
USACE / NAVFAC / AFCEA / NASA UFGS-13 34 00.00 40 (July 2007)

Preparing Activity: NASA Superseding
UFGS-13 34 00.00 40 (June 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2007

Revised throughout - changes not indicated by CHG tags

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FABRICATED ENGINEERED STRUCTURES

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NOTE: This specification covers the requirements for pre-engineered buildings and single-sheet uninsulated and insulated wall panel construction complete and erected in-place.

Aluminum doors, overhead and sliding doors, concrete, masonry, electrical, plumbing, heating and ventilating, and painting requirements, as well as cranes and hoists are not included in this section and must be specified in the appropriate sections.

Drawings must indicate building size, profile, module, column footings and foundations, roof slope, design loadings, panel-configuration insulation requirements, sidewall and roof openings, crane or monorail runway systems, type and extent of auxiliary loading, and electrical and mechanical requirements.

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 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 DAF-45 (2003) Designation System for Aluminum Finishes

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISC/AISI 121 (2004) Standard Definitions for Use in the Design of Steel Structures

AISI/COS/NASPEC (2001, R 2002) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Manual (2006) Manual for Railway Engineering

ASTM INTERNATIONAL (ASTM)

ASTM A 1 (2005) Standard Specification for Carbon Steel Tee Rails

ASTM A 1008/A 1008M (2006a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened

ASTM A 1011/A 1011M	(2006b) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
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 36/A 36M	(2005) Standard Specification for Carbon Structural Steel
ASTM A 500	(2003a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(2001; R 2005) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 526/A 526M	(1990) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A 529/A 529M	(2005) Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A 572/A 572M	(2006) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 653/A 653M	(2006a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924/A 924M	(2006) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C 1036	(2006) Standard Specification for Flat Glass
ASTM C 592	(2004) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
ASTM D 3841	(1997; R 2001) Standard Specification for Glass Fiber-Reinforced Polyester Plastic Panels

ASTM E 84 (2007) Standard Test Method for Surface Burning Characteristics of Building Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A115 (2006) (Complete Set - Spec dates Vary) Specifications for Door and Frame Preparation for Hardware (Incl A115.1 (1990), A115.2 (1987), A115.4 (1994), A115.5 (1992), A115.6 (1993), A115.12 (1994), A115.13 (1991), A115.14 (1994), A115.15 (1994), A115.16 (1990), A115.17 (1994), A115.18 (1994))

BHMA A156.1 (2006) Butts and Hinges

BHMA A156.18 (2006) Materials and Finishes

BHMA A156.2 (2003) Bored and Preassembled Locks and Latches

BHMA A156.3 (2001) Exit Devices

BHMA A156.4 (2000) Door Controls - Closers

BHMA A156.6 (2005) Architectural Door Trim

BHMA A156.8 (2005) Door Controls - Overhead Stops and Holders

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM (2002) Metal Building Systems Manual

NATIONAL WOOD WINDOW AND DOOR ASSOCIATION (NWWDA)

AAMA/NWWDA 101/I.S.2 (1997) Voluntary Guide Specifications for Aluminum, Poly(Vinyl Chloride) (PVC) and Wood Windows and Glass Doors

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8 (2003) Recommended Specification for Standard Steel Doors and Frames

STEEL WINDOW INSTITUTE (SWI)

SWI SWS (2005) Steel Window Specifications

1.2 GENERAL REQUIREMENTS

Manufacturer's Instructions shall be submitted by the Contracting Officer for Pre-Engineered Building Systems, indicating the recommended installation methods and sequence.

Manufacturer's Standard Color Charts and Color Panels shall be submitted by the Contracting Officer for Exterior Panels, Interior Panels, Accessories and Trim.

Design analysis and calculations for [Pre-Engineered Metal Buildings](#), [Structural Steel Members](#) and [Metal Roofing and Siding Panels](#) shall be prepared and certified by a registered professional structural engineer.

[Certificates](#) shall be submitted for [Materials](#), [Equipment](#) and [Accessories](#) showing conformance with the referenced standards contained in this section.

1.3 DESIGN CRITERIA

Structure shall be designed to withstand a live load on the roof, in accordance with local code requirements and wind and seismic loading and in accordance with [MBMA MBSM](#). Loads shall be combined for determining maximum stress in accordance with [MBMA MBSM](#).

Allowable stresses may be increased one-third for design-load combinations involving wind.

Structural steel members shall be designed in accordance with [AISC/AISI 121](#) and [AISI/COS/NASPEC](#).

Design of [pre-engineered metal buildings](#) shall be in accordance with the [MBMA MBSM](#).

Deflection of metal roofing and siding panels shall not exceed 1/180 of the span on single span loading under the total live and wind load.

1.4 DESIGN CRITERIA FOR CRANE LOADING

[Crane loading shall be in accordance with [MBMA MBSM](#).]

1.5 FRAMING SYSTEM

1.5.1 Straight Column, Tapered Rafter, and Rigid Frame

Framing shall consist of straight section columns, splice plates field-bolted to tapered rafters and shall be of the span, eave height, and bay spacing.

1.5.2 Tapered Column, Straight Rafter, and Rigid Frame

Framing shall consist of tapered sections, and welded-up plate columns, both field-bolted to straight section rafters; framing shall be of the span, eave height, and bay spacing.

1.5.3 Tapered Column, Tapered Rafter, and Rigid Frame

Framing shall consist of tapered section, welded-up plate columns, and roof beams complete with splice plates for field assembly and shall be of the span, roof pitch, eave height, and bay spacing.

1.6 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

Manufacturer's Instructions shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

SD-02 Shop Drawings

Fabrication drawings shall be submitted for the following items:

Installation drawings shall also be submitted for the following items and shall be in accordance with the paragraph entitled, "Assembly and Erection," of this section.

Structural Steel Primary Members
Structural Steel Secondary Members
Subframing
Roofing and Siding
Accessories
Interior Panels
Windows
Steel Doors and Frames
Overhead Door Frames
Ventilators and Louvers
Gutters and Downspouts

Crane Rails
Pre-Engineered Metal Buildings

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items, including accessories and installation materials.

Structural Steel Primary Members
Structural Steel Secondary Members
Subframing
Roofing and Siding
Coating
Accessories
Interior Panels
Insulating Materials
Windows
Steel Doors and Frames
Weatherstripping
Overhead Door Frames
Glass and Glazing
Ventilators and Louvers
Gutters and Downspouts
Crane Rails
Fluoropolymer Coating
Silicone Polyester Coating

SD-04 Samples

Contractor shall provide the following samples:

Roofing and Siding: One piece, 230 millimeter 9 inches by width of panel

Color Panels: Three pieces, 100 by 100 millimeter 4 by 4 inches, to indicate maximum color range

Exposed Fasteners: One of each type

Filler Strips: One piece, width of panel

Sandwich Walls: One piece, 200 by 280 millimeter 8 by 11 inches

Insulating Materials: One piece 200 by 280 millimeter 8 by 11 inches

One of the full-size **Windows**, complete with hardware, operating vent, casing, and trim. After approval, sample window shall be installed where directed and the location shall be recorded.

Manufacturer's Standard Color Charts shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Color Panels
Exterior Panels
Interior Panels
Accessories
Trim

SD-05 Design Data

Design analysis and calculations for the following items shall be in accordance with the paragraph entitled, "General Requirements," of this section.

Pre-Engineered Metal Buildings
Structural Steel Members
Metal Roofing and Siding Panels

SD-07 Certificates

Certificates shall be submitted for the following in accordance with paragraph entitled, "General Requirements," of this section.

Materials
Equipment
Accessories

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL PRIMARY MEMBERS

Steel for hot-rolled mill shapes, plates, and bars shall be in accordance with ASTM A 36/A 36M.

Hot-rolled steel sheet, plate, and strip of welded assemblies shall conform to [ASTM A 529/A 529M] [ASTM A 1011/A 1011M] [ASTM A 572/A 572M], Grade [42] [50].

Steel tubing shall conform to [ASTM A 501] [ASTM A 500], Grade B.

Diagonal-rod bracing steel shall be in accordance with [ASTM A 572/A 572M, Grade [60] [65]], [ASTM A 36/A 36M, not less than 10 millimeter 3/8-inch diameter]. Threads shall be rolled or cut. Nuts shall be semifinished hex-head.

Anchor bolts shall be uncoated, carbon steel in accordance with ASTM A 36/A 36M hot-dipped galvanized in accordance with ASTM A 153/A 153M.

[Primary members shall be hot-dip galvanized in accordance with ASTM A 123/A 123M.]

[Primary members shall be shop primed with a rust-inhibitive primer compatible with the finish to be applied.]

2.2 STRUCTURAL STEEL SECONDARY MEMBERS

[Members shall conform to [ASTM A 653/A 653M, Grade C] [ASTM A 1011/A 1011M, Grade [40] [45] [50]]. Zinc coating shall conform to ASTM A 653/A 653M and ASTM A 924/A 924M. Minimum thickness of members shall be 16-gage 1.6 millimeter 16-gage, prepunched for bolted field assembly.]

[Members shall conform to [ASTM A 653/A 653M, Grade C] [ASTM A 1011/A 1011M, Grade [40] [45] [50]]. Shop prime paint shall be the final finish. Minimum thickness of members shall be 1.6 millimeter 16-gage. Members shall be prepunched for bolted field assembly.]

2.3 SUBFRAMING

[Subframing shall be die-formed shapes may be bar-size shapes in accordance with ASTM A 36/A 36M. Zinc coating shall conform to ASTM A 653/A 653M and ASTM A 924/A 924M. Minimum uncoated thickness shall be 1.3 millimeter 18-gage. Bar shapes shall be at least 6 by 25 millimeter 1/4 by 1 inch. T-bars shall have a minimum uncoated thickness of 0.85 millimeter 22-gage and Z-bars a minimum uncoated thickness of 2.0 millimeter 14-gage.]

[Subframing shall be die-formed shapes in accordance with ASTM A 526/A 526M, Type I, Class d, or may be bar-size shapes conforming to ASTM A 36/A 36M. Shop prime paint shall be the final finish. Minimum uncoated thickness shall be 1.3 millimeter 18-gage. Bar shapes shall be at least 6 by 25 millimeter 1/4 by 1 inch. T-bars shall have a minimum uncoated thickness of 0.85 millimeter 22-gage and Z-bars a minimum uncoated thickness of 2.0 millimeter 14-gage.]

Concealed clips shall be fabricated from hot-dip galvanized steel conforming to ASTM A 1008/A 1008M. Zinc coating shall be in accordance with ASTM A 653/A 653M and ASTM A 924/A 924M.

2.4 ROOFING AND SIDING

Panels shall conform to ASTM A 653/A 653M, Grade [A] [B] [C] [D] [E], not less than 0.55 millimeter 26-gage thick, before coating. Zinc coating shall conform to ASTM A 653/A 653M and ASTM A 924/A 924M.

Metal fascia shall be of the same material as the roofing and siding and not less than 0.55 millimeter 26-gage.

Roofing sheets shall be of sufficient length to bridge at least 3 purlin spans plus the required end lap. Siding sheets shall extend full height of Sandwich Walls, without horizontal joints. Roofing sheets shall extend full width from ridge to eave in buildings 18288 millimeter 60 feet and less in width. Roofing and siding sheets shall have concealed, semiconcealed, or exposed fasteners on exterior.

2.5 FINISH

[Baked enamel Coating shall be a two coat, thermosetting, acrylic enamel or vinyl-solution finish standard with the manufacturer, applied to outside of panels. Inside shall be primed.]

[Fluoropolymer Coating shall consist of a primer and a finish coat of polyvinyl fluoride, or polyvinylidene fluoride standard with the manufacturer, applied to outside of panels. Inside shall be primed.]

[Silicone Polyester Coating shall consist of an epoxy primer and a finish coat of silicone polyester standard with the manufacturer. Coating shall be applied to the outside of the panels. Inside shall be primed.]

2.6 ACCESSORIES

Sheet-metal accessories shall be formed of material of the same type and finish as roofing and siding panels and shall be not less than 0.55 millimeter 26-gage.

Filler Strips shall be premolded neoprene or polyvinylchloride.

2.7 INTERIOR PANELS

[Panels shall conform to ASTM A 653/A 653M, grade and baked-enamel finish standard with the manufacturer.]

2.8 INSULATING MATERIALS

2.8.1 Flame Spread

[Insulation shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84.]

NOTE: Specify blanket insulation for concealed locations and exposed locations where surface waviness would not be objectionable. Board insulation must be retained as an alternative to blanket insulation and specified exclusively for exposed locations when warranted for the particular application.

2.8.2 Rigid or Semirigid Board

Board insulation shall conform to ASTM C 592. Exposed insulation shall have a white nondusting and nonshedding painted finish.

2.8.3 Blanket Insulation

Blanket insulation shall conform to ASTM C 592.

2.9 WINDOWS

NOTE: Insert Type A-A2, HS-A2, HS-A3, C-A2, C-A3, DH-A2, DH-A3, P-A2, or P-A3 in the first paragraph.

[Windows shall be aluminum and conform to AAMA/NWWDA 101/I.S.2, Type [____].] [Windows shall be factory glazed with [____] glass. Aluminum shall be provided with a AA-M10-C22-A31 clear anodized finish in accordance with the requirements of AA DAF-45 designation system for aluminum surfaces. All ventilating sections shall be provided with insect screens.]

Windows shall be galvanized steel and shall be in accordance with SWI SWS, [commercial projected] [architectural projected] [standard intermediate projected] [standard intermediate casement]. All ventilating sections shall be provided with insect screens. Windows shall be glazed with [____] glass.

2.10 STEEL DOORS AND FRAMES

Doors and frames shall conform to SDI/DOOR A250.8.

Doors and frames shall be galvanized in accordance with ASTM A 653/A 653M and ASTM A 924/A 924M.

Preparation for hardware shall be in accordance with BHMA A115 and the

manufacturer's standards.

2.11 FINISH HARDWARE

Hardware shall be the manufacturer's standard and conform to BHMA A156.1, BHMA A156.2, BHMA A156.3, BHMA A156.4, BHMA A156.6, and BHMA A156.8.

Finishes shall conform to BHMA A156.18.

2.12 WEATHERSTRIPPING

[Weatherstripping for the heads, jambs, meeting stiles, and sills of exterior doors shall be the manufacturer's standard.]

2.13 OVERHEAD DOOR FRAMES

Steel framing shall consist of structural-steel shapes or cold-formed members of size and details indicated, hot-dip galvanized in accordance with ASTM A 123/A 123M.

2.14 GLASS AND GLAZING

Glass shall conform to ASTM C 1036.

2.15 PLASTIC GLAZING

[Plastic panels shall conform to ASTM D 3841 fire retardant.]

2.16 VENTILATORS AND LOUVERS

[Ventilators and louvers shall be the manufacturer's standard of galvanized steel conforming to ASTM A 526/A 526M. Zinc coating shall be in accordance with ASTM A 653/A 653M and ASTM A 924/A 924M.]

[Spring-loaded, pull-chain operated, fusible-link dampers shall be provided where indicated.]

[Bird screen shall be 12.5 by 12.5-millimeter 1/2- by 1/2-inch mesh of 1.024 millimeter 0.0403-inch diameter galvanized wire.]

2.17 GUTTERS AND DOWNSPOUTS

[Gutters and downspouts shall conform to ASTM A 526/A 526M. Zinc coating shall be in accordance with ASTM A 653/A 653M and ASTM A 924/A 924M. Material shall be not less than 0.55 millimeter 26-gage.]

2.18 CRANE RAILS

[Crane rails shall be controlled-cooled, open-hearth carbon steel, AREMA Manual rails conforming to ASTM A 1, No. 1 rails.]

PART 3 EXECUTION

3.1 ASSEMBLY AND ERECTION

Assembly and erection shall be on a prepared foundation in accordance with the manufacturer's instructions and recommendations.

Manufacturer shall furnish either templates or an anchor bolt layout

drawing that must be used for the location of anchor bolts.

3.2 CRANE RUNWAYS

[Runways shall be erected complete with columns, girders, beams, bracing, crane rails, crane stops, and other components. Gage, alignment, and elevation of crane rails shall be accurate to a tolerance of plus or minus 3 millimeter 1/8 inch. Crane-rail joints shall be staggered with respect to each other on opposite sides of the runway and shall not coincide with the crane girder joints. Top of the crane rails shall be flush at joints.]

-- End of Section --