
USACE / NAVFAC / AFCEA

UFGS-08 11 16 (August 2008)

Preparing Activity: NAVFAC

Superseding

UFGS-08 11 16 (November 2007)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2009

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SECTION 08 11 16

ALUMINUM DOORS AND FRAMES 08/08

NOTE: This guide specification covers aluminum doors and frames intended for use principally as main entrance and vestibule doors, and for prominent interior doors from lobbies and similar spaces in buildings of public access where appearance is a major factor.

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

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

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the 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).

NOTE: On the drawings, show:

1. Size of door openings; thickness, swing and travel of doors; whether flush, paneled, glazed, or louvered; width of stiles and rails
2. Elevations of each door and frame type, at 1:50
1/4 inch scale
3. Details of head, jamb, sill, mullions, and transom sections; key sections to door frame elevations; type and spacing of anchors
4. Type and thickness of glazing required and

method of glazing

5. Details of weatherstripping for exterior doors

6. Amount of free area for louvers

7. A separate number for each door opening on door schedule

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 in the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (2003) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2603 (2002) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

AAMA 2604 (2005) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM A 36/A 36M (2008) Standard Specification for Carbon

Structural Steel

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 221	(2008) 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 E 1300	(2007e1) Determining Load Resistance of Glass in Buildings
ASTM E 283	(2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E 331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F 1642	(2004) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F 2248	(2003) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

1.2 PERFORMANCE REQUIREMENTS

1.2.1 Structural

NOTE: Include the bracketed statement for static load, frame deformation, minimum glazing frame bite, and frame connection requirements when personnel density is greater than one person per 40 square meters 430 square feet and minimum AT/FP standoff distances are met. This provision is not required for guard type facilities, single and duplex detached family housing. The requirements are specified in UFC 4-010-01 "Department of Defense Minimum Antiterrorism Standards for Buildings".

[Exterior doors, frames and hardware shall be designed to resist equivalent static design loads in accordance with ASTM F 1642. Frame deflections shall not exceed L/160 of the unsupported member lengths. Equivalent static design loads for connections of window or door frame to the

surrounding walls or hardware and associated connections, and glazing stop connections shall be in accordance with ASTM F 2248 and ASTM E 1300. Design supporting elements and their connections based on their ultimate capacities. Provide calculations of a Professional Engineer that substantiates compliance with these requirements. Use frames that provide an equivalent level of performance. Shapes and thicknesses of framing members shall be sufficient to withstand [a design wind load of not less than 1.4 [] kPa 30 [] pounds per square foot of supported area] [the design wind load indicated] with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65. Provide glazing beads, moldings, and trim of not less than 1.25 mm 0.050 inch nominal thickness.

1.2.2 Air Infiltration

When tested in accordance with ASTM E 283, air infiltration shall not exceed 2.63 by 10⁻⁵ cms per square meter 0.06 cubic feet per minute per square foot of fixed area at a test pressure of 0.30 kPa 6.24 pounds per square foot (80 kilometers 50 mile per hour wind).

1.2.3 Water Penetration

When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 0.38 kPa 8 pounds per square foot of fixed area.

1.3 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.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors[, windows] and frames[; G][; G, [_____]]

Show elevations of each door type, size of doors and frames, metal gages, details of door and frame construction, methods of anchorage, glazing details, weatherstripping, provisions for and location of hardware, and details of installation.

SD-04 Samples

Finish sample

SD-05 Design Data

Structural calculations for deflection[; G][; G, [____]]

SD-08 Manufacturer's Instructions

Doors and frames

Submit detail specifications and instructions for installation, adjustments, cleaning, and maintenance.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on nonabsorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method, except that no coatings or lacquers shall be applied to surfaces to which calking and glazing compounds must adhere.

1.5 QUALITY CONTROL

1.5.1 Shop Drawing Requirements

Drawings shall indicate elevations of doors[, windows] and frames, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, [mullion details,] [method and materials for weatherstripping,] [material and method of attaching subframes,] [trim,] installation details, and other related items.

1.5.2 Sample Requirements

1.5.2.1 Finish Sample Requirements

Submit color chart of standard factory-finish color coatings.

PART 2 PRODUCTS

2.1 DOORS AND FRAMES

Swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members [, subframes] [, transoms] [, adjoining sidelights] [, adjoining window wall] [, trim], and accessories.

2.2 MATERIALS

2.2.1 Anchors

Stainless steel [or steel with hot-dipped galvanized finish].

2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

2.2.3 Aluminum Alloy for Doors and Frames

ASTM B 221M ASTM B 221, Alloy 6063-T5 for extrusions. ASTM B 209M ASTM B 209, alloy and temper best suited for aluminum sheets and strips.

2.2.4 Fasteners

Hard aluminum or stainless steel.

2.2.5 Structural Steel

ASTM A 36/A 36M.

2.2.6 Aluminum Paint

Aluminum door manufacturer's standard aluminum paint.

2.3 FABRICATION

2.3.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide removable glass stops and glazing beads for frames accommodating fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 300 mm 12 inches on center. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

2.3.2 Aluminum Doors

Of type, size, and design indicated and not less than 45 mm 1-3/4 inch thick. Minimum wall thickness, 3 mm 0.125 inch, except beads and trim, 1.25 mm 0.050 inch. Door sizes shown are nominal and shall include standard

clearances as follows: 2.5 mm 0.093 inch at hinge and lock stiles, 3 mm 0.125 inch between meeting stiles, 3 mm 0.125 inch at top rails, 5 mm 0.187 inch between bottom and threshold, and 17 mm 0.687 inch between bottom and floor. [Bevel single-acting doors 2 or 3 mm 0.063 or 0.125 inch at lock, hinge, and meeting stile edges.] [Double-acting doors shall have rounded edges at hinge stile, lock stile, and meeting stile edges.]

2.3.2.1 Full Glazed Stile and Rail Doors

Doors shall have [narrow] [medium] [wide] stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 10 or 13 mm 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

2.3.2.2 Flush Doors

NOTE: The optional types of door construction may not be suitable for use in all facilities. Delete any option listed not considered desirable for a particular usage or for use in a particular facility.

Use facing sheets with [a vertical ribbed] [an embossed] [or] [a plain smooth] surface. Use one of the following constructions:

- a. A phenolic resin-impregnated kraft paper honeycomb core, surrounded at edges and around glass and louvered areas with extruded aluminum shapes. The impregnation of core shall have a minimum of 18 percent resin content. Provide sheet aluminum door facings, not less than 0.8 mm 0.032 inch thick laminated to a 2.5 mm 0.10 inch thick tempered hardboard backing, and bond the backing to the honeycomb core. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.
- b. A phenolic resin-impregnated kraft paper honeycomb core. Use aluminum facing sheets not less than 1.25 mm 0.050 inch thick and form into two pans which will eliminate seams on the faces. Bond honeycomb core to the face sheets using an epoxy resin or contact cement-type adhesive.
- c. A solid fibrous core, surrounded at edges and around glass and louvered areas and cross-braced at intermediate points with extruded aluminum shapes. Use aluminum facing sheets of not less than 1.25 mm 0.050 inch thickness. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.
- d. Form from extruded tubular stiles and rails mitered at corners, reinforce, and continuously weld at miters. Facing sheets shall consist of 0.8 mm 0.032 inch thick sheet aluminum internally reinforced with aluminum channels or Z-bars placed horizontally not more than 400 mm 16 inch apart and extending full width of panel. Fit spaces between reinforcing with sound-deadening insulation. Facing sheets shall finish flush with faces of stiles

and rails and be welded to reinforcing bars or channels and to stiles and rails.

- e. Form from an internal grid system composed of extruded aluminum tubular sections. Provide extruded aluminum tubular sections at both sides, and at perimeters of louver and glass cutouts. Provide three extruded aluminum tubular sections at top and bottom of door. Wall thickness of tubular sections shall be not less than 2.25 mm 0.09 inch except that lock rail shall be not less than 3 mm 0.125 inch thick, hinge lock rail shall be not less than 3 mm 0.125 inch thick, and hinge rail edge shall be not less than 5 mm 0.19 inch thick. Fill spaces in door with mineral insulation. Facing sheets shall be of aluminum not less than 2.25 mm 0.09 inch thick.
- f. Form from extruded aluminum members at top and bottom, both sides, and at perimeters of louver and glass cutouts. Wall sections of extruded aluminum members shall be not less than 2.25 mm 0.09 inch thick and be properly reinforced for application of hardware. Framing members shall be covered on both sides with aluminum facing sheets not less than 2 mm 0.064 inch thick. Fill door with foamed-in urethane with a 48 kg per cubic meter 3 pound density.

2.3.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts will be permitted only in inconspicuous locations, and shall have countersunk heads. Weld concealed reinforcements for hardware in place.

2.3.4 Weatherstripping

NOTE: Maximum air leakage rates are 2.19 x 10⁻⁵ cms
per sq. m 0.5 cfm per sq. ft. of door area for
residential swinging doors and 5.48 x 10⁻⁵ cms per
sq. m 1.25 cfm per sq. ft. of door area for
non-residential doors. Both of the air leakage
rates assume the use of threshold and sweepstrip.
Coordinate with Section 08 71 00 DOOR HARDWARE.

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping shall be replaceable without special tools, and adjustable at meeting rails of pairs of doors. Installation shall allow doors to swing freely and close positively. Air leakage of a single leaf weatherstripped door shall not exceed [2.19 x 10⁻⁵] [5.48 x 10⁻⁵] cubic meter per second of air per square meter [0.5] [1.25] cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E 283.

2.3.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. [Where indicated, reinforce vertical mullions with structural steel members of sufficient length to

extend up to the overhead structural slab or framing and secure thereto.]
[Reinforce and anchor freestanding door frames to floor construction as
indicated on approved shop drawings and in accordance with manufacturer's
recommendation.] Place anchors [as indicated] [near top and bottom of each
jamb and at intermediate points not more than 635 mm 25 inch apart].

2.3.6 Provisions for Hardware

NOTE: This guide specification requires that
hardware and glazing for aluminum doors be specified
in their respective sections of the project
specification.

NOTE: Where items of hardware such as operating
mechanism for balanced doors, integral push bars,
concealed closing devices, and special panic bolts
for exceptionally narrow stile doors are designed as
an integral part of door or frame construction, it
may be necessary to revise specification so these
items are furnished as part of door and frame unit.
When accessories, such as finger guards, electric
strikes, automatic power operators, and special
thresholds are required, add as necessary.

Coordinate with Section 08 71 00 DOOR HARDWARE. Deliver hardware templates
and hardware (except field-applied hardware) to the door manufacturer for
use in fabrication of aluminum doors and frames. Cut, reinforce, drill,
and tap doors and frames at the factory to receive template hardware.
Provide doors to receive surface-applied hardware, except push plates, kick
plates, and mop plates, with reinforcing only; drill and tap in the field.
Provide hardware reinforcements of stainless steel or steel with hot-dipped
galvanized finish, and secure with stainless steel screws. [Provide
reinforcement in core of flush doors as required to receive locks, door
closers, and other hardware.]

2.3.7 Provisions for Glazing

NOTE: This guide specification requires that
hardware and glazing for aluminum doors be specified
in their respective sections of the project
specification.

Provide extruded aluminum snap-in glazing beads on interior side of doors.
Provide extruded aluminum, theft-proof, snap-in glazing beads or fixed
glazing beads on exterior or security side of doors. Glazing beads shall
have vinyl insert glazing gaskets. Design glazing beads to receive glass
of thickness indicated or specified.

2.3.8 Finishes

NOTE: Specify finish designation AA-M10-C22-A31,
Architectural Class II clear (natural) anodized

finish or AA-M10-C22-A32, Architectural Class II color-anodized finish, when doors will not be subject to excessive wear or abrasion and will be regularly cleaned and maintained. Specify finish designation AA-M10-C22-A41, Architectural Class I clear (natural) anodized finish or AA-M10-C22-A42, Architectural Class I color-anodized finish, when doors will be subject to excessive wear and will not be regularly cleaned and maintained. Also specify these designations (Class I) when doors will be used in highly corrosive industrial atmospheres where dust, gases, salts, and other destructive elements that attack metal are in existence. Color-anodized finish is available in medium bronze, dark bronze, and black. Where revolving aluminum doors and frames are shown in connection with aluminum swing doors, exercise care to obtain matching color and finish of the two door types.

Provide exposed aluminum surfaces with [mill finish] [factory finish of anodic coating or organic coating].

2.3.8.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF-45. Finish shall be [clear (natural), designation AA-M10-C22-A31, Architectural Class II 0.01 to 0.0175 mm 0.4 mil to 0.7 mil] [clear (natural), designation AA-M10-C22-A41, Architectural Class I 0.0175 mm 0.7 mil or thicker] [integral color-anodized, designation AA-M10-C22-A32, Architectural Class II 0.01 to 0.0175 mm 0.4 mil to 0.7 mil] [integral color-anodized, designation AA-M10-C22-A42, Architectural Class I 0.0175 mm 0.7 mil or thicker] [electrolytically deposited color-anodized, designation AA-M10-C22-A34, Architectural Class II 0.01 to 0.0175 mm 0.4 mil to 0.7 mil] [electrolytically deposited color-anodized, designation AA-M10-C22-A44, Architectural Class I 0.0175 mm 0.7 mil or thicker]. [Color shall be [_____] [as indicated].]

2.3.8.2 Organic Coating

NOTE: Specify baked enamel finish as an option to Class II anodized. Specify high-performance finish as an option to Class I anodized.

Clean and prime exposed aluminum surfaces. Provide [a baked enamel finish in accordance with AAMA 2603 with total dry film thickness not less than 0.02 mm 0.8 mil] [a high-performance finish in accordance with AAMA 2604 with total dry film thickness of not less than 0.03 mm 1.2 mils]. The finish color shall be [_____] [as indicated].

PART 3 EXECUTION

3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors [, transoms] [, adjoining sidelights] [, and] [, adjoining window walls]. Anchor frames to adjacent construction as indicated and in accordance with

manufacturer's printed instructions. Anchor bottom of each frame to rough floor construction with 2.4 mm 3/32 inch thick stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors. Hang doors to produce clearances specified in paragraph entitled "Aluminum Doors," of this section. After erection and glazing, adjust doors and hardware to operate properly.

3.2 PROTECTION FROM DISSIMILAR MATERIALS

3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact to dissimilar metals.

3.2.1.1 Protection

Provide one of the following systems to protect surfaces in contact with dissimilar metals:

- a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.
- b. Apply a good quality elastomeric sealant between the aluminum and the dissimilar metal.
- c. Paint the dissimilar metal with one coat of primer and one coat of aluminum paint.
- d. Use a nonabsorptive tape or gasket in permanently dry locations.

3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint to prevent aluminum discoloration.

3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood, with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting the aluminum, the Contractor shall have the option of painting the wood or other absorptive surface with two coats of aluminum paint and sealing the joints with elastomeric sealant.

3.3 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's written recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

3.4 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --