

PROJECT MANUAL

for



VA SAN DIEGO HEALTHCARE SYSTEM RENOVATE BUILDING 1 FIRST FLOOR FOR VOLUNTEER AND PATIENT SERVICES PHASE 3

DEPARTMENT OF VETERANS AFFAIRS
3350 La Jolla Village Drive
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VA PROJECT NO. 664-09-103

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**DEPARTMENT OF VETERANS AFFAIRS
PROJECT SPECIFICATIONS**

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SECTION 05 12 20

REINFORCING STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 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 or Complex Steel Building 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.

1.3 TOLERANCES:

Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by Section 7, Code of Standard Practice for Buildings and Bridges, and by Standard Mill Practice - General Information (AISC ASD Manual, Ninth Edition, Page 1-145 LRFD Manual, Second Edition, Page 1-183.

1.4 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.

1.5 REGULATORY REQUIREMENTS:

- A. AISC: Specification for Structural Steel Buildings - Allowable Stress Design, or LRFD Specification for Structural Steel Buildings.

- B. AISC: Code of Standard Practice for Steel Buildings and Bridges.

1.6 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.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Structural Steel: ASTM A36, A242, A283, or A572 as appropriate.
- 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 or 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 - Allowable Stress Design and Plastic Design, or 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.
- D. 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.

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- B. Finish painting of steel surfaces is specified in Section 09 91
00, PAINTING.

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SECTION 05 31 00

STEEL DECKING

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 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.

1.3 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.

1.4 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.

1.5 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):
- 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
- C423-08.....Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C. American Institute of Steel Construction (AISC):
1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (ninth Edition, 1989)
 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (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 or ASTM A611, Grade C, D, or E
- 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.

2.2 REQUIREMENTS:

- A. Provide steel decking of the type, depth, gauge, and section properties as shown on the drawings.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.

- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Provide steel decking in sufficient lengths to extend over 3 or more spans, except for interstitial levels.
- E. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.
- F. Fastening Deck Units:
 - 1. Fasten floor deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.
 - 2. Tack weld or use self-tapping No. 8 or larger machine screws at 915 mm (3 feet) o.c. for fastening end closures. Only use welds to attach longitudinal end closures.
 - 3. Weld side laps of adjacent floor deck units that span more than 1524 mm (5 feet). Fasten at midspan or 915 mm (3 feet) o.c., whichever is smaller.
 - 4. 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.
- 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:

- A. Areas scarred during erection.
- B. Welds to be thoroughly cleaned and touched-up. Touch-up paint for zinc-coated units shall be zinc rich galvanizing repair paint, or Touch-up paint for shop painted units of same type used for shop painting.

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SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified

1.2 RELATED WORK:

- A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. 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 with the minimum physical and structural properties indicated.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.
- D. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

1.5 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Iron and Steel Institute (AISI):

Specification and Commentary for the Design of Cold-Formed Steel
Structural Members (1996)

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

A36/A36M(REV. A)-2003...Standard Specifications for Carbon
Structural Steel

A123/A123M-2002.....Standard Specifications for Zinc (Hot-Dip
Galvanized) Coatings on Iron and Steel
Products

A153/A153M-2003.....Standard Specifications for Zinc Coating
(Hot-Dip) on Iron and Steel Hardware

A307-2002.....Standard Specifications for Carbon Steel
Bolts and Studs

A653/A653M-2003.....Standard Specifications for Steel Sheet,
Zinc-Coated (Galvanized) or Zinc-Iron
Alloy-Coated (Galvannealed) by the Hot-
Dip Process

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

C1107-2002.....Standard Specifications for Packaged Dry,
Hydraulic-Cement Grout (Non-shrink)

E488-96(Reapproved 2003)Standard Test Methods for Strength of
Anchors in Concrete and Masonry Elements

E1190-95(Reapproved 2000)Standard Test Methods for Strength of
Power-Actuated Fasteners Installed in
Structural Members

D. American Welding Society (AWS):

D1.3-(98).....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

MIL-P-21035B (Reinst. Notice 2), Paint, High Zinc Dust Content,
Galvanizing Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Sheet Steel for joists, studs and accessories 16 gage and
heavier: ASTM A653, structural steel, zinc coated // G60 // //
G90 //, with a yield of 340 MPa (50 ksi) minimum.

- B. Sheet Steel for joists, studs and accessories 18 gage and lighter: ASTM A653, structural steel, zinc coated // G60 // // G90 //, with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 WALL FRAMING:

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the requirements indicated on the drawings.
- 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 ksi).
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Gusset plates.
 - 5. Deflection track and vertical slide clips.
 - 6. Stud kickers and girts.
 - 7. Joist hangers and end closures.
 - 8. Reinforcement plates.

2.4 ANCHORS, CLIPS, AND FASTENERS:

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.

- B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 REQUIREMENTS:

- A. Welding in accordance with AWS D1.3
- B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION:

- A. Framing components may be preassembled into panels. Panels shall be square with components attached.
- B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.
- C. Hold members in place until fastened.
- D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - 1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - 2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 ERECTION:

- A. Handle and lift prefabricated panels in a manner as to not distort any member.
- B. Securely anchor tracks to supports as shown.
- C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.
- D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.
- E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- G. Install headers in all openings that are larger than the stud spacing in that wall.
- H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- I. Studs in one piece for their entire length, splices will not be permitted.
- J. Provide a load distribution member at top track where joist is not located directly over bearing stud.
- K. Provide joist bridging and web stiffeners at reaction points where shown.
- L. Provide end blocking where joist ends are not restrained from rotation.
- M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.
- N. Provide temporary bracing and leave in place until framing is permanently stabilized.
- O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 TOLERANCES:

- A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.
- C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.
- D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 FIELD REPAIR:

Touch-up damaged galvanizing with galvanizing repair paint.

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SECTION 05 50 00

METAL FABRICATION

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers items and assemblies fabricated from structural steel shapes and other materials as shown and specified.

1.2 SUBMITTALS

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

- A. Shop Drawings: For each item specified in the contract provide shop drawings 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. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - FF-B-588C(1).....Bolt, Toggle; And Expansion Sleeve, Screw
 - FF-P-395B.....Pin, Drive, Guided And Pin Drive, Power Actuated (Fasteners For Powder Actuated And Hand Actuated Fastening Tools)
 - FF-S-325Shield, Expansion; Nail, Expansion; And Nail, INT AMD 3 Drive Screw (Devices, Anchoring, Masonry)
 - QQ-A-200/9C(1).....Aluminum Alloy Bar, Rod, Shapes, Tube And Wire, Extruded, 6063
 - QQ-F-461C(1).....Floor, Plate, Steel, Rolled
 - QQ-S-775E.....Steel, Sheets, Carbon, Zinc-Coated
 - RR-T-650B.....Treads, Metallic And Non-Metallic, Non-Skid
 - TT-P-641G(1).....Primer Coating, Zinc Dust-zinc Oxide (For Galvanized Surfaces)
 - TT-P-645A.....Primer, Paint Zinc Chromate, Alkyd Type
 - WW-P-406D.....Pipe, Steel (Seamless And Welded)
- C. Military Specifications (Mil. Spec.):

MIL-P-21035(SHIPS).....Paint, High Zinc Dust Content, Galvanizing
Repair

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

A36-81.....Structural Steel

A307.....Low-carbon steel externally and internally
threaded standard fasteners

E. American Welding Society (AWS):

D1.1-81.....Structural Welding Code

F. Structural Steel Painting Council (SSPC):

SSPC-SP 1-63.....No. 1, Solvent Cleaning

SSPC-SP 2-63.....No. 2, Hand Tool Cleaning

SSPC-SP 3-63.....No. 3, Power Tool Cleaning

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: ASTM A36.

B. Threaded Rods: ASTM A36.

C. Machine Bolts: ASTM A307 Low-carbon steel externally and
internally threaded standard fasteners.

D. Power Actuated Drive Pins: Fed. Spec. FF-P-395, style to suit
material.

E. Expansion Bolts (Shields): Fed. Spec. FF-S-325, except lead,
fiber and plastic shields are not acceptable. Furnish bolts and
screws required.

F. Toggle Bolts: Fed. Spec. FF-B-588, except wire wings are not
acceptable.

G. Zinc Chromate Primer: Fed. Spec. TT-P-645, Type II.

H. Zinc Dust Primer: Fed. Spec. TT-P-641, Type II.

I. Zinc Rich Paint: Mil. Spec. MIL-P-21035.

2.2 FABRICATION GENERAL

A. Material: Material shall be as specified. Material required
which is not named or which is named but for which a standard of
quality is not specified shall be of good commercial quality,
suitable in all respects for the intended purpose.

1. Material shall be free of defects which affect the
appearance of serviceability of the finished product.

- B. Size: Size and thickness of members shall be as shown. When size and thickness is not specified or shown for an individual part, the size and thickness shall be not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.
- C. Connections: Except as otherwise specified, connections may be made by welding, riveting or bolting. Field riveting will not be approved.
 - 1. Holes, for bolts shall be accurately punched or drilled, and shall have the burrs removed. Size, number and placement of rivets and bolts, shall be designed so as to develop a joint strength of not less than the design value.
 - 2. Welding shall be in accordance with AWS D1.1. Welds shall be of sufficient size and shape to develop the full design strength of the parts connected by welds and shall transmit imposed stresses without permanent deformation of failure when subject to service loadings.
 - 3. Bolts shall be of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
- D. Fasteners and Anchors: Methods for fastening or anchoring metal fabrications to building construction shall be as shown or specified. Where fasteners and anchors are not shown, the type, size, location and spacing shall be designed so as to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and shall suit the sequence of installation. The material and finish of the fasteners shall be compatible with the kinds of materials which are fastened together and their location in the finished work.
 - 1. Fasteners for securing metal fabrication to existing construction or new construction may be by expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.
- E. Workmanship:
 - 1. General: Fabricate items to design shown. Furnish members in longest lengths commercially available within the limits shown and specified. All work shall be straight, true, free from warp and twist, and where applicable square and in same plane.
 - a. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items. Provide openings, cut-outs and tapped holes for attachment and clearances required for work of other trades. Prepare members for the installation and fitting of hardware.
 - b. All surfaces and edges shall be free from sharp edges, burrs and projects which may cause injury.
 - 2. Welding: Welding shall be in accordance with the requirements of AWS D1.1. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and

rigid joints in proper alignment. Where exposed in the finished work, welds shall be continuous for the full length of the members joined and have depressed areas filled and all protruding welds finished smooth and flush with adjacent surfaces.

3. Joining: Miter or butt members at corners. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Cutting and Fitting: All joints, corners, copes, and miters shall be accurately cut, machined and fitted. Removable members shall be fitted so as to be easily removed.
 - a. Design and construct field connections in the most practical place for appearance and ease of installation. All pieces shall fit together as required. Connections shall provide ease of assembly (and disassembly) without use of special tools. Joints shall be firm when assembled.
 - b. Joining, fitting and welding on exposed work shall be concealed as far as practical. Rivets and screws shall not show prominently on the exposed face.
 - c. The fit of components and the alignment of holes shall eliminate the need to modify any component or to use exceptional force in the assembly of any item and shall eliminate the need to use other than common tools.

F. Finish:

1. Steel and Iron:

- a. Shop Prime Painting: All surfaces of steel and iron except surfaces to be welded and zinc coated (galvanized) surfaces shall be cleaned of all oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1. Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3. Surfaces exposed in the finished work shall have all holes, dents and similar voids and depressions filled with epoxy type patching compound and all projections and rough surfaces finished smooth. After cleaning and finishing, apply one coat of zinc-chromate primer.
- b. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coated items and zinc dust primer on all other zinc coated items.
- c. Finish painting of exposed surfaces is specified elsewhere.

- G. Protection: Insulate aluminum surfaces that will come in contact with metals other than stainless steel, zinc or white bronze by giving the dissimilar metal a coat of heavy-bodied alkali resisting bituminous paint. Insulate aluminum from plaster,

masonry and concrete by painting the aluminum with zinc-chromate primer.

2.3 SUPPORTS

- A. General: Fabricate of structural steel shapes as shown. Provide clip angles or make provisions for welding hangers and braces to overheads construction. Field connections may be welded or bolted.
- B. Supports for Wall Mounted Items: Where items are supported by metal stud partitions provide supports as follows:
 - 1. 16 gauge steel hat channels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation of metal fabrications shall be by experienced mechanics capable of installing each item in accordance with the drawings and specifications, in consideration of the field conditions, and the shop and erection drawings.
- B. 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.
- C. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and for the positioning of items having anchors to be built into concrete.
- D. 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.
- E. Field welding shall be in accordance with AWS D1.1 and shall be designed and finished as specified for shop welding.
- F. Provide 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.
- G. 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.

3.2 CLEANING AND ADJUSTING

- A. All movable parts including hardware shall be cleaned and adjusted to operate as designed without binding or deformation of the members, to be centered in the opening or frame and, where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.

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SECTION 05 52 36

MATCH EXISTING ALUMINUM RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install aluminum railings as indicated on the drawings and specified, including extending and matching existing railings.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01340.
- B. Product Data for each type of railing product specified.
- C. Shop drawings showing fabrication and installation of handrails and railings including plans, sections, details of components, and attachments to other units of Work.
- D. Samples for the anodized finish required, prepared on components that are of the same metal indicated for final unit of Work.

PART 2 PRODUCTS

2.1 MATCH EXISTING ALUMINUM RAILINGS

- A. Provide materials that match the existing alloy and finish. Exposed-to-view surfaces that exhibit irregularities that are inconsistent with the original railings will not be acceptable.
- B. Manufacturer: Subject to compliance with specified requirements, when available provide materials by the original manufacturer, or provide railings by Moultrie Manufacturing Co. or "or equal" handrails and railing systems of one of the following:
 - 1. Blum: Julius Blum & Co., Inc.
 - 2. Braun: J.G. Braun Co.
 - 3. Newman Bros., Inc.
- C. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, with not less than the strength and durability properties of the alloy 6063-T5.
- D. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are incompatible with materials joined.
- E. Connections: Fabricate railing systems and handrails for connection of members by welding or by means of railing manufacturer's concealed mechanical fasteners and fittings, subject to approval by the Architect, and as follows:

1. Welded Connections for Aluminum Pipe or Tube: Fabricate pipe or tube handrails and railing systems for connection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
 2. Nonwelded Connections for Aluminum Pipe or Tube: Fabricate railing systems and handrails for connection of members by means of railing manufacturer's standard adhesively connected fittings by use of epoxy cement. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- F. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors for interconnection of handrail and railing members to other construction.
- G. Provide inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
- F. For railing posts set in concrete, provide core drilled holes, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.
- I. For handrails and railing systems that are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.
- J. Match existing finishes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Clean and stabilize the existing railings to reestablish its "like new" appearance as closely as practicable. Repair existing components so as to retain their original appearance and serviceability.
- B. Fit exposed connections accurately together to form tight, hairline joints.
- C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting. Align rails

so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

- D. Restore damaged finishes so that no evidence remains of defects or defacements. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

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SECTION 06 20 00

FINISH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies exterior and interior millwork as indicated on the drawings and specified.

1.2 RELATED WORK

- A. Fabricated Metal brackets, bench supports and countertop legs: Section 05 50 00, METAL FABRICATIONS.
- B. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Millwork items - Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
 - 2. Show construction and installation.
- C. Samples: Solid surface fabrications, and Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).
- D. Certificates: provide Woodwork Institute (WI) certified Compliance Certificate attesting that finish carpentry complies with the specifications.

1.4 DELIVERY, STORAGE AND HANDLING

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

1.5 APPLICABLE PUBLICATIONS

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

- B. American Society of Testing and Materials (ASTM):
- A36/A36M-08.... Structural Steel
 - A53-07..... Pipe, Steel, Black and Hot-Dipped Zinc Coated,
Welded and Seamless
 - A167-99 (R2009) Stainless and Heat-Resisting Chromium-Nickel Steel
Plate, Sheet, and Strip
 - B26/B26M-09.... Aluminum-Alloy Sand Castings
 - B221-08..... Aluminum and Aluminum-Alloy Extruded Bars, Rods,
Wire, Profiles, and Tubes
 - E84-09..... Surface Burning Characteristics of Building
Materials
- C. American Hardboard Association (AHA):
- A135.4-04..... Basic Hardboard
- D. Builders Hardware Manufacturers Association (BHMA):
- A156.9-03..... Cabinet Hardware
 - A156.11-04..... Cabinet Locks
 - A156.16-02..... Auxiliary Hardware
- E. Hardwood Plywood and Veneer Association (HPVA):
- HP1-09..... Hardwood and Decorative Plywood
- F. National Particleboard Association (NPA):
- A208.1-99..... Wood Particleboard
- G. American Wood-Preservers' Association (AWPA):
- AWPA C1-03..... All Timber Products - Preservative Treatment by
Pressure Processes
- H. Architectural Woodwork Institute (AWI):
- AWI-99..... Architectural Woodwork Quality Standards and
Quality Certification Program
- I. National Electrical Manufacturers Association (NEMA):
- LD 3-05..... High-Pressure Decorative Laminates
- J. U.S. Department of Commerce, Product Standard (PS):
- PS20-05..... American Softwood Lumber Standard
- K. Military Specification (Mil. Spec):
- MIL-L-19140E... Lumber and Plywood, Fire-Retardant Treated

- L. Federal Specifications (Fed. Spec.):
 - A-A-1922A..... Shield Expansion
 - A-A-1936..... Contact Adhesive
 - FF-N-836D..... Nut, Square, Hexagon Cap, Slotted, Castle
 - FF-S-111D(1)... Screw, Wood
 - MM-L-736(C).... Lumber, Hardwood

PART 2 - PRODUCTS

2.1 LUMBER

- A. Grading and Marking:
 - 1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.
 - 2. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
 - 3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Sizes:
 - 1. Lumber Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which product is produced.
 - 2. Millwork, standing and running trim, and rails: Actual size as shown or specified.
- C. Hardwood: MM-L-736, species as specified for each item.
- D. Softwood: PS-20, exposed to view appearance grades:
 - 1. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
 - 2. Use Prime for painted or opaque finish.
- E. Use edge grain Wood members exposed to weather.

2.2 PLYWOOD

- A. Softwood Plywood:
 - 1. Prod. Std.

2. Grading and Marking:
 - a. Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood.
 - b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
 3. Plywood, 13 mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.
 4. Plastic Laminate Plywood Cores:
 - a. Exterior Type, and species group.
 - b. Veneer Grade: A-C.
 5. Shelving Plywood:
 - a. Interior Type, any species group.
 - b. Veneer Grade: A-B or B-C.
 6. Other: As specified for item.
- B. Hardwood Plywood:
1. HPVA: HP.1
 2. Species of face veneer shall be as shown or as specified in connection with each particular item.
 3. Inside of Building:
 - a. Use Type II (interior) A grade veneer for transparent finish.
 - b. Use Type II (interior) Sound Grade veneer for paint finish.
 4. On Outside of Building:
 - a. Use Type I, (exterior) A Grade veneer for natural or stained and varnish finish.
 - b. Use Type I, (exterior) Sound Grade veneer for paint finish.
 5. Use plain sliced red oak or rotary cut white birch, unless indicated otherwise.

2.3 PARTICLEBOARD

- A. NPA A208.1
- B. Plastic Laminate Particleboard Cores:

1. Use Type 1, Grade 1-M-3, or Type 2, Grade 2-M-2, unless otherwise specified.
 2. Use Type 2, Grade 2-M-2, exterior bond, for tops with sinks.
- C. General Use: Type 1, Grade 1-M-3 or Type 2, Grade 2-M-2.

2.4 PLASTIC LAMINATE

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

2.5 SOLID SURFACING MATERIALS

- A. Subject to compliance with specified requirements, solid surfacing materials shall be Formica and Avonite Solid Surface, or an "or equal" product of E. I. du Pont de Nemours & Co., Inc., and of the dimensions and profiles indicated on the drawings. Other manufacturers offering "or equal" products are Wilsonart, and Nevamar.
- B. Joint adhesive: Provide the manufacturer's recommended adhesive for inconspicuous non-porous joints.
- C. Sealant: Provide the manufacturer's recommended silicone adhesive in colors closely matching the solid surfacing.
- D. Polishing cream: compatible polishing cream to achieve specified sheen.
- E. Core framing: Softwood lumber, clear and free of knots
- F. hardware: Provide stainless steel inserts, screws, flat washers, wing nuts, and clips required to make the installation complete.

G. Adhesive for Plastic Laminate: Fed. Spec. A-A-1936.

H. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

2.6 STAINLESS STEEL

ASTM A167, Type 302 or 304.

2.7 ALUMINUM CAST

ASTM B26

2.8 ALUMINUM EXTRUDED

ASTM B221

2.9. HARDWARE

A. Finish Hardware: match the existing as closely as practicable.

1. Cabinet Hardware: ANSI A156.9.

a. Door/Drawer Pulls: B02011. Door in seismic zones: B03182.

b. Drawer Slides: B05051 for drawers over 150 mm (6 inches) deep, B05052 for drawers 75 mm to 150 mm 3 to 6 inches) deep, and B05053 for drawers less than 75 mm (3 inches) deep.

c. Sliding Door Tracks: B07063.

d. Adjustable Shelf Standards: B4061 with shelf rest B04083.

e. Concealed Hinges: B1601, minimum 110 degree opening.

f. Butt Hinges: B01361, for flush doors, B01381 for inset lipped doors, and B01521 for overlay doors.

g. Cabinet Door Catch: B0371 or B03172.

h. Vertical Slotted Shelf Standard: B04103 with shelf brackets B04113, sized for shelf depth.

2. Cabinet Locks: ANSI A156.11.

a. Drawers and Hinged Door: E07262.

b. Sliding Door: E07162.

3. Auxiliary Hardware: ANSI A156.16.

a. Shelf Bracket: B04041, japanned or enameled finish.

b. Combination Garment rod and Shelf Support: B04051 japanned or enamel finish.

- c. Closet Bar: L03131 chrome finish of required length.
- d. Handrail Brackets: L03081 or L03101.
 - 1) Cast Aluminum, satin polished finish.
 - 2) Cast Malleable Iron, japanned or enamel finish.

2.10 MOISTURE CONTENT

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

2.11 FABRICATION

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

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

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain work areas and storage areas to a minimum temperature of 21°C (70°F) for not less than 10 days before and during installation of interior millwork.
- B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2 INSTALLATION

- A. General:
 - 1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.
 - 2. Secure trim with fine finishing nails, screws, or glue as required.
 - 3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.
 - 4. Seal cut edges of preservative and fire retardant treated wood materials with a certified acceptable sealer.
 - 5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
 - 6. Plumb and level items unless shown otherwise.
 - 7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.
- B. Shelves:
 - 1. Install mounting strip at back wall and end wall for shelves in closets where shown secured with toggle bolts at each end and not over 600 mm (24 inch) centers between ends.
 - a. Nail Shelf to mounting strip at ends and to back wall strip at not over 900 mm (36 inches) on center.
 - b. Install metal bracket, ANSI A156.16, B04041, not over 1200 mm (4 feet) centers when shelves exceed 1800 mm (6 feet) in length.
 - c. Install metal bracket, ANSI A156.16, B04051, not over 1200 mm (4 feet) on centers where shelf length exceeds 1800 mm (6 feet) in length with metal rods, clothes

hanger bars ANSI A156.16, L03131, of required length,
full length of shelf.

2. Install vertical slotted shelf standards, ANSI A156.9, B04103 to studs with toggle bolts through each fastener opening. Double slotted shelf standards may be used where adjacent shelves terminate.
 - a. Install brackets ANSI A156.9, B04113, providing supports for shelf not over 900 mm (36 inches) on center and within 13 mm (1/2 inch) of shelf end unless shown otherwise.
 - b. Install shelves on brackets so front edge is restrained by bracket.

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SECTION 07 14 21

LATEX MASTIC DECK COVERING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies latex mastic covering for waterproofing deck surfacing.

1.2 MANUFACTURER'S QUALIFICATIONS

Latex mastic deck covering shall be a product of a manufacturer regularly engaged in producing and supplying latex mastic deck covering as specified.

1.3 APPLICATOR'S QUALIFICATIONS

Deck covering installation shall be performed by an applicator approved by the manufacturer.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - D412-06.....Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - D570-98 (R2005).....Water Absorption of Plastics
 - D903-98 (R2005).....Peel or Stripping Strength of Adhesive Bonds.
 - D2240-05.....Rubber Property-Durometer Hardness.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: 150 mm (6 inch) square, each color.
- C. Manufacturer's Literature and Data:
 - 1. Latex mastic deck covering.
 - 2. Installation instructions.
- D. Certificates:
 - 1. Compliance of material with specification requirements.

2. Manufacturer's qualifications as specified.

3. Applicator's qualifications as specified.

1.6 DELIVERY

Deliver materials to job site in original sealed containers identified with manufacturer's name and brand.

1.7 WARRANTY

Deck covering and integral flashing is subject to the "Warranty of Construction", FAR clause 52.246-21, except that the warranty period against leaks or other failures, over and above normal wear and structural failure of the substructure, is two years in lieu of one year.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Provide Crossfield Products Corp. "Dex-O-Tex Weatherwear Traffic Bearing Roof Deck," or equal. Subject to review by the architect, comparable products by Mer-Kote, or equal, may also be acceptable.
- B. Product shall be a trowel applied elastomeric material meeting all performance requirements specified and designed primarily for waterproofing deck surfacing.

2.2 PERFORMANCE REQUIREMENTS

- A. Tensile Strength: ASTM D412: Not less than 7240 KPa (1050 psi).
- B. Water Transmission: ASTM D570: None when subjected to a water pressure of 345 KPa (50 psi) for a period of one hour.
- C. Hardness: ASTM D2240: 60-70 Shore "A".
- D. Adhesive Strength: ASTM D-903: Not less than 1035 kPa (150 psi).
- E. Weight: 1.8 kg/m² (0.45 lbs psf).
- F. Elongation: ASTM D412: 500 percent.

2.3 FINISH

The topcoat shall be of the color selected by the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare surface by removing dirt or other foreign matter including any concrete curing agents.

- B. Apply epoxy primer by roller.
- C. Apply basecoat and pigmented topcoat as per manufacturer's instructions. Turn up the material against walls to form an integral waterproof membrane.
- D. Typical finish of two coats shall be minimum 2 mm (1/16 inch).

- - - E N D - - -

SECTION 07 21 13

THERMAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes thermal and acoustical insulation for buildings.
- B. Acoustical insulation is identified by thickness and words "Acoustical Insulation".

1.2 SUBMITTALS

- A. In accordance with Section 01 33 23, SAMPLES AND SHOP DRAWINGS, furnish the following:
 - 1. Manufacturer's Literature and Data:
 - a. Thermal insulation, each type used
 - b. Adhesive, each type used.
 - c. Tape
 - 2. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.3 STORAGE AND HANDLING

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.4 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 basic designation only.
- B. Federal Specifications (Fed. Spec.)
 - FF-N-105B(3).....Nails, Brads, Staples And Spikes: Wire, Cut And Wrought
- C. American Society of Testing and Materials (ASTM):
 - C270-86a.....Mortar for Unit Masonry
 - C516-75.....Vermiculite Loose Fill Insulation
 - C549-81.....Perlite Loose Fill Insulation
 - C552-79.....Cellular Glass Block and Pipe Thermal Insulation

C553-70.....	Mineral Fiber Blanket and Felt Insulation (Industrial Type)
C578-85.....	Preformed Cellular Polystyrene Thermal Insulation
C591-83.....	Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation
C612-83.....	Mineral Fiber Block and Board Thermal Insulation
C665-84.....	Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C728-82.....	Perlite Thermal Insulation Board
C954-86.....	Steel Drill Screws for the Application of Gypsum Board Metal Plaster Base to Steel Studs From 0.033 inch to 0.112 inch in thickness
D312-71.....	Asphalt For Use in Constructing Built-up Roof Coverings

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

- A. Where thermal resistance ("R" value) is specified or shown for insulation, the thickness shown on the drawings is nominal. Use only insulation with actual thickness that is not less than that required to provide the thermal resistance specified.
- B. Where "R" value is not specified for insulation, use the thickness shown on the drawings.
- C. Where more than one type of insulation is specified, the type of insulation for each use is optional, except use only one type of insulation in any particular area.

2.2 EXTERIOR FRAMING OR FURRING INSULATION

- A. Batt or Blanket: Optional.
- B. Mineral Fiber: ASTM C665, Type II, Class C where framing is faced with gypsum board.
- C. Mineral Fiber: ASTM C665, Type III, Class A where framing is not faced with gypsum board.

2.3 ACOUSTICAL INSULATION

- A. Mineral Fiber: ASTM C553, Type II, flexible, or Type III, semirigid (4.5 pound nominal density).
- B. Thickness as shown; of widths and lengths to fit tight against framing.

2.4 SOUND DEADENING BOARD

- A. Mineral Fiber Board: ASTM C612, Class I, 1/2-inch thick
- B. Perlite Board: ASTM C728, 1/2-inch thick.

2.5 RIGID INSULATION

- A. On the inside face of exterior walls, spandrel beams, floors and where shown.
- B. Mineral Fiber Board: ASTM C612, Class 1 or 2.
- C. Perlite Board: ASTM C728.
- D. Cellular Glass Block: ASTM C552, Type I.

2.6 FASTENERS

- A. Staples or Nails: Fed. Spec. F-N-105, zinc-coated, size and type best suited for purpose.
- B. Screws: ASTM C954, size and length best suited for purpose with washer not less than two inches in diameter.
- C. Impaling Pins: Steel pins with head not less than two inches in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

2.7 ADHESIVE

- A. As recommended by the manufacturer of the insulation.
- B. Asphalt: ASTM D312, Type III or IV.
- C. Mortar: ASTM C270, Type 0.

2.8 TAPE

- A. Pressure sensitive adhesive on one face.
- B. Perm rating of not more 0.50.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.
- B. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.
- C. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.
- D. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

3.2 EXTERIOR FRAMING OR FURRING BLANKET INSULATION

- A. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.
- B. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.
- C. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.
- D. Fasten blanket insulation between wood studs or framing with nails or staples through flanged edges on face of stud. Space fastenings not more than six inches apart.
- E. Roof Rafter Insulation or Floor Joist Insulation: Place mineral fiber blankets between framing to provide not less than a two inch air space between insulation and roof sheathing or subfloor.
- F. Ceiling Insulation and Soffit Insulation:
 - 1. Fasten blanket insulation between wood framing or joist with nails or staples through flanged edges of insulation.
 - 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. Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.
 - 3. In areas where suspended ceilings adjoin areas without suspended ceilings, install either blanket, batt, or mineral fiberboard extending from the suspended ceiling to underside of deck or slab above. Secure in place to prevent collapse or separation of hung blanket, batt, or board insulation and maintain in vertical position. Secure blanket or batt with continuous cleats to structure above.

3.3 RIGID INSULATION ON SURFACE OF EXTERIOR WALLS, FLOORS, AND UNDERSIDE OF FLOORS

- A. On the interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to the face of studs for interior wall finish where shown.
- B. Bond to solid vertical surfaces with adhesive as recommended by insulation manufacturer. Fill joints with adhesive cement.
- C. Use impaling pins for attachment to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.
- D. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings not more than 12 inches apart. Stagger fasteners at joints of boards. Install at each corner.

E. Floor insulation:

1. Bond insulation to concrete floors in attic by coating surfaces with hot steep asphalt applied at rate of not less than 25 pounds per 100 square feet, and firmly bed insulation therein.
2. When applied in more than one layer, bed succeeding layers in hot steep asphalt applied at the rate of not less than 25 pounds per 100 square feet.
3. Contractors option: Insulation may be installed with nonflammable adhesive in accordance with the manufacturer's printed instructions when a separate vapor retarder is used.

3.4 ACOUSTICAL INSULATION:

- A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
- B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.
- C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- D. Where acoustical insulation is installed above suspended ceilings install blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.
- E. Where sound deadening board is shown, secure with adhesive to masonry or concrete walls and with screws to metal or wood framing. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

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SECTION 07 21 17

ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes acoustical insulation for buildings.
- B. Acoustical insulation is identified by thickness and words "Acoustical Insulation."

1.2 SUBMITTALS

- A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS, furnish the following:
 - 1. Manufacturer's Literature and Data:
 - a. Acoustical insulation, each type used
 - b. Adhesive, each type used.
 - c. Tape
 - 2. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.3 STORAGE AND HANDLING

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.4 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 basic designation only.
- B. Federal Specifications (Fed. Spec.)
 - FF-N-105B(3).....Nails, Brads, Staples And Spikes: Wire, Cut And Wrought
- C. American Society of Testing and Materials (ASTM):
 - C553-70.....Mineral Fiber Blanket and Felt Insulation (Industrial Type)
 - C578-85.....Preformed Cellular Polystyrene Thermal Insulation
 - C591-83.....Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation
 - C612-83.....Mineral Fiber Block and Board Thermal Insulation

C665-84.....Mineral Fiber Blanket Thermal Insulation for
Light Frame Construction and Manufactured
Housing

C954-86.....Steel Drill Screws for the Application of Gypsum
Board Metal Plaster Base to Steel Studs From
0.033 inch to 0.112 inch in thickness

PART 2 - PRODUCTS

2.1 ACOUSTICAL INSULATION

- A. Mineral Fiber: ASTM C553, Type II, flexible, or Type III, semirigid (4.5 pound nominal density).
- B. Thickness as shown; of widths and lengths to fit tight against framing.

2.2 SOUND DEADENING BOARD

- A. Mineral Fiber Board: ASTM C612, Class I, 1/2-inch thick
- B. Perlite Board: ASTM C728, 1/2-inch thick.

2.3. FASTENERS

- A. Staples or Nails: Fed. Spec. F-N-105, zinc-coated, size and type best suited for purpose.
- B. Screws: ASTM C954, size and length best suited for purpose with washer not less than two inches in diameter.
- C. Impaling Pins: Steel pins with head not less than two inches in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

2.4 ADHESIVE

- A. As recommended by the manufacturer of the insulation.
- B. Asphalt: ASTM D312, Type III or IV.
- C. Mortar: ASTM C270, Type 0.

2.5. TAPE

- A. Pressure sensitive adhesive on one face.
- B. Perm rating of not more 0.50.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.

- B. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.
- C. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.
- D. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

3.1 INSTALLATION OF ACOUSTICAL INSULATION:

- A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
- B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.
- C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- D. Where acoustical insulation is installed above suspended ceilings install blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.
- E. Where sound deadening board is shown, secure with adhesive to masonry or concrete walls and with screws to metal or wood framing. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

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SECTION 07 22 00

ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install rigid insulation (tapered and even) as indicated on the drawings and specified.

1.2 RELATED WORK

- A. Rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- B. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 - 90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings
- C. ASTM International (ASTM):
 - C208-08.....Cellulosic Fiber Insulating Board
 - C552-07.....Cellular Glass Thermal Insulation
 - C726-05.....Mineral Fiber Roof Insulation Board
 - C728-05.....Perlite Thermal Insulation Board
 - C1177/C1177M-08...Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - C1278/C1278M-07...Standard Specification for Fiber-Reinforced Gypsum Panel
 - C1289-10.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - C1396/C1396M-09...Standard Specification for Gypsum Board

- D41-05.....Asphalt Primer Used in Roofing, Dampproofing,
and Waterproofing
- D312-06.....Asphalt Used in Roofing
- D1970-09.....Standard Specification for Self-Adhering
Polymer Modified Bituminous Sheet Materials
Used as Steep Roofing Underlayment for Ice Dam
Protection
- D2178-04.....Asphalt Glass Felt Used in Roofing and
Waterproofing
- D2822-05.....Asphalt Roof Cement
- D4586-07.....Standard Specification for Asphalt Roof Cement,
Asbestos-Free
- E84-09.....Standard Test Method for Surface Burning
Characteristics of Building Material
- F1667-05.....Driven Fasteners: Nails, Spikes, and Staples
- D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
- 4450-89.....Approved Standard for Class 1 Insulated Steel
Deck Roofs
- 4470-10.....Approved Standard for Class 1 Roof Coverings
- 1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.
- 1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof
Components
- 1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing
- E. National Roofing Contractors Association: Roofing and
Waterproofing Manual
- F. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog,
www.biopreferred.gov
- G. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory
(2009)
- H. U.S. Department of Commerce National Institute of Standards and
Technology (NIST):
- DOC PS 1-09.....U.S. Product Standard for Construction and
Industrial Plywood
- DOC PS 2-04.....Performance Standard for Wood-Based Structural-
Use Panels.

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Performance: Provide roof insulation meeting minimum overall R-value at any location of 10, not less than the thickness required.
- B. FM Approvals: Provide roof insulation complying with requirements in FM Approvals 4450 and 4470 as part of specified roofing system, listed in FM Approvals "RoofNav" as part of roofing system meeting Fire/Windstorm Classification in Division 07 roofing section.

1.5 QUALITY CONTROL

- A. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.
- B. Requirements of applicable FM Approval for specified roofing system insulation attachment.
- C. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
 - 1. Adhesive materials, each type.
 - 2. Roofing cement, each type.
 - 3. Roof insulation, each type.
 - 4. Substrate board, each type.
 - 5. Cover board, each type.
 - 6. Fastening requirements.
 - 7. Insulation span data for flutes of metal decks.
- C. LEED or Federal Sustainable Design Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.
- D. Shop Drawings: Include plans, sections, details, and attachments.
1. Nailers, cants, and terminations.
 2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.
- E. Samples:
1. Roof insulation, each type.
 2. Nails and fasteners, each type.
- F. Certificates:
1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
 2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.
- G. Laboratory Test Reports: Thermal values of insulation products.
- H. Layout of tapered roof system showing units required.
- I. Documentation of supervisors' and inspectors' qualifications.

1.7 DELIVERY, STORAGE AND MARKING

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation requirements.

1.8 QUALITY ASSURANCE:

- A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.
1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread

and smoke developed ratings will be accepted in-lieu-of
copies of test reports.

2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."
3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.1 ADHESIVE MATERIALS

- A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
 1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Fiberglass Adhesives: 80 g/L.
 - d. Contact Adhesives: 80 g/L.
 - e. Other Adhesives: 250 g/L.
 - f. Nonmembrane Roof Sealants: 300 g/L.
 - g. Sealant Primers for Nonporous Substrates: 250 g/L.
 - h. Sealant Primers for Porous Substrates: 775 g/L.
- B. Primer: ASTM D41.
- C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.
- D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free,

cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

- E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, ; or, D4586, Type I or Type II.

2.2 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Cellular Glass Board Insulation: ASTM C552, Type IV, kraft-paper sheet faced.
- D. Perlite Board Insulation: ASTM C728, expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.
- E. Tapered Roof Insulation System:
 - 1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
 - 2. Cut to provide high and low points with crickets and slopes as shown.
 - 3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
 - 4. Minimum slope 1:48 (1/4 inch per 12 inches).

2.3 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
 - 1. Wood Cant Strips: Provide pressure treated douglas fir.
 - 2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

3. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
 - a. Cellulosic Fiberboard: ASTM C208.
 - b. Mineral Fiberboard: ASTM C726.
 - c. Perlite Board: ASTM C728.
- C. Vapor Retarder:
 1. Glass-Fiber Felts: ASTM D2178, Type IV, asphalt impregnated.
 2. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).
- D. Substrate Board: Provide either of the following as required for the proper fire ratings.
 1. Type X gypsum board, ASTM C1396/C1396M, 16 mm (5/8 inch) thick.
 2. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 13 mm (1/2 inch) Type X, thick, factory primed.
 3. Perlite Board Insulation, ASTM C728, (19 mm (3/4 inch) thick.
- E. Cover Board: Provide either of the following as required for the proper fire rating.
 1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 6 mm (1/4 inch) thick, factory primed.
 2. Cellulosic-fiber-reinforced, water-resistant gypsum substrate, ASTM C1278/C1278M, 6 mm (1/4 inch).
 3. Oriented Strand Board, DOC PS 2, Exposure 1, 11 mm (7/16 inch) thick.

2.4 FASTENERS

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.
- B. Staples and Nails: ASTM F1667. Type as designated for item anchored and for substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

- A. Comply with requirements of Division 07 roofing section.

3.3 SUBSTRATE BOARD INSTALLATION

- A. Fasten substrate board to top flanges of steel deck to resist uplift pressures according to roofing system manufacturer's instructions and requirements of FM Approvals listing for specified roofing system.

3.4 VAPOR RETARDER INSTALLATION

- A. General:
 - 1. Install continuous vapor retarder on roof decks where indicated.
 - 2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
 - 3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.
 - 4. Seal penetrations with roof cement.
- B. Steel Deck:
 - 1. Material and method of application of roofing systems used on metal decks shall meet the requirements of FM Approvals for Class I-A Insulated Steel Roof Deck.
 - 2. Attach substrate board and subsequent components to meet the requirements of FM Approval's "RoofNav" listing for specified system meeting Fire/Windstorm Classification indicated in Division 07 roofing section.
 - 3. Locate the long dimension edge joints to have solid bearing on top of decking ribs; do not cantilever over rib openings or flutes.

3.5 RIGID INSULATION INSTALLATION

- A. Insulation Installation, General:
 - 1. Install roof insulation in accordance with roofing system manufacturer's written instructions.

2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.
 3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.
 4. Cant Strips: Install preformed insulation cant strips or wood cant strips at junctures of roofing system with vertical construction.
 5. Use same insulation as existing for roof repair and alterations unless specified otherwise.
- B. Insulation Thickness:
1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
 2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.
 3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
 4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).
 5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).
- C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tight against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

H. Installation Method:

1. Adhered Insulation:

- a. Prime substrate as required.
- b. Set each layer of insulation firmly in solid mopping of hot asphalt.
- c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.
- d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.

2. Mechanically Fastened Insulation:

- a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
- b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.

3. Mechanically Fastened and Adhered Insulation:

- a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
- b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

4. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Adhered Insulation" or "Mechanically Fastened Insulation" requirements.

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SECTION 07 41 72

MATCH EXISTING METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide metal wall panels that match the existing metal wall panels, or after weathering will match the existing panels as closely as practicable.

1.2 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings, indicating panel and fastener layout, joints, corners, supports, anchorages, trim, flashing, closures and special details.
- B. Product Data:
 - 1. Submit catalog cuts, technical data sheets and descriptive literature on sheets, panels, accessories and fasteners.
 - 2. Submit complete installation recommendations.
- C. Material Samples: Submit Samples showing full range of manufacturer's standard colors, minimum 3 inch x 5 inch size.

1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made, compare new to existing panels and demonstrate aesthetic effects, and qualities of materials and execution.
 - 1. Build mockup of typical corner wall panel as shown on Drawings; approximately 48 inches (1200 mm) square by full thickness, including supports, attachments, and accessories.
 - 2. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
 - 3. Approval of mockups constitute approval of deviations from the Contract Documents containing in mockups unless such deviations are specifically approved by Architect in writing.
 - 4. Approved mockups may become part of the completed Work if approved by the Architect.
- B. Comply with the following as a minimum requirement:
 - 1. AISC - Steel Construction Manual.
 - 2. AISI - Cold Form Steel Design Manual.
 - 3. ASTM A 653 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM A 792 - Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.

- 5. ASTM A 924 - Steel Sheet, Metallic- Coated by the Hot-Dip Process.
- 6. SMACNA - Architectural Sheet Metal Manual.
- C. Qualifications of Installer: Minimum 2 years experience in the installation of roof and wall panel systems of similar complexity as required by this section.
- D. Trained and certified by manufacturer to install the specified products.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver panels to the Project site without damage.
- B. Storage: Store materials and accessories above ground on skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up.
- C. Handling: The bending, warping, or twisting of panels is not permitted during unloading, storing or installation.

1.5 WARRANTY

- A. Manufacturer shall provide a 20 year material warranty.
- B. Installer shall provide a 5 year labor warranty.

PART 2 - PRODUCTS

2.1 MATCH EXISTING METAL WALL PANELS

- A. Subject to compliance with specified requirements, wall panels shall be the product of the manufacturer of the original manufacturer, or one of the following:
 - 1. Berridge Manufacturing Company.
 - 2. IMETCO.
 - 3. AEP-Span.
 - 4. Peterson Aluminum Corporation.
 - 5. Una-Clad Copper Sales, Inc.
 - 6. McElroy Metal Inc.

2.2 MISCELLANEOUS METAL FRAMING

- A. Steel Sheet components, General: complying with ASTM C 645 requirements for metal and with ASTM A 653, G60 (Z180), hot-dip galvanized or manufacturer's standard corrosion-resistant zinc coating.
- B. Subgirts: C- or Z-shaped sections fabricated from 0.598-inch (1.5-mm) bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.
- C. Zee Clips: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.
- D. Base or Sill Angles and Channels: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 2. Depth: 7/8 inch (22 mm).
- F. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch (13-mm) wide flange.
1. Depth: 3/4 inch (19 mm).
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch (1.59-mm) diameter wire, or double strand of 0.0475-inch (1.21-mm) diameter wire.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
- H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 FABRICATION

- A. Fabricate trim, flashing and accessories to match the existing profiles.
- B. Fabricate trim and flashing from same material as the wall panel.

PART 3 - EXECUTION

3.1 MATCH EXISTING WALL PANEL INSTALLATION

- A. General: Install attachment system required to support wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips and anchor channels.
 1. Match the existing workmanship as closely as practicable.
 2. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
 3. Seal horizontal and vertical joints between adjacent panels with manufacturer's standard gaskets.
- B. Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: the Contractor shall engage and pay a qualified independent testing and inspecting agency to perform field tests and inspection and prepare test reports.
- B. Water Penetration: Test areas of installed wall panels for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. (300 Pa).
- C. Water-Spray Test: After completing the installation, test the assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.
- D. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean conditions during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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SECTION 07 60 50

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

This section includes materials and workmanship for flashing and sheet metal work indicated on the drawings.

1.2 RELATED WORK

- A. Sealant compound and methods of preparation: Section 07920, SEALANT AND CAULKING.

1.3 SUBMITTALS

- A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS, submit shop drawings for all sheet metal and flashing.

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. Federal Specification (Fed. Spec):
 - 0-F-506C..... Flux, Soldering; Paste and Liquid
 - FF-S-325..... Shield, Expansion; Nail, Expansion; And Nail, Sheared, Sawed, Or Machine Edges, (Plate, Bar Sheet, And Strip)
 - QQ-S-571E(2)..... Solder; Tin Alloy; Tin-lead Alloy; And Lead Alloy
 - QQ-S-766C..... Steel Plates, Sheets, And Strip-Corrosion Resisting
 - QQ-S-775E..... Steel Sheet, Carbon, Zinc-coated
- C. American Society for Testing and Materials (ASTM):
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - Architectural Sheet Metal Manual (Third Edition, 1979).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Flux: Fed. Spec. 0-F-506, Type I, Form A or B, and Type II, Form A or B.
- B. Solder: Fed. Spec. QQ-S-571; flux type and alloy composition as required for use with metals to be soldered.
- C. Expansion Shields: Fed. Spec. FF-S-325, Group II or III.

D. Galvanized Steel: Fed. Spec. QQ-S-775, Type I, Class d.

2.2 FABRICATION, GENERAL

A. Jointing: Surfaces of sheet metal work required to be soldered shall be treated in accordance with metal producers recommendations. Completely remove acid and flux after soldering is completed.

1. Joints shall conform to following requirements:

- a. Flat-lock joints shall finish not less than 3/4-inch wide.
- b. Lap joints subject to stress shall finish not less than one inch wide and shall be soldered and riveted.
- c. Unsoldered lap joints shall finish not less than four inches wide.

2. Flat and lap joints shall be made in direction of flow.

B. Expansion and Contraction Joints: Provide expansion and contraction joints, fabricated in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metalwork in continuous runs. Expansion and contraction joints shall be slip-type or loose locked, and filled with polyurethane polymer, if joint cover is minimum 3" needs to be riveted, then one side of the joint needs to have longated slotted holes for any movement. Joint covers shall be same thickness material as sheet metal served.

C. Fastenings:

- 1. Direct nailing of sheet metal shall be confined to strips 12 inches or less wide. Flashings shall be nailed along one edge only. Nails shall be spaced not over four inches on center. Nails shall have large flat heads and needle points, and shall penetrate nailer at least 7/8-inch. Nails exposed to the weather shall have neoprene washers.
- 2. Install bolts, rivets, and screws where indicated, specified or required in accordance with the SMACNA Sheet Metal Manual. Rivets shall be spaced at three inches on centers in two rows in a staggered position.

D. Cleats: Provide cleats to secure flashings and sheet metal work over 6" inches wide and elsewhere specified or required. Cleats shall be evenly spaced not over 12 inches on centers. Secure one end of cleat over nail heads. Lock other end into the seam. Pretin cleats for soldered seams.

- 1. Cleats shall be formed of same metal and weights as the sheet metal being installed.

E. Drips: Form drips at lower edge of sheet metal counter-flashings by folding edge back and bending out 45 degrees from vertical to carry water away from the wall. Form drip to provide hook to engage cleat or edge strip for fastening.

2.3 BASE FLASHING

- A. Metal base flashing for use at vertical surfaces intersecting built-up roofing (without cant strips) shall be either copper, stainless steel, or copper clad stainless steel. Flashing shall be either 20 ounce copper, 0.018 inch stainless steel, or 0.018 inch thick copper clad stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

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.

3.2 SURFACE PREPARATION

- A. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
- B. 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 1/4-inch with sheet metal compatible with the flashing material used.

3.3 FLASHING, GENERAL

- A. Install flashing at intersections of roofs with vertical surfaces, at projections through roofs, where shown and specified, and where required to provide watertight construction.
- B. Install counter-flashing in conjunction with all base flashings, except as otherwise specified or shown.
- C. Install metal base flashings, gravel stops, pitch pockets and other metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied. Set flanges in heavy trowel coat of plastic cement and nail through flanges into wood nailers.

3.4 PIPE FLASHING

- A. Where vent and other pipes, penetrate built-up roofing, install metal flashing consisting of a sleeve with flange and seal with a polyurethane polymer.

3.5 INSPECTION

- A. Cleat use to secure flashing must be inspected before flashing is applied.
- B. Flashing for any openings must be inspected before lathing, metal siding, or membrane goes on.
- C. Joint must be inspected before any paint is applied.

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SECTION 07 71 00

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies roof hatches; equipment supports; gravity ventilators; and metal grating roof walkway system.

1.2 RELATED WORK

- A. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- 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. Federal Specifications (Fed. Spec.):
 - RR-G-1602D.....Grating, Metal, Other Than Bar Type (Floor,
Except for Naval Vessels)
- C. American Society for Testing and Material (ASTM):
 - A653/A653M-02.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-
Iron Alloy-Coated (Galvannealed) By the Hot-Dip
Process
 - B209/209M-02.....Aluminum and Aluminum Alloy-Sheet and Plate
 - B221/221M-02.....Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes
 - C612-00.....Mineral Fiber Block and Board Thermal Insulation
 - D1187-97.....Asphalt-Base Emulsions for Use as Protective
Coatings for Metal
- D. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500 Series....Metal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):
 - 605-98.....High Performance Organic Coatings on
Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum Sheet: ASTM B209/B209M.
- C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.
- D. Metal Grating for Roof Walkway: Fed. Spec. RR-G-1602.

2.2 ROOF HATCH (SCUTTLE)

- A. Fabricate from aluminum with mill finish.
- B. Curb and Cover:
 - 1. Exterior facing: Minimum 2.3 mm (0.09 inch) thick sheet
aluminum.
 - 2. Interior facing: Minimum 1 mm (0.04 inch) thick sheet
aluminum.
 - 3. Minimum of 25 mm (one inch) thick mineral fiber insulation
between facings of cover and over exterior face of curb.

4. Form exterior curb facing with an integral three inch wide roof flange and cap flashing minimum 2.3 mm (0.09 inch) thick sheet aluminum.
5. Make curb 300 mm (12 inches).
6. Form cover to lap curb and cap flashing.
7. Size opening as shown.

C. Hardware:

1. Provide spring snap latch with inside and outside operating handles and padlock hasp on inside. Provide two snap latches when hinge side is over 2100 mm (7 feet) long.
2. Provide pintle hinges.
3. Provide automatic hold open and operating arm with enclosed torsion or compression spring lifting mechanism.
4. Covers shall automatically lock in the open position at not less than 70 degrees.
5. Provide weatherstripping at cover closure.
6. Galvanize all hardware items.

D. Assembly:

1. Completely shop assemble roof scuttle.
2. Fully weld all joints exposed to the weather and built into the roofing.
3. Finish weld smooth where exposed.
4. Operation with minimum force to open and close.

2.3 EQUIPMENT SUPPORTS

- A. Fabricate equipment supports from 1.3 mm (0.0516 inch) thick galvanized steel.
- B. Form exterior curb with integral base, and deck closures for curbs installed on steel decking.
- C. Use galvanized steel liners for curbs having inside dimension over 305 mm (12 inches).
- D. Fabricate curb with a minimum height of 200 mm (8 inches) above roof surface.
- E. Attach preservative treated wood nailers to top of curb. Use 50 mm (2 inch) by 50 mm (2 inch) minimum nominal size on curb with openings and 50 mm (2 inch) thick, width of curb up to 300 mm (12 inches) on equipment support curbs.

- F. Make size of supports suit size of equipment furnished, with height as shown on drawings, but not less than 200 mm (8 inches) above roof surface.

2.4 LOW SILHOUETTE GRAVITY VENTILATORS

- A. Fabricate base of 1 mm (0.04 inch) thick aluminum, and vent of 0.8 mm (0.032 inch) thick aluminum. Height not to exceed 300 mm (12 inches) above top of roof curb. Design ventilators to withstand 137 Km (85 miles) per hour wind velocity. Provide ventilators with a removable 18 by 18 mesh aluminum wire cloth insect screen.
- B. Construct damper of the same material as the ventilator and design to completely close opening or remain wide open. Hold damper in closed position by a brass chain and catch. Extend chains 300 mm (12 inches) below and engage catch when damper is closed.

2.5 METAL GRATING ROOF WALKWAY SYSTEM

- A. Provide metal grating roof walkway system consisting of prefabricated pans, of 14 gauge, galvanized (G-90 Coating) steel grating with slip resistant surface.
- B. Grating units shall be in 600 mm (two foot) widths and in 3000 to 3600 mm (10 to 12 foot long) sections as required.
- C. Provide complete with support framing, brackets, connectors, nosings and other accessories as required for complete roof walkway system. Include support stands at minimum 1500 mm (five feet) on center to hold planks a minimum of nine inches above roof surface.
- D. Include step units, nosings framing and connectors to provide changes in elevation as required.
- E. Provide neoprene rubber pads having a shore A hardness of 80 to 90-Durometer under each support, or bearing surface.

2.6 FINISH

- A. In accordance with NAAMM Amp 500 Series, and as directed by the Architect.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.
- C. Aluminum, Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1, Architectural, 0.7 mils thick, or Class II, Architectural, 0.4 mils thick.
- D. Aluminum Colored Finish: AA-C22A42 (anodized or AA0C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1, Architectural, 0.7 mils thick, or Class II, Architectural, 0.4 mils thick. Dyes will not be accepted.
- E. Fluorocarbon Finish: AAMA 605.2 high performance organic coating, color as selected by the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof specialties where shown.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.
- E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
 - a. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
 - b. 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.
 - c. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).
- J. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturers recommendations.

3.2 PROTECTION OF ALUMINUM

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.3 ADJUSTING

- A. Adjust roof hatch hardware to operate freely and so that cover will operate without binding, close tightly at perimeter, and latch securely.

3.4 PROTECTION

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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SECTION 07 72 00

ROOF ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies roof accessories as indicated on the drawings.

1.2 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.

1.3 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.

1.4 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. American Society for Testing and Material (ASTM):
 - B209/209M-07.....Aluminum and Aluminum Alloy-Sheet and Plate
 - B221/221M-07.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - C612-04.....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 500-505-88.....Metal Finishes Manual
- D. American Architectural Manufacturers Association (AAMA):
605-98.....High Performance Organic Coatings on
Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, Extruded: ASTM B221/B221M.
- B. Aluminum Sheet: ASTM B209/B209M.
- C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.
- D. Insulation: ASTM C612, Class 1 or 2.
- E. Asphalt Coating: ASTM D 1187, Type I, quick setting.

2.2 COPINGS

- A. Fabricate of aluminum not less than 1.6 mm (0.063 inch thick) or 0.5 mm (0.018 inch thick stainless steel)
- B. Turn outer edges down each face of wall as shown.
- C. Maximum lengths of 3000 mm (10 feet).
- D. Shop fabricate external and internal corners as one piece assemblies with not less than 300 mm (12 inch) leg lengths.
- E. Provide 100 mm (four inch) wide 0.8 mm (0.032 inch) thick watertight joint covers.

2.3 EXTRUDED ALUMINUM GRAVEL STOPS AND FASCIAS

- A. Fabricate of aluminum not less than 2 mm (0.078 inch) thick.
- B. Turn fascia down face of wall and up above roof as shown.
- C. Maximum lengths of 3000 mm (10-feet).
- D. Shop fabricate external and internal corners as one piece assemblies with not less than 300 mm (12 inch) leg lengths.
- E. Provide 100 mm (four inch) wide 2 mm (0.078 inch) thick watertight joint covers with 150 mm (six inch) wide 0.8 mm (0.030 inch) thick underside joint flashing.

2.4 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM

- A. The fascia-cant system consists of three pieces, an extruded aluminum fascia, a galvanized steel cant, and an aluminum compression clamp.

- B. Furnish in stock lengths of not more than 3000 mm (10 feet) long.
- C. Form fascia from not less than 2 mm (0.070 inch) thick aluminum. Provide four inch wide 0.8 mm (0.032-inch) thick concealed sheet aluminum joint cover plates in back of fascia.
- D. Form cant strip from galvanized steel not less than 0.8 mm (0.0299 inch) thick, to profile shown and design to hold lower edge of the fascia.
- E. Form compression clamp of not less than 0.8 mm (0.032 inch) thick aluminum designed to hold the top edge of the fascia and the built-up flashing.

2.5 FINISHES

- A. In accordance with NAAMM Amp 500-505.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.
- C. Aluminum, Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1, Architectural, 0.7 mils thick.
- D. Aluminum Colored Finish: AA-C22A42 (anodized or AA0C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1, Architectural, 0.7 mils thick. Dyes will not be accepted.
- E. Fluorocarbon Finish: AAMA 605.2 high performance organic coating.

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 with roofing work for installation of items in sequence to prevent water infiltration.
- D. 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.
- E. 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 ensure front and back edges are locked in place.

F. 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.

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.

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SECTION 07 81 05

SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the application of sprayed-on cementitious fireproofing as required for Type I construction as specified in the California Building Code (CBC).
- B. Apply fireproofing material on interior structural steel members where removal of such fireproofing has been removed.

1.2 TESTS

- A. Sprayed-on fireproofing material shall have been tested for fire endurance by a nationally recognized laboratory in accordance with ASTM E119, or NFPA 251, or UL 263 for each fire rating specified.
- B. Surface Burning Characteristics: Prepare test specimen of fireproofing materials in accordance with Fed. Spec. SS-S-111. Test for flame spread, fuel contributed and smoke developed, and report results in accordance with ASTM E84.
- C. Field Tests: Tests for thickness and density shall be in accordance with ASTM CE605.
 - 1. Tests for thickness and density of applied material will be performed by Contractor.
 - 2. Project Engineer will select areas to be tested in specific bays on each floor using a geometric grid pattern. Areas showing thickness less than that required as a result of fire endurance test will be rejected.
- D. When tested for fire endurance and surface burning characteristics, fireproofing material shall be tested using the adhesive and sealer to be supplied under the contract.

1.3 SUBMITTALS

- A. In accordance with Section 01 33 23, SAMPLES AND SHOP DRAWINGS, furnish the following:
- B. Manufacturer's Literature and Data: Manufacturer's complete and detailed application instructions and specifications.
- C. Certificates:
 - 1. Certificates, accompanied by complete test report and test record from testing laboratories attesting that the proposed fireproofing material and application method meet the specified fire rating.
 - a. Certificate shall list thickness and density of material proposed for use, as required to meet the specified fire rating.

- b. Letter from testing laboratories summarizing a test, but not containing the complete test results, will not be accepted as meeting the requirements for submission of complete test reports and test records.
 - c. Certificate indicating that the sprayed-on fireproofing material supplied under the Contract, is the same within manufacturing tolerance as the fireproofing material tested.
- D. Miscellaneous: Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Fireproofing material shall be delivered to job-site in sealed containers marked and labeled to show manufacturer's name and brand and certification of compliance with the specified requirements. Damaged containers will be rejected and shall be removed from the site.
- B. Store the materials off the ground, under cover, away from damp surfaces. Keep dry until ready for use. Materials that have been exposed to water before installation shall be removed from 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 test by the basic designation only.
- B. Federal Specifications (Fed. Spec.):

SS-S-111B.....Sound Controlling Materials (Trowel And Spray Applications)
- C. American Society For Testing and Materials (ASTM):

E605.....Test for Thickness and Density of Fireproofing.

E759.....Test Method for Effect of Deflection of Sprayed Fire-Resistive Materials Applied to Structural Members.

E84-81.....Surface Burning Characteristics of Building Materials

E760.....Test Method for Effect of Impact on Binding of Sprayed Fire-Resistive Material Applied to Structural Members.

E859.....Test Method for Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members.

E937.....Test Method for Corrosion of Steel by
Sprayed Fire-Resistive Materials Applied
to Structural Members.

E119-83.....Fire Tests of Building Construction and
Materials

D. National Fire Prevention Association (NFPA)

NFPA 521.....Standard Methods of Fire Tests of Building
Construction and Materials

E. Underwriters Laboratories, Inc. (UL):

UL 263.....Fire Tests of Building Construction and
Materials

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING

A. Manufacturers: The basis of design is Monokote MK-6HY and Retroguard by W.R. Grace Co. Subject to compliance with specified requirements, "or equal" products by the following manufacturers may also be acceptable:

1. Carboline Co., Fireproofing Div.
2. Isolatek International Corp., Cafco Products.

B. Fed. Spec. SS-S-111, Class 25, Type I, factory mixed cementitious materials with approved aggregate, and integral inorganic binders, having the following characteristics:

1. Material containing asbestos are not permitted.
2. Minimum applied dry density per cubic foot:
 - a. Type I - 15 pounds
3. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.
4. Corrosion Resistance: Steel with applied replacement fireproofing shall be tested in accordance with ASTM E937 without evidence of corrosion of the steel.
5. Bond-Impact Test: In accordance with ASTM E760, impact test. Test specimen shall not crack or delaminate the material from the surface to which it is applied.
6. Bond Strength: Replacement fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 200 PSF, and a minimum individual bond strength of 200 psf, and a minimum individual bond strength of 150 psf.
7. Air Erosion: Maximum allowable weight loss of the fireproofing material shall be 0.025 gm/f+2 when tested in accordance with ASTM E859.

8. Surface Burning Characteristics: Surface Burning characteristics of fireproofing material when tested in accordance with ASTM E84 shall be as follows:

Flame spread.....0
Fuel contributed...5 or less
Smoke developed....0

2.2 ADHESIVE (Not Used) .

2.3 SEALER (Not Used) .

2.4 WATER

- A. Clean, fresh, and free from organic and mineral impurities.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Surface to receive fireproofing shall be clean and free of dust, soot, oil, grease water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.
- B. Coordinate application of fireproofing material with other trades. Install all hangers, inserts and clips before the application of fireproofing material. Install ductwork, piping and other obstructing material and equipment after the fireproofing is complete.
- C. Applicators shall be approved by the manufacturer of fireproofing material. No fireproofing material shall be applied prior to completion of concrete work on steel decking and concrete encased steel.
1. Application shall not start until written approval has been obtained from Veterans Professional Industrial Hygienist (VPIH) that surfaces have been inspected by the VPIH, and are suitable to receive sprayed-on fireproofing.
2. Mixing and application shall be in accordance with manufacturer's instruction. Furnish two copies of manufacturer's application instructions to the Project Engineer prior to commencement of work. Material and water ratios shall be mechanically controlled on the project site. Apply adhesive and sealer, when not in integral part of the materials, in accordance with the manufacturer's instructions.
3. Temperature and enclosure conditions shall be as required by fireproofing material manufacturer.
4. Application shall be completed in one area, inspected and approved by Project Engineer before removal of application equipment and proceeding with further work.
5. 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. The representative shall give manufacturer's approval of completed installation.

3.2 PRE-APPLICATION TEST AREA

- A. A test area consisting of a typical overhead fireproofing installation, but not less than 15 linear feet of beam, shall be installed in location selected by the Project Engineer, for approval by the representative of the fireproofing material manufacturer and by the Government. Fireproofing in other areas shall not proceed until installation of test area has been completed and approved. Approved installation shall remain in place and open for observation as criteria for all work under contract.

3.3 PATCHING AND REPAIRING

- A. Corrective measures shall be taken as directed by the Project Engineer. Manufacturer's representative of fire protection material shall submit recommendations through the Contractor to the Project Engineer for corrections and approval.
- B. Patch fireproofing material which is removed or disturbed after acceptance. Material for patching must be sprayed by machine directly on point to be patched; or, into a container and then hand applied. Hand mixing of material is not permitted.
- C. Repair: Re-spray all test and rejected areas. Final inspection of sprayed areas shall be conducted. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered. Re-spray all areas requiring additional fireproofing material to provide the required thickness.

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SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Firestopping as described herein, consists of furnishing and installing materials, or combinations of materials, to form an effective barrier against the spread of flame and hot gases, and to maintain the integrity of time rated construction. It shall be used for fire or smoke barriers that require sealing around penetrations in accordance with NFPA-101 and NFPA 70 when applicable. Types of construction included are two hour partitions, one hour partitions, smoke partitions, floors and interstitial space walk-on decks, chase enclosures, and partitions above ceilings.

1.2 SUBMITTALS

- A. In accordance with Section 01340, SAMPLES AND SHOP DRAWINGS, furnish the following:
1. Manufacturers literature and installation instructions.
 2. Certificates: Indicating firestopping material conforms to specified requirements.
 3. Shop Drawings: Complete construction details showing proposed material, reinforcement, anchorage, fastenings, and method of installation.

1.3 DELIVERY AND STORAGE

- A. All materials shall be delivered in their original unopened containers and stored in a location providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the site.

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. American Society for Testing and Materials (ASTM):
- C24-79.....Pyrometric Cone Equivalent (PCE) of
Refractory Materials
- E84-81.....Surface Burning Characteristics of
Building Materials
- E119-83.....Fire Tests of Building Construction and
Materials
- E814-81.....Fire Tests of Through-Penetration Fire
Stops

- C. National Fire Protection Association (NFPA):
- 70-78.....National Electrical Code
- 101-81.....Life Safety Code
- 258-76.....Standard Test Method for Measuring the
Smoke Generated by Solid Materials

2.1 MATERIALS

- A. Rock Wool Fiber: Minimum four pound per cubic foot density. Flame spread 25, smoke developed 0 when tested in accordance with ASTM E84. Minimum melt point shall be 2000 degrees F when tested in accordance with ASTM C24.
- B. Silicone Foam Sealant: Fire retardant, service temperature from minus 50 degrees F to plus 450 degrees F; nontoxic and nonallergenic; UL classified as passing ASTM E119 fire and hose stream tests, flame spread rating 20, fuel contributed factor 20 when tested in accordance with ASTM E84.
1. Form: Two-part liquid product pre-measured and contained in a hand operated disposable cartridge for mixing and dispensing.
 2. Characteristic after Dispensing: Fully expanded in five minutes, fully cured in 24 hours; approximate density 20 pounds per cubic foot.
- C. Intumescent Materials: Intumescent caulks, putty and sheets shall be capable of expanding up to 10 times when exposed to temperatures over 250 degrees F. One part no-mixing system that is non-corrosive and compatible with synthetic cable jackets; UL classified as passing ASTM E814 fire and hose stream tests, flame spread less than 20, fuel contribution 0 when tested in accordance with ASTM E84.
- D. Other Materials: Materials such as concrete, gypsum cement, masonry mortar or combinations of such materials may be used subject to meeting the specified requirements and Project Engineers approval.

2.2 PHYSICAL REQUIREMENTS

- A. Materials used for firestopping shall meet the following requirements:
1. Materials used to seal penetrations in time rated floor or wall assemblies shall be capable of preventing the passage of smoke, flame and hot gases sufficient to ignite cotton waste when subjected to time-temperature fire conditions on the opposite side of the wall when tested in accordance with ASTM E119 for the adjacent construction.
 2. Non-toxicity: Non-toxic to human beings at all stages of application and during fire conditions.
 3. Flame spread: 25 or less, ASTM E84.

4. Fuel contribution: 25 or less, ASTM E84.
5. Smoke density: 250 or less, NFPA 258.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Contractor shall examine areas to receive firestopping prior to beginning work or submitting data required by paragraph, SUBMITTALS. Data to be submitted shall be based on the findings of the Contractor's examination.

3.2 LOCATIONS

- A. Duct, conduit, and piping penetrations through floor slab and through time rated partitions and/or fire walls and interstitial space walk on decks. Unless otherwise specified or shown on the drawings, the Contractor shall assume that all floor slabs will be considered as time rated, and all walls or partitions having, or which are part of an enclosure having, fire rated doors will be considered as time rated.
- B. Penetration of vertical service shafts.
- C. Other locations where specifically shown on the drawings, or where called for in other sections of the specification.

3.3 INSTALLATION

- A. Installation shall be in accordance with approved construction drawings (shop drawings), and approved manufacturer's literature and installation instructions.
- B. Except for intumescent type firestopping materials, the firestopping materials shall completely fill the void space regardless of geometric configuration. Floors and partitions that are sealed with masonry or concrete shall be carefully filled and inspected for cracks or other imperfection. Intumescent firestopping materials shall be installed in accordance with manufacturers' printed instructions.
- C. Pipe Insulation: Insulated pipes and ducts penetrating fire rated floors and walls shall be insulated with material which provides the same performance as the firestopping material. This material shall extend a minimum of six inches on each side of the opening. Vapor barrier of such insulation shall have a perm rating of 0.03 maximum.

3.4 CLEAN-UP AND ACCEPTANCE OF WORK

- A. As work on each floor is completed, remove materials, litter, and debris. All work shall be inspected and accepted by the Contracting Officer or his designated representative before materials and equipment is moved to the next-scheduled work area.

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SECTION 07 92 00

SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers sealant and caulking material and application.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SAMPLES AND SHOP DRAWINGS:
1. Manufacturer's installation instructions for each product used.
 2. Cured samples of exposed sealants for each color where required to match adjacent material.
 3. Manufacturer's Literature and Data for:
 - a. Caulking compound
 - b. Primers
 - c. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

1.3 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 90 degrees or less than 40 degrees F.

1.4 DEFINITIONS

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

1.5 GUARANTEE

- A. Guarantee exterior sealing against leaks and subject to terms of "Guaranty" Article specified in Section, SPECIAL REQUIREMENTS,

except that guaranty period shall be two years in lieu of one year.

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):
 - C570-72(1985).....Oil and Resin-Base Caulking Compound for Building Construction.
 - C612-83.....Mineral Fiber Block and Board Thermal Insulation.
 - C717-88.....Definitions of Terms Relating to Building Seals and Sealants (Rev. A).
 - C790-84.....Use of Latex Sealing Compounds
 - C804-83.....Use of Solvent-Release Type of Sealants.
 - C834-76(1986).....Latex Sealing Compounds
 - C920-87.....Elastomeric Joint Sealants
 - C962-86.....Use of Elastomeric Joint Sealants
 - C1085-87.....Butyl Rubber-Based Solvent-Release Sealants.

PART 2 - PRODUCTS

2.1 SEALANTS

- A. Subject to compliance with specified requirements, sealants shall be the product of one of the following:
 - 1. Tremco Sealant/Weatherproofing division of RPM International, Inc.
 - 2. 3M Company.
 - 3. Pecora Corp.
 - 4. Dow Corning Corp.
 - 5. GE Corp.
- B. S-6
 - 1. ASTM C920, silicone, neutral cure.
 - 2. Type S.
 - 3. Class: Joint movement range of plus 100 percent to minus 50 percent.

4. Grade NS.
 5. Shore A hardness of 15-20.
 6. Minimum elongation of 1200 percent.
- C. S-9
1. ASTM C920 silicone.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-30.
 6. Non-yellowing, mildew resistant.

2.2 FIRESTOP CAULKING

- A. Fire Stop Sealant: Single component, noncombustible fire stop sealant Biotherm "T" self leveling silicone by Bio, Pensil 100 by GE, CP25WB by 3M, or equal.
- B. Fire Stop Putty: One-part intumescent type FSP by Nelson, MPS/MPP by 3M, or equal.
- C. Cementitious Fire Stop Mortar: Novasit K-10 (55 lb. density) by Bio, 3M mortar by 3M, or equal. Cementitious mortar shall be non-shrinking, asbestos free type.

2.3 COLOR

- A. Color of sealants shall be clear or white, unless specified otherwise.
- B. Caulking shall be light gray or white, unless specified otherwise.

2.4 BOND BREAKERS

- A. Polyethylene tape or similar type and consistency recommended by the sealant manufacturer for the particular application.
- B. Back-up Rod: ASTM C962, Type A, joint-fillers; closed cell neoprene, butyl, polyurethane, vinyl, or polyethylene rod; diameter approximately 1-1/3 times the joint width.

2.5 FILLER

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

2.6 PRIMER

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

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 ASTM C962.
- 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.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printer instructions.
 - 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 - 2. Use brush or other approved means that will reach all parts of joints.

3.3 BACKING INSTALLATION

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

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

3.4 SEALANT DEPTHS AND GEOMETRY

- A. At widths up to 1/4-inch, sealant depth equal to width.
- B. At widths over 1/4-inch, sealant depth 1/2 of the width up to 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 the sealants and caulking only when the ambient temperature is between 40 and 100 degrees F.
 - 2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 - 3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
 - 4. Apply caulking and sealing compound in accordance with manufacturer's printer instructions.
 - 5. Avoid dropping or smearing compound on adjacent surfaces.
 - 6. Fill joints solidly with compound and finish compound smooth.
 - 7. Tool joints to concave surface unless shown or specified otherwise.
 - 8. Finish paving or floor joints flush unless joint is otherwise detailed.
 - 9. Apply compounds with nozzle size to fit joint width.
 - 10. Test sealants for comparability with each other and substrate. Use only compatible sealant.
- B. For application of sealants, follow requirements of ASTM C962 unless specified otherwise.
- C. Follow requirements of ASTM C790 for application of C-1 caulking.
- D. Follow requirements of ASTM C804 for application of C-2 and C-3 caulking.
- E. Follow requirements of ASTM C570 for application of C-4 caulking.

3.6 CLEANING

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

3.7 LOCATIONS

- A. Use S-6 for vertical and inclined joints at:
 - 1. Interior joints and recesses formed where frames of louvers and vents and the like adjoin other materials.
 - 2. Where sealant is shown on drawings, except where sealing compounds for joints in horizontal surfaces and high temperature (over 400 degrees F) applications are specifically required.
- B. Use S-6 at Metal-to-metal joints where sealing is shown or specified.
- C. Use S-6 or S-9 in fire rated partitions or combination fire and smoke or sound rated partitions.
- D. Use S-9 in baths, toilets, and showers. Use at openings between walls and partitions where pipes or toilet and bath accessories or anchors penetrate partition including openings between adjacent lockers, vanities, casework shelving, and plumbing fixtures, built-in or surface mounted.
- E. Use S-9 for sealing between adjoining wall finish and sinks, bath tubs, shower receptors, service sinks and penetrations of wall surfaces in showers including escutcheon (cover) plates.
- F. Use caulking compound or sealant for the following interior applications:
 - 1. Use C-1, C-2, C-3 or C-4 unless specified otherwise for:
 - a. Openings 1/4-inch and less between walls and partitions and adjacent lockers, casework, laboratory furniture, shelving, built-in or surface mounted equipment, and lighting fixtures.
 - b. Where caulking is shown on drawings.
 - c. Other interior locations where small voids between materials require filling for painting.

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