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USACE / NAVFAC / AFCEA / NASA UFGS-05 51 33 (May 2010)  
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Preparing Activity: NAVFAC Superseding  
UFGS-05 51 33 (August 2008)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2010

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05/10

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SECTION 05 51 33

### METAL LADDERS 05/10

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NOTE: This guide specification covers requirements  
for metal ladders.

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, suggestions and recommended changes for  
this guide specification are welcome and should be  
submitted as a Criteria Change Request (CCR).

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NOTE: Show the following information on the  
drawings:

1. Location and configuration of all metalwork.
2. All sizes and dimensions.
3. Special fastenings, attachments or anchoring.
4. Location of products to be galvanized.
5. Location and support detail of ladders.

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## PART 1 GENERAL

### 1.1 REFERENCES

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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.

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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; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

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

ASTM A 47/A 47M (1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings

ASTM A 500/A 500M (2010) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 53/A 53M (2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 780/A 780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 924/A 924M	(2010) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 108/B 108M	(2008) Standard Specification for Aluminum-Alloy Permanent Mold Castings
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 B 26/B 26M	(2009) Standard Specification for Aluminum-Alloy Sand Castings
ASTM D 1187	(1997; R 2002e1) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer
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THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders
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1.2 SUBMITTALS

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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.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for information only.] [for Contractor Quality Control approval.] 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-02 Shop Drawings

Ladders, installation drawings

Ship's ladder (with or without guards), installation drawings

#### SD-03 Product Data

Ladders

Ship's ladder (with or without guards)

### 1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

### 1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

## PART 2 PRODUCTS

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NOTE: Product selections should be based on esthetic values, reliability and cost. Delete

alternate requirements where they occur.

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## 2.1 MATERIALS

### 2.1.1 Structural Carbon Steel

ASTM A 36/A 36M.

### 2.1.2 Structural Tubing

ASTM A 500/A 500M.

### 2.1.3 Steel Pipe

ASTM A 53/A 53M, Type E or S, Grade B.

### 2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A 47/A 47M.

### 2.1.5 Aluminum Alloy Products

Conform to ASTM B 209M ASTM B 209 for sheet plate, ASTM B 221M ASTM B 221 for extrusions and ASTM B 26/B 26M or ASTM B 108/B 108M for castings, as applicable. Provide aluminum extrusions at least 3 mm 1/8 inch thick and aluminum plate or sheet at least 1.3 mm 0.050 inch thick.

## 2.2 FABRICATION FINISHES

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NOTE: In the Material Safety Data Sheets (MSDS) for coating materials show exclusion or replacement of the following materials as intended ingredients: asbestos, benzene, chromium compounds, coal tar, 2-ethoxyethanol and 2-methoxyethanol and their acetates, halogenated hydrocarbons, and lead compounds. The content of volatile organic compounds (VOC), and marking, must be in compliance with air quality regulations for the type of application and jurisdiction where used.

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### 2.2.1 Galvanizing

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NOTE: Specify galvanizing for items installed in exterior exposures subject to salt spray or corrosive fumes and interior areas subject to continual wetting or high humidity.

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Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123/A 123M, ASTM A 153/A 153M, ASTM A 653/A 653M or ASTM A 924/A 924M, Z275 G90, as applicable.

### 2.2.2 Galvanize

Anchor bolts, washers, and parts or devices necessary for proper

installation, unless indicated otherwise.

### 2.2.3 Repair of Zinc-Coated Surfaces

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**NOTE: Delete this paragraph when no galvanized items are specified.**  
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Repair damaged surfaces with galvanizing repair method and paint conforming to **ASTM A 780/A 780M** or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

### 2.2.4 Shop Cleaning and Painting

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**NOTE: Shop painting herein is for steel protected from the weather and not subjected to corrosive environments. For steel which will be exposed to the weather or corrosive environments, modify the shop painting accordingly.**  
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#### 2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with **SSPC SP 6/NACE No.3**. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with **SSPC SP 3** in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean.

#### 2.2.4.2 Pretreatment, Priming and Painting

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**NOTE: Use manufacturers standard treatment when painting and finishing is required.**  
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Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. [On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of **0.03 mm 1.0 mil**. Tint additional prime coat with a small amount of tinting pigment.]

### 2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

### 2.2.6 Aluminum Surfaces

#### 2.2.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in



scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

#### 2.2.6.2 Aluminum Finishes

Unexposed plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF-45. Unless otherwise specified, provide all other aluminum items with [standard mill finish.] [hand sanded or machine finish to a 240 grit.] Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45.

#### 2.3 LADDERS

Fabricate vertical ladders conforming to Section 7 of 29 CFR 1910.27. Use 65 by 10 mm 2 1/2 by 3/8 inch steel flats for stringers and 20 mm 3/4 inch diameter steel rods for rungs. Rungs to be not less than 400 mm 16 inches wide, spaced one foot apart, plug welded or shouldered and headed into stringers. Install ladders so that the distance from the rungs to the finished wall surface will not be less than 175 mm 7 inches. Provide heavy clip angles riveted or bolted to the stringer and drilled [for not less than two 12 mm 1/2 inch diameter expansion bolts] as indicated. Provide intermediate clip angles not over 1200 mm 48 inches on centers.

##### 2.3.1 Ladder Cages

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NOTE: Delete this paragraph when the length of  
climb is 6000 mm 20 feet or less.  
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Conform to 29 CFR 1910.27. Fabricate 50 by 6 mm 2 by 1/4 inch horizontal bands and 40 by 5 mm 1 1/2 by 3/16 inch vertical bars. Provide attachments for fastening bands to the side rails of ladders or directly to the structure. Provide and fasten vertical bars on the inside of the horizontal bands. Extend cages not less than 690 mm 27 inches or more than 710 mm 28 inches from the centerline of the rungs, excluding the flare at the bottom of the cage, and not less than 690 mm 27 inches in width. Clear the inside of the cage of projections.

##### 2.3.2 Ship's Ladder

Fabricate stringers and framing of steel plate or shapes. Bolt, rivet or weld connections and anchor to supporting construction. Provide treads with non-slip surface as specified for safety treads. [Aluminum ladders may be provided, subject to approval of treads, materials, and shop drawings. Requirements shown or specified for steel apply. Provide anchor items of zinc-coated steel.] Design assembly, including tread connections and methods of attachment, to support a live load of 1300 N 300 pounds per tread. Provide railings as specified for metal handrails.

#### PART 3 EXECUTION

##### 3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Provide Exposed fastenings of compatible

materials, generally matching in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners will be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports must provide strength and stiffness. Formed joints exposed to the weather to exclude water. Items listed below require additional procedures.

### 3.2 WORKMANSHIP

Metalwork must be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching must produce clean true lines and surfaces. Continuously weld along the entire area of contact. Do not tack weld exposed connections of work in place. Grid smooth exposed welds. Provide smooth finish on exposed surfaces of work in place, unless otherwise approved. Where tight fits are required, mill joints. Cope or miter corner joints, well formed, and in true alignment. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

### 3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion anchors, and powder-actuated fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine bolts, carriage bolts and powder-actuated threaded studs for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

### 3.4 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with [AWS D1.1/D1.1M](#). Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

### 3.5 FINISHES

#### 3.5.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to [MPI 79](#) to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with [ASTM D 1187](#), asphalt-base emulsion.

#### 3.5.2 Field Preparation

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**NOTE: Delete these paragraphs when Section 09 90  
00, PAINTS AND COATINGS is included in the project  
specifications.**  
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Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when

assembled, must be free of rust, grease, dirt and other foreign matter.

### 3.5.3 Environmental Conditions

Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than **minus 15 degrees C** **5 degrees F** above the dew point of the surrounding air, or when surface temperature is below **7 degrees C** or over **35 degrees C** **45 degrees F** or over **95 degrees F**, unless approved by the Contracting Officer.

### 3.6 LADDERS

Secure to the adjacent construction with the clip angles attached to the stringer. [Secure to masonry or concrete with not less than two **12 mm 1/2 inch** diameter expansion bolts.] Install intermediate clip angles not over **1200 mm 48 inches** on center. Install brackets as required for securing of ladders welded or bolted to structural steel or built into the masonry or concrete. Ends of ladders must not rest upon [finished roof] [floor].

-- End of Section --