recommended by accessory manufacturer for component and substrate for use in solid masonry or concrete.

F. Screws:

1. ASME B18.6.4.
2. Fed Spec. FF-S-107, Stainless steel Type A.

G. Adhesive: As recommended by manufacturer for products to be joined.

2.3 FINISH

A. In accordance with NAAMM AMP 500 series.

B. AA-M32: Mechanical finish, medium satin.

1. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.
2. Stainless Steel: NAAMM AMP 503, finish number 4.
3. Ferrous Metal:

a. Shop Prime: Clean, pretreat and apply one coat of primer and bake.
b. Finish: Over primer apply two coats of alkyd or phenolic resin enamel, and bake.

2.4 FABRICATION - GENERAL

A. Welding, AWS D10.4.

B. Grind dress, and finish welded joints to match finish of adjacent surface.

C. Form exposed surfaces from one sheet of stock, free of joints.

D. Provide steel anchors and components required for secure installation.

E. Form flat surfaces without distortion. Keep exposed surfaces free from scratches and dents. Reinforce doors to prevent warp or twist.

F. Isolate aluminum from dissimilar metals and from contact with building materials as required to prevent electrolysis and corrosion.

G. Hot-dip galvanized steel, except stainless steel, anchors and fastening devices.

H. Shop assemble accessories and package with all components, anchors, fittings, fasteners and keys.

I. Key items alike.

J. Provide templates and rough-in measurements as required.

K. Round and deburr edges of sheets to remove sharp edges.

2.5 PAPER TOWEL DISPENSERS

A. Surface mounted type with sloping top.

B. Dispensing capacity for 300 sheets of any type of paper toweling.

C. Fabricate of stainless steel.

D. Provide door with continuous hinge at bottom, and either spring tension cam lock or tumbler lock, keyed alike, at top and a refill sight slot in front.

2.6 WASTE RECEPTACLES

A. Semi-recessed type, without doors. Fed. Spec WW-P-541, Type II.

B. Fabricate of stainless steel.

C. Form face frame from one piece.

D. Provide removable waste receptacle of approximately (12 gallon) capacity, fabricated of stainless steel.

E. Waste receptacle key locked in place.

2.7 TOILET TISSUE DISPENSERS

A. Double roll surface mounted type.

B. Mount on continuous backplate.

C. Removable spindle ABS plastic or chrome plated plastic.

D. Wood rollers are not acceptable.

2.8 GRAB BARS

A. Fed. Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.

B. Fabricate of either stainless steel or nylon coated steel, except use only one type throughout the project:

1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.

C. Concealed mount, except grab bars mounted at floor, swing up and on metal toilet partitions.

D. Bars:

1. Fabricate from 38 mm (1-1/2 inch) outside diameter tubing.

   a. Stainless steel, minimum 1.2 mm (0.0478 inch) thick.

2. Fabricate in one continuous piece with ends turned toward walls, except swing up , bars may be fabricated in two sections, with concealed slip joint between.
3. Continuous weld intermediate support to the grab bar.
4. Swing up bars manually operated. Designed to prevent bar from falling when in raised position.

E. Flange for Concealed Mounting:

1. Minimum of 2.65 mm (0.1046 inch) thick, approximately 75 mm (3 inch) diameter by 13 mm (1/2 inch) deep, with provisions for not less than three set screws for securing flange to back plate.
2. Insert grab bar through center of the flange and continuously weld perimeter of grab bar flush to back side of flange.

F. In lieu of providing flange for concealed mounting, and back plate as

specified, grab rail may be secured by being welded to a back plate and be covered with flange.

G. Back Plates:

1. Minimum 2.65 mm (0.1046 inch) thick metal.
2. Fabricate in one piece, approximately 6 mm (1/4 inch) deep, with diameter sized to fit flange. Provide slotted holes to accommodate anchor bolts.
3. Furnish spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on metal partitions.

2.9 CLOTHES HOOKS-ROBE OR COAT

A. Fabricate hook units either of chromium plated brass with a satin finish, or stainless steel, using 6 mm (1/4 inch) minimum thick stock, with edges and corners rounded smooth to the thickness of the metal, or 3 mm (1/8 inch) minimum radius.

B. Fabricate each unit as a double hook on a single shaft, integral with or permanently fastened to the wall flange, provided with concealed fastenings.

2.10 METAL FRAMED MIRRORS

A. Spec. A-A-3002 metal frame; stainless steel, type 302 or 304.

B. Mirror Glass:

1. Minimum 6 mm (1/4 inch) thick.
2. Set mirror in a protective vinyl glazing tape.
3. Use tempered glass for mirrors in Mental Health and Behavioral Nursing units.

C. Frames:

1. Channel or angle shaped section with face of frame not less than 9 mm (3/8 inch) wide. Fabricate with square corners.
2. Use either 0.9 mm (0.0359 inch) thick stainless steel, chrome finished steel, or extruded aluminum, with clear anodized finish 0.4 mils thick.
3. Filler:

   a. Where mirrors are mounted on walls having ceramic tile wainscots not flush with wall above, provide fillers at void between back of mirror and wall surface.
   b. Fabricate fillers from same material and finish as the mirror frame, contoured to conceal the void behind the mirror at sides and top.

D. Back Plate:

1. Fabricate backplate for concealed wall hanging of either zinc-coated, or cadmium plated 0.9 mm (0.036 inch) thick sheet steel,

die cut to fit face of mirror frame, and furnish with theft resistant concealed wall fastenings.

2. Use set screw type theft resistant concealed fastening system for mounting mirrors.

E. Mounting Bracket:

1. Designed to support mirror tight to wall.
2. Designed to retain mirror with concealed set screw fastenings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before starting work notify Resident Engineer in writing of any conflicts detrimental to installation or operation of units.

B. Verify with the Resident Engineer the exact location of accessories.

3.2 INSTALLATION

A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Toggle bolt to steel anchorage plates in frame partitions or hollow masonry.

C. Install accessories in accordance with the manufacturer's printed instructions and ASTM F446.

D. Install accessories plumb and level and securely anchor to substrate.

E. Install accessories in a manner that will permit the accessory to function as designed and allow for servicing as required without hampering or hindering the performance of other devices.

F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance as needed.

G. Align mirrors, dispensers and other accessories even and level, when installed in battery.

H. Install accessories to prevent striking by other moving, items or interference with accessibility.

3.3 SCHEDULE OF ACCESSORIES

A. As indicated on drawings.

3.4 CLEANING

A. After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

- - - E N D - - -

SECTION 10 51 13
METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard metal lockers.

1.2 SUBMITTALS

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

B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For units with factory-applied color finishes.

D. Maintenance data.

E. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Where metal lockers and benches are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver master and control keys to Owner by registered mail or overnight package service.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Warranty Period for All-Welded Metal Lockers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

B. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

C. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as indicated for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.2 STANDARD METAL LOCKERS

A. Products: Subject to compliance with requirements, provide one of the following:

1. ASI Storage Solutions Inc.; Traditional Collection.
2. Lyon Workspace Products, LLC; Standard Lockers.
3. Republic Storage Systems Company; Standard Lockers.

B. Locker Arrangement: Single tier and Double tier

C. Material: Cold-rolled steel sheet.

D. Body and Shelves: Assembled by riveting or bolting body components together. Fabricate from non-perforated 0.024-inch nominal-thickness steel sheet.

E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

F. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Doors less than 12 inches wide may be fabricated from 0.048-inchnominal-thickness steel sheet.
2. Doors for box lockers less than 15 inches wide may be fabricated from 0.048-inch nominal-thickness steel sheet.
3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.

4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
5. Door Style: Louvered vents at top and bottom

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that is completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.

a. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated **with vinyl or nylon** to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Door Handle and Latch for Box Lockers: Stainless-steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.

J. Cylinder Locks: Built-in, flush, cam locks with five-pin tumbler keyway, keyed separately and master keyed. Furnish two change keys for each lock and two master keys.

1. Key Type: Flat.

K. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

L. Accessories:

1. Legs: 6 inches high; formed by extending vertical frame members, or fabricated from 0.075-inch nominal-thickness steel sheet; welded to bottom of locker.

a. Closed Front and End Bases: Fabricated from 0.036-inch nominal-thickness steel sheet.

2. Continuous Sloping Tops: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.

   a. Closures: Vertical -end type.

3. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
4. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
5. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

M. Finish: Baked enamel.

1. Color(s): As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

D. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

E. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

G. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in

lengths as long as practical; finished to match lockers.

H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

I. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

J. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.4 STEEL SHEET FINISHES

A. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

B. All-Welded Metal Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

4. Attach recess trim to recessed metal lockers with concealed

clips.

5. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
6. Attach sloping-top units to metal lockers, with closures at exposed ends.
7. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

- - - E N D - - -