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Preparing Activity: NASA Superseding
UFGS-05 70 00.00 40 (June 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated March 2008

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SECTION 05 72 00

DECORATIVE METAL SPECIALTIES

07/07

NOTE: This specification covers the requirements for decorative metal products used in building construction for architectural and decorative effects.

Drawings must include a complete design indicating the character of the work to be performed and giving the following:

Location and details of each metal item, indicating dimensions, shapes and sizes of members, connections, finishes, and the relation to other building components.

Anchorage and/or fastening devices embedded in other construction.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text

of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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

ALUMINUM ASSOCIATION (AA)

- AA ADM1 (2005; Errata 2005) Aluminum Design Manual
- AA ASM-35 (2000) Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5
- AA DAF-45 (2003) Designation System for Aluminum Finishes
- AA PK-1 (2002) Pink Sheets: Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI B18.13 (1996; Addenda 1998; R 2003) Screw and Washer Assemblies - Seams (Inch Series)
- ANSI B18.13.1M (1998; R 2003) Screw and Washer Assemblies-SEMS (Metric Series)
- ANSI B18.22.1 (1965; R 2003) Plain Washers
- ANSI B18.22M (1981; R 2005) Metric Plain Washers

AMERICAN WELDING SOCIETY (AWS)

- AWS A5.3/A5.3M (1999; R 2007) Specification for Aluminum and Aluminum-Alloy Electrodes for Shielded Metal Arc Welding
- AWS D1.2/D1.2M (2003; Errata 2004) Structural Welding Code - Aluminum

ASME INTERNATIONAL (ASME)

- ASME B18.2.1 (1996; Addenda A 1999; Errata 2003; R 2005) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2	(1987; R 2005) Standard for Square and Hex Nuts (Inch Series)
ASME B18.2.3.8M	(1981; R 2005) Metric Hex Lag Screws
ASME B18.2.4.1M	(2002) Metric Hex Nuts, Style 1
ASME B18.21.1	(1999; R 2005) Lock Washers (Inch Series)
ASME B18.21.2M	(1999; R 2005) Lock Washers (Metric Series)
ASME B18.24	(2004; Addenda A 2006) Part Identifying Number (PIN) Code System Standard for B18 Fastener Products
ASME B18.3.3M	(1986; R 2002) Hexagon Socket Head Shoulder Screws (Metric Series)
ASME B18.6.1	(1981; R 1997) Wood Screws (Inch Series)
ASME B18.6.3	(2003) Machine Screws and Machine Screw Nuts
ASME B18.6.5M	(2000; R 2005) Standard Specification for Metric Thread-Forming and Thread-Cutting Tapping Screws
ASME B18.6.7M	(1999; R 2005) Metric Machine Screws

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 27/A 27M	(2005) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A 283/A 283M	(2003; R 2007) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 47/A 47M	(1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 209M	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B 211	(2003) Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire

ASTM B 211M	(2003) Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire (Metric)
ASTM B 221	(2006) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 221M	(2007) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM B 247	(2002a) Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings
ASTM B 247M	(2002a) Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings (Metric)
ASTM B 26/B 26M	(2005) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B 316/B 316M	(2002) Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods
ASTM C 514	(2004) Standard Specification for Nails for the Application of Gypsum Board
ASTM C 636/C 636M	(2006) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM D 1730	(2003) Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
ASTM D 1752	(2004a) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM G 71	(1981; R 2003) Standard Guide for Conducting and Evaluating Galvanic Corrosion Tests in Electrolytes
ASTM G 82	(1998; R 2003) Standard Guide for Development and Use of a Galvanic Series for Predicting Galvanic Corrosion Performance

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC CS 23.00/NACE No.12	(2003) Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of
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Steel

SSPC PA 1

(2000; E 2004) Shop, Field, and
Maintenance Painting

SSPC PS 11.01

(1982; E 2004) Black (or Dark Red) Coal
Tar Epoxy-Polyamide Painting System

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-344

(Rev A) Lacquer (Clear Gloss)

1.2 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit survey data showing Existing Conditions prior to work in accordance with paragraph entitled, "Field Measurements," of this

section.

SD-02 Shop Drawings

Submit fabrication drawings for [Ornamental Metal Items](#) in accordance with the paragraph entitled, "Fabrication In General," of this section.

Submit [Installation Drawings](#) for the following items in accordance with paragraph entitled, "Fabrication In General," of this section.

[Ornamental Metal Items](#)

[Shop and Field Connections](#)

[Construction Details](#)

SD-03 Product Data

Submit manufacturer's catalog data for the following items listing all ornamental metal accessories including casting, forgings, fasteners and anchorage devices.

[Installation Materials](#)

[Metals for Fabrication](#)

[Ornamental Metal Items](#)

SD-04 Samples

Submit [Manufacturer's Standard Color Charts](#) for the following items and secure Contracting Officer's approval prior to work commencement.

[Shop Paint](#)

[Finish Paint](#)

Samples for [Aluminum Finishes](#), one for each type, must comply with paragraph entitled, "Aluminum Finishes," of this section.

Samples for each type of [Anchorage Devices and Fasteners](#) must be in accordance with paragraph entitled, "Installation Materials," of this section.

Samples for each type of [Architectural Metal Items](#) must be in accordance with paragraph entitled, "Metals for Fabrications," of this section.

Samples for aluminum finishes, two of each type, must be in accordance with paragraph entitled, "Ornamental Metal Items," of this section.

Samples must be standard size as used in construction. After approval, full-sized samples may be used in construction, provided each sample is clearly identified and its location recorded.

SD-06 Test Reports

Submit Test reports for [Welding Tests](#) complying with [AWS D1.2/D1.2M](#), "Qualifications of Procedures and Personnel."

SD-07 Certificates

[Welding Procedures](#) must comply with [AWS D1.2/D1.2M](#), "Structural Welding Code - Aluminum."

Submit Certificates for [Ornamental Metal Items](#) in accordance with the paragraphs entitled, "Metals For Fabrication" and "Ornamental Metal Items." Certificates of [Welder Qualifications](#) must comply with the paragraph entitled, "Qualifications for Welding Work," of this section.

SD-08 Manufacturer's Instructions

[Preventative Maintenance and Inspection](#) for the following items must be in accordance with paragraph entitled, "Aluminum Finishes," of this section.

[Cleaning Materials](#) and [Maintenance Instructions](#)
[Application Methods](#)

1.3 QUALIFICATIONS FOR WELDING WORK

NOTE: If Section [05 14 00.13 WELDING STRUCTURAL ALUMINUM FRAMING](#) is not included in the project specification, applicable requirements thereof should be inserted and the following paragraph deleted.

[Section [05 14 00.13 WELDING STRUCTURAL ALUMINUM FRAMING](#) applies to work specified in this section.]

[Submit [Welding Procedures](#) and [Welding Tests](#) in accordance with [AWS D1.2/D1.2M](#). Prepare all Test specimens in the presence of Contracting Officer and have specimens tested by an approved testing laboratory at the Contractor's expense.

Submit Certification of [Welder Qualifications](#) by tests in accordance with [AWS D1.2/D1.2M](#). In addition, tests must be performed on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, an immediate retest of two test welds must be made. Failure in either of the two immediate retests mandates the welder be retested after further practice or training, and a complete new set of tests welds must be made.]

1.4 DELIVERY, STORAGE, AND HANDLING

Store all [Architectural metal items](#) off the ground.

Keep materials free from dirt and grease and protected from corrosion.

Store packaged materials in their original, unbroken containers in a dry area, until ready for installation.

1.5 FIELD MEASUREMENTS

Records of [Existing Conditions](#) may be provided by the Contracting Officer prior to the start of work. Field measurements must be taken prior to preparation of shop drawings and fabrication.

PART 2 PRODUCTS

2.1 INSTALLATION MATERIALS

[2.1.1 Concrete Inserts

NOTE: Concrete inserts must be used for fastening ornamental metal items to cast-in-place concrete construction when the anchorage device will be subjected to direct pull-out loadings such as fascia flanges for ornamental features.

Select one of the paragraphs below and delete the other for pre-placed type inserts

- [Wedge-type concrete inserts must be galvanized, box-type, ferrous castings with integral anchor loop at back of box and be designed to accept bolts having special wedge shape heads. Ferrous castings must be malleable iron conforming to [ASTM A 47/A 47M](#), Grade 32510 or Grade 35018, [Grade 22010 or Grade 24118,] or medium-strength cast steel conforming to [ASTM A 27/A 27M](#), Grade U-60-30. Inserts must be hot-dip galvanized after fabrication in accordance with [ASTM A 153/A 153M](#). Carbon steel bolts must be provided with special wedge shape heads, nuts, washers, and shims, and must be hot-dip galvanized in accordance with [ASTM A 153/A 153M](#).]
- [Provide slotted-type concrete inserts hot-dip galvanized, pressed steel plate, welded construction, box-type, with slot to receive square head bolt and to provide lateral adjustment of the bolt. Length of insert body less anchorage lugs must be minimum [115 mm 4-1/2 inches](#). Provide inserts with knockout cover. Steel plate must not be less than [3 mm 1/8 inch](#) thick conforming to [ASTM A 283/A 283M](#), Grade C. Inserts must be hot-dip galvanized after fabrication in accordance with [ASTM A 123/A 123M](#).]
- Concrete inserts must be non-removable when embedded in concrete of [20 Megapascal 3,000 pounds per square inch](#) compressive strength and subjected to a [26.7 kilonewton 6,000-pound](#) tension load test in an axial direction. Concrete must not indicate any evidence of failure attributable to the anchoring device itself.

] [2.1.2 Masonry Anchorage Devices

NOTE: Masonry anchorage devices must be used only for the fastening of ornamental metal items to solid masonry and concrete-in-place construction when the anchorage device will not be subjected to direct pull-out loadings nor to vibration. Masonry anchorage devices must be used only for non-vibratory shear loads. Select the appropriate anchorage device, or insert an alternate type of masonry anchorage device, and delete the remaining

options listed below.

Masonry anchorage devices must be expansion shields conforming to ASTM C 514, Group, Type, and Class as follows:

- [Provide lead expansion shields for machine screws and bolts 6 mm 1/4 inch and smaller, head-out embedded nut type, single-unit class, conforming to Group I, Type 1, Class 1.]
- [Provide lead expansion shields for machine screws and bolts larger than 6 mm 1/4 inch, head-out embedded nut type, multiple-unit class, conforming to Group I, Type 1, Class 2.]
- [Provide bolt anchor expansion shields for lag bolts, zinc-Alloy long-shield anchors class, conforming to Group II, Type 1, Class 1.]
- [Provide bolt anchor expansion shields for bolts, closed-end bottom bearing class, conforming to Group II, Type 2, Class 1.]
- [Provide [_____] anchorage [_____] , conforming to [_____] .]

] [2.1.3 Toggle Bolts

NOTE: Toggle bolts must be used for fastening ornamental metal items to hollow masonry and stud partitions.

Provide toggle bolts of the class and style best suited for the work, conforming to ASTM C 636/C 636M, Type II. Toggle bolts must be corrosion-resistant chromium-nickel steel conforming to AISI Type 302, 303, 304, 305, or 316.

] [2.1.4 Standard Bolts and Nuts

Provide standard bolts, regular hexagon head, corrosion-resistant steel, coarse thread series, conforming to ASME B18.3.3M ASME B18.2.1, Type II.

Provide standard nuts, plain hexagon, regular style, corrosion-resistant steel, conforming to ASME B18.2.4.1M ASME B18.2.2, Type II, Style 4.

] [2.1.5 Lag Bolts

Provide lag bolts, square head, gimlet point or cone point, corrosion-resistant steel, conforming to ASME B18.2.3.8M ASME B18.2.1, Type I, Grade C.

] [2.1.6 Machine Screws

- [Provide machine screws, corrosion-resistant steel, cross-recess drive, flat head, conforming to ASME B18.6.7M ASME B18.6.3, Type III, Style 2C.]
- [Provide machine screws, corrosion-resistant steel, drive, flat head, conforming to ASME B18.6.7M ASME B18.6.3, Type III, Style 3C.]

] [2.1.7 Wood Screws

Provide wood screws, corrosion-resistant steel, single-thread, flat head with cross-recess drive, conforming to ASME B18.6.5M ASME B18.6.1.

] [2.1.8 Plain Washers

Provide plain washers, round, general-assembly, corrosion-resistant steel, conforming to ANSI B18.22M ANSI B18.22.1, Type A, Grade I, Class B.

] [2.1.9 Lock Washers

Provide lock washers, helical spring, corrosion-resistant steel (nonmagnetic), conforming to ASME B18.21.2M and ANSI B18.13.1M ANSI B18.13 and ASME B18.21.1.

] [2.1.10 Welding Filler Metal

Provide welding filler metal for welding of aluminum alloys, conforming to AWS A5.3/A5.3M. Filler metal must be the aluminum-alloy recommended by the aluminum producer for the work.

] 2.2 METALS FOR FABRICATION

NOTE: Delete the following metals that are not required for the items specified in paragraph "Ornamental Metal Items." The specified metals are only those which are common to several architectural metal items. Metals (and other materials) which are required only for a specific architectural metal item are specified in the paragraph for the item.

] [2.2.1 Aluminum-Alloy Extrusions

Aluminum fabrications must conform to AA ADM1, AA ASM-35, and AA PK-1.

Extrusions must be 6063, temper T5, conforming to ASTM B 221M ASTM B 221.

Aluminum-alloy extrusions to receive an integral-color anodized coating must be the aluminum alloy and temper recommended by the aluminum producer for the specified finish with integral-color anodized coating, and have mechanical properties equal to, or exceeding, those of aluminum alloy 6063, temper T5, conforming to ASTM B 221M ASTM B 221.

] [2.2.2 Aluminum-Alloy Sheets and Plates

[Aluminum-alloy sheets and plates, unless otherwise specified, must be aluminum alloy 3003, temper H16, conforming to ASTM B 209M ASTM B 209.]

[Aluminum-alloy sheets and plates to receive a clear anodized coating must be aluminum alloy 5005, temper H16, conforming to ASTM B 209M ASTM B 209.]

[Aluminum-alloy sheets and plates to receive an integral-color anodized coating must be the aluminum alloy and temper recommended by the aluminum producer for the specified coating, and have mechanical properties equal to, or exceeding, those of alloy 5005, temper H16 of ASTM B 209M ASTM B 209.

]

] 2.2.3 Aluminum-Alloy Castings

[Aluminum alloy castings must be alloy 5140, temper F, sand castings, conforming to ASTM B 26/B 26M.]

[Aluminum-alloy castings to receive a clear anodized coating must be aluminum alloy as recommended by the Aluminum Association.]

[Aluminum-alloy castings to receive an integral-color anodized coating must be the casting alloy and condition recommended by the aluminum producer for the specified finish with integral-color anodized coating, and have mechanical properties equal to, or exceeding, those of alloy 5140, temper F, conforming to ASTM B 26/B 26M.]

] 2.2.4 Aluminum-Alloy Forgings

[Aluminum-alloy forgings must be aluminum alloy 6061, temper T6, conforming to ASTM B 247M ASTM B 247.]

[Aluminum-alloy forgings to receive an integral-color anodized coating must be the aluminum alloy and temper recommended by the aluminum producer for the specified finish with integral-color anodized coatings, and have mechanical properties equal to or exceeding those of aluminum alloy 6061, temper T6, conforming to ASTM B 247M ASTM B 247.]

] 2.2.5 Metals for Fasteners

Fastener identification must conform to ASME B18.24.

Provide aluminum-alloy bolts and screws made from rod conforming to ASTM B 211M ASTM B 211, alloy 2024 and temper T351.

Provide aluminum-alloy nuts made from rod conforming to ASTM B 211M ASTM B 211, alloy 6061 and temper T6.

Provide aluminum-alloy washers made from sheet conforming to ASTM B 209M ASTM B 209, alloy 2024 and temper T4.

Provide aluminum-alloy rivets made from rod or wire conforming to ASTM B 316/B 316M, alloy 6053 and temper T61.

Provide corrosion-resistant steel fasteners made of chromium-nickel steel, AISI Type 302, 303, 304, 305, or 316, with form and condition best suited for the application.

2.2.6 Shop Paint for Aluminum

Shop paint must be an inhibitive epoxy polyamide primer conforming to SSPC PS 11.01, SSPC CS 23.00/NACE No.12, ASTM G 71 and ASTM G 82.

2.3 ORNAMENTAL METAL ITEMS

NOTE: Additional paragraph headings and paragraphs specifying special ornamental metal items, such as aluminum sills for other than aluminum windows, aluminum mullions that are not a part of a curtain wall system, and any other item not specified, must

be added as required.

2.3.1 Aluminum Joint Cover Assemblies

Aluminum joint cover assemblies must be designed for horizontal movement and the joint width indicated.

Provide floor joint cover assemblies consisting of continuous frame unit on each side of floor-to-floor joints or on one side of floor-to-wall joints as required by construction conditions. Assemblies must include floor cover plates, filler strips, anchors, and other accessories as required to complete the installation, and as follows:

Floor frame units must be aluminum-alloy extrusions fabricated to provide an integral curb edge bar for the expansion joint edges, integral grooves to receive anchor bolts, and floor cover plate and filler strip surfaces that will finish flush with the finished floor elevation when the floor cover assembly is installed. Provide corrosion-resistant coated aluminum alloy or steel anchor bolts and nuts, spaced not more than 75 mm 3 inches from each end and not more than 450 mm 18 inches on center between end anchors. Coated steel anchor bolts and nuts must conform to SSPC PA 1. Provide frame splice connectors as required to complete the installation.

- [Provide plain type floor cover plates, aluminum-alloy extrusions with smooth surface.]
- [Provide recessed type floor cover plates, aluminum-alloy extrusions with recess to receive resilient floor covering. Depth of recess must be that required to provide a resilient floor covering surface flush with the finished floor elevation.]
- [Provide non-slip-type floor cover plates, aluminum-alloy castings with abrasive grit embedded uniformly into the walking surface at the time of casting. Abrasive grit must be 20-grain aluminum oxide.]

Provide floor cover plates of the patterns and widths indicated. Lengths shall be as long as practical. Metal thickness must be not less than 6 mm 1/4 inch. Drill and countersink fixed edge of floor cover plates to receive flathead screws, spaced not more than 75 mm 3 inches from each cover plate end and not more than 450 mm 18 inches on center between the end screw holes. Screws for securing floor cover plates must be made of corrosion-resistant steel.

Finish of exposed-to-view surfaces must be mill finish.

Provide rubber and cork composition tape filler strips with pressure-sensitive adhesive coating on one face and smooth suede surface on the exposed face, conforming to ASTM D 1752. Filler strip must be not less than 38 mm 1-1/2 inches wide and depth as required to provide a surface flush with the finished floor elevation.

Provide wall and ceiling joint cover assemblies consisting of continuous anchor strips on one side of the wall or ceiling expansion joint; wall and ceiling cover plates; and seals, anchors, and other accessories as required to complete the installation, and as follows:

Provide aluminum-alloy wall and ceiling anchor strip extrusions fabricated to provide an integral curb bar edge and integral lugs to

receive snap-on cover plates. Field drill fixed edge of anchor strips with holes to receive screws, spaced not more than 75 mm 3 inches from each end and not more than 300 mm 12 inches on center between the end screw holes. Provide cadmium-plated screws with masonry anchorage devices or toggle bolts as required by construction conditions.

Provide aluminum-alloy wall and ceiling cover plate extrusions of the patterns and widths indicated, designed for snap-on application over anchor strips, fabricated with integral grooves to receive sealing gaskets, and having a smooth exposed-to-view surface.

Provide vinyl sealing gaskets for [exterior wall joint cover assemblies]
[wall and ceiling joint cover assemblies].

[Finish of exposed-to-view surfaces must be frosted finish with Class II clear anodized coating.]

[Finish of interior wall and ceiling joint cover assembly exposed-to-view surfaces must be frosted finish with lacquer coating.]

[Finish of exterior wall joint cover assembly exposed-to-view surfaces must be frosted finish with Class II clear anodized coating.]

2.4 FABRICATION IN GENERAL

Submit [Manufacturer's Standard Color Charts](#) for [Shop Paint](#) and [Finish Paint](#) for approval by the Contracting Officer prior to work.

[Installation Drawings](#) for [Ornamental Metal Items](#), [Shop and Field Connections](#) and [Construction Details](#) must show location, dimensions, size, and weight or gage as applicable of each ornamental item; type and location of shop and field connections; and other pertinent construction and erection details. Show on drawings location and details of anchorage devices embedded in cast-in-place concrete and masonry construction.

2.4.1 Workmanship

Metalwork must be well formed to shape and size, with lines, angles, and curves true. Provide necessary rabbets, lugs, and brackets so that the work can be assembled. Conceal fasteners where practical.

Design exterior ornamental metal items to withstand expansion and contraction of the component parts at an ambient temperature of 38 degrees C 100 degrees F without causing harmful buckling, opening of joints, overstressing of fasteners, or other harmful effects.

Welded fabrication must meet requirements as specified in [AWS D1.2/D1.2M](#). Execute all welds behind finished surfaces without distortion or discoloration of the exposed side. Welded joints must be cleaned of flux and dressed on exposed and contact surfaces.

Drill or punch holes for fasteners. Drilling and punching must produce clean true lines and surfaces.

Mill all joints to a close fit. Corner joints must be coped or mitered, well formed, and in true alignment. Joints exposed to weather must be formed and fabricated to exclude water.

Castings must be sound and free from warp or defects that impair their

strength and appearance. Exposed surfaces must have a smooth finish and sharp well-defined lines and arrises. Mill joints to a close fit.

2.4.2 Holes for Other Work

Provide holes where indicated for securing other work to metal work.

2.4.3 Protection of Aluminum from Dissimilar Materials

Protect aluminum surfaces that will come in contact with dissimilar metals, or masonry, concrete, or wood, with epoxy polyamide conforming to [SSPC PS 11.01](#), and topcoated with aliphatic polyurethane conforming to [ASTM G 71](#) and [ASTM G 82](#)

Prepare aluminum surfaces to be painted by the acid pickling method conforming to [ASTM D 1730](#), Type B, Method 2 or Method 3.

Apply paint to dry, clean surfaces by brush or spraying to provide a minimum dry-film thickness of [0.038 mm 1.5 mils \(0.0015 inch\)](#).

2.4.4 Aluminum Finishes

Finish of exposed-to-view aluminum surfaces of [architectural metal items](#) must conform to [AA DAF-45](#) and have the finish specified for each item and as follows:

NOTE: Select the appropriate finish(es) from the
following, or insert alternate finish.

- [Provide aluminum producer's as-fabricated mill finish, conforming to AA M10, as specified in [AA DAF-45](#).]
- [Frosted finish with lacquer coating must be a medium matte chemical etch finish and a clear methacrylate lacquer coating, applied in two coats with interim drying, by brush, spraying, or other approved method to provide a continuous minimum dry film thickness of [0.015 mm 0.6 mil \(0.0006 inch\)](#). Lacquer must be nonyellowing and conform to [FS A-A-344](#). Finish must conform to AA C22-R1X, as specified in [AA DAF-45](#).]
- [Frosted finish with Class II clear anodized coating must be a medium matte chemical etch finish and Architectural Class II [0.010 to 0.018 mm 4- to 0.7-mil](#) thick anodized coating producing natural aluminum color finish. Finish must conform to AA C22-A31, as specified in [AA DAF-45](#).]
- [Frosted finish with Class I clear anodized coating must be a medium matte chemical etch finish and Architectural Class I [0.018 mm 0.7 mil](#) and greater thick anodized coating producing natural aluminum color finish. Finish must conform to AA C22-A41, as specified in [AA DAF-45](#).]

NOTE: The following polished, satin, and matte
finishes generally are required for aluminum
ornamental items only.

- [Polished finish with Class II clear anodized coating must be smooth specular buffed mechanical finish and Architectural Class II [0.010 to](#)

0.018 mm 0.4- to 0.7-mil thick anodized coating producing natural aluminum color finish. Finish must conform to AA M21-A31, as specified in AA DAF-45.]

- [Satin finish with Class II clear anodized coating must be a medium satin directional textured mechanical finish and Architectural Class II 0.010 to 0.018 mm 0.4- to 0.7-mil thick anodized coating producing natural aluminum color finish. Finish must conform to AA M32-A31, as specified in AA DAF-45.]

- [Matte finish with Class II clear anodized coating must be a medium matte non-directional textured mechanical finish and Architectural Class II 0.010 to 0.018 mm 0.4- to 0.7-mil thick anodized coating producing natural aluminum color finish. Finish must conform to AA M42-A31, as specified in AA DAF-45.]

NOTE: The following polished-frosted finishes are the finishes specified for aluminum doors and frames and aluminum curtain wall systems and apply to exterior architectural metal items requiring a matching finish. Select the desired coating thickness.

- [Polished-frosted finish with Class II clear anodized coating must be a smooth specular buffed mechanical finish, followed by a medium matte chemical etch finish and Architectural Class II 0.010 to 0.018 mm 0.4- to 0.7-mil thick anodized coating producing natural aluminum color finish. Finish must conform to AA M21-C22-A31, as specified in AA DAF-45.]
- [Polished-frosted finish with Class I clear anodized coating must be a smooth specular buffed mechanical finish, followed by a medium matte chemical etch finish and Architectural Class I 0.018 mm 0.7-mil and greater thickness anodized coating producing natural aluminum color finish. Finish shall conform to AA M21-C22-A41, as specified in AA DAF-45.]

NOTE: It is recommended that a sample of the required color be on display where it may be seen by bidders during the bidding period.

- [Polished-frosted finish with integral-color anodized coating must be a smooth specular buffed mechanical finish, followed by a nonetching inhibitive alkaline cleaning, medium matte, chemical etch finish and Architectural Class 1 0.018 mm 0.7-mil and greater thickness anodized coating producing dark bronze integral color finish. Finish must conform to AA DAF-45.]
- [Finish color and appearance must match that of the aluminum finish sample approved for each Architectural metal item within the aluminum producer's standard color range.]

Preventative Maintenance and Inspection shall be in accordance with the aluminum producer's recommended Cleaning Materials and Application Methods including precautions in the use of cleaning materials that may be

detrimental to the aluminum finish when improperly applied.

PART 3 EXECUTION

3.1 GENERAL PROVISIONS

Install decorative metal work in accordance with the approved shop drawings and descriptive data for each ornamental metal item, as specified.

Decorative metal items must be securely fastened plumb and true to lines and levels.

3.2 ANCHORAGE DEVICES EMBEDDED IN OTHER CONSTRUCTION

Deliver anchorage devices, such as concrete inserts, anchor bolts, and ornamental metal items having integral anchors that are to be embedded in cast-in-place concrete and masonry construction, to the project site in time to be installed before the start of cast-in-place concrete operations and masonry work. Provide setting drawings, templates, instructions, and directions for the installation of the anchorage items.

3.3 FASTENING TO CONSTRUCTION-IN-PLACE

Provide [Anchorage devices and fasteners](#) where necessary for fastening ornamental metal items to construction-in-place. Fastening must include threaded fasteners for concrete inserts embedded in cast-in-place concrete; masonry anchorage devices and threaded fasteners for solid masonry and concrete-in-place; toggle bolts for hollow masonry and stud partitions; through bolting for masonry and wood construction; lag bolts and wood screws for wood construction; and threaded fasteners for structural steel. Provide fastening as indicated and as specified. Fastening to wood plugs in masonry or concrete-in-place is not permitted.

3.4 CUTTING AND FITTING

Cutting, drilling, and fitting required must be performed for the installation of ornamental metal work. Cutting, drilling, and fitting shall be executed carefully; when required, work shall be fitted in place before fastening.

3.5 SETTING MASONRY ANCHORAGE DEVICES

Set all masonry anchorage devices in masonry or concrete-in-place construction in accordance with the anchorage device manufacturer's printed instructions. Holes must be of the recommended depth and diameter and be drilled to the size recommended by the manufacturer of the particular anchorage device used. Drilled holes must be left rough, not reamed, and free of drill dust.

3.6 WELDING PROCEDURES

Procedures for welding, appearance, and quality of welds made, and the methods used in correcting welding work must conform to [AWS D1.2/D1.2M](#).

Ground exposed welds smooth.

3.7 THREADED CONNECTIONS

Where exposed to view, bolt and screw heads must be flat and countersunk,

unless otherwise specified. Threaded connections must be made up tightly so that the threads will be entirely concealed by fitting.

3.8 CLEANING

Before final acceptance, wash exposed-to-view aluminum surfaces with clean water and soap and rinsed with clean water. Do not use acid solutions, steel wool, or other harsh abrasives. Stains that remain after washing must be removed or the finish restored in accordance with the aluminum producer's recommendations.

3.9 INSPECTION AND ACCEPTANCE PROVISIONS

3.9.1 Finished Ornamental Metal Work Requirements

Ornamental metal work will be rejected for any of the following deficiencies:

Finish of exposed-to-view aluminum surfaces having color and appearance that are outside the color and appearance range of the approved samples for aluminum finish.

Installed ornamental metal items having stained, discolored, abraded, or otherwise damaged exposed-to-view aluminum surfaces that cannot be removed by cleaning or repairing.

Installed ornamental metal items that do not match the approved sample.

Aluminum surfaces in contact with dissimilar materials that are not protected as specified.

3.9.2 Repair of Defective Work

Defective work must be removed and replaced with ornamental metal materials that meet the requirements of this section.

3.10 MAINTENANCE INSTRUCTIONS

Submit [maintenance instructions](#) as follows:

Aluminum producer's recommended cleaning materials and application methods including precautions in the use of cleaning materials that may be detrimental to the aluminum finish when improperly applied.

-- End of Section --