UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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02/15, CHG 1: 05/17

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SECTION 10 14 53

TRAFFIC SIGNAGE
02/15, CHG 1: 05/17

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NOTE: This guide specification covers the requirements for traffic signs and sign posts.

The use of state DOT specifications and standard detail drawings is encouraged.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. 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, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
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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 Reference Identifier (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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 133	(2012; R 2016) Standard Specification for Preservatives and Pressure Treatment Processes for Timber
AASHTO M 168	(2007; R 2012) Standard Specification for Wood Products
AASHTO M 268	(2014) Standard Specification for Retroreflective Sheeting for Flat and Vertical Traffic Control Applications
AASHTO MASH	(2016) Manual for Assessing Safety Hardware - Second Edition

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA T1	(2020) Use Category System: Processing and Treatment Standard
AWPA U1	(2020) Use Category System: User Specification for Treated Wood

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A320/A320M	(2017b) Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
ASTM A499	(2015, R 2020) Standard Specification for Steel Bars and Shapes, Carbon Rolled from "T" Rails
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A563M	(2007; R 2013) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A709/A709M	(2018) Standard Specification for Structural Steel for Bridges
ASTM A1011/A1011M	(2018a) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM D4956	(2013) Standard Specification for Retroreflective Sheeting for Traffic Control
ASTM F436/F436M	(2019) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F3125/F3125M	(2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA SHS	(2004; Supplement 2012) Standard Highway Signs
MUTCD	(2009; Rev 2012) Manual on Uniform Traffic

Control Devices

NCHRP 350 (1993) Recommended Procedures for the Safety Performance Evaluation of Highway Features

1.2 GENERAL

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NOTE: If the project is located in a state that has their own MUTCD, signage must conform to the state DOT MUTCD. State DOT MUTCD's should be in substantial conformance with the national MUTCD. Where local standards are more stringent than the MUTCD, the local standards should be followed.

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All signs must be in accordance with the MUTCD. Any signs not detailed on the drawings must be in accordance with the FHWA SHS.

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Traffic Sign Posts

FHWA Acceptance Letter

Traffic Sign Retroreflective Sheeting

SD-04 Samples

Flexible Posts

PART 2 PRODUCTS

2.1 TRAFFIC SIGN POSTS

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NOTE: Sign posts located within the clear zone of roads and streets must be a breakaway or yielding design meeting the crashworthiness criteria of NCHRP 350 or the Manual for Assessing Safety of Hardware (MASH) or must be shielded by guardrail, barrier, or an energy absorbing system meeting the requirements of NRCRP 350 or AASHTO MASH. FHWA acceptance letters for various breakaway supports for signs are available on the FHWA Safety Program webpage.

Ensure details of sign posts are included in the drawings. Breakaway support anchor posts may extend no more than 100 mm 4 inches above grade to lessen the probability of snagging the undercarriage of a vehicle after a support has broken away from its base. Extend anchor posts at least 450 mm 18 inches below grade.

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2.1.1 Steel Flanged Channel Section (U-Shape)

Fabricate steel posts from steel conforming to ASTM A36/A36M or ASTM A499 and with a minimum yield strength of 207 MPa 30 ksi and a minimum tensile strength of 345 MPa 50 ksi. Punch or drill 7.9 to 9.5 mm 5/16 to 3/8 inch diameter holes spaced at 25.4 or 50.8 mm 1 or 2 inch centers along the centerline of the web prior to galvanizing for the entire length of the post. Galvanize posts after punching in accordance with ASTM A123/A123M.

2.1.2 Perforated Steel Tube

Fabricate steel posts from steel conforming to either ASTM A653/A653M, structural steel, Grade 340 50, Class 1, coating designation G90 or ASTM A1011/A1011M, structural steel, Grade 340 50, hot-dip galvanized after punching in accordance with ASTM A123/A123M. Prepunch holes approximately 11.1 mm 7/16 inch in diameter spaced at approximately 25.4 mm

1 inch centers along each side of the tube for the entire length of the post.

2.1.3 Steel Tube

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NOTE: Fill in the required Test Level (TL) if triangular slip bases are used.

NOTE: Sign supports are tested at two levels under NCHRP 350. TL-2 includes four tests conducted at speeds of 35 and 70 km/hr. TL-3 includes four tests conducted at speeds of 35 and 100 km/hr.

Sign supports are tested at three levels under MASH. TL-1 includes three tests conducted at speeds of 30 and 50 km/hr. TL-2 includes three tests conducted at speeds of 30 and 70 km/hr. TL-3 includes three tests conducted at speeds of 30 and 100 km/hr.

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Conform to ASTM A500/A500M, Grade B or C, and hot-dip galvanized in accordance with ASTM A123/A123M. [Manufactured triangular slip bases must be approved by the Federal Highway Administration (FHWA) for use under the provisions of NCHRP 350, TL-[_____] or AASHTO MASH, TL-[_____]. Submit a copy of the FHWA Acceptance Letter.]

2.1.4 Structural Steel H Section

Conform to ASTM A709/A709M, Grade 345 50 or 345W 50W. Galvanize posts, fuse plate and splice plate after fabrication in accordance with ASTM A123/A123M.

2.1.4.1 Slip Base, Fuse Plate and Splice Plate

Conform to ASTM A36/A36M, minimum yield strength 345 MPa 50,000 psi.

2.1.4.2 High-Strength Bolts, Nuts and Washers

High strength bolts must conform toASTM F3125/F3125M. Nuts must conform to ASTM A563M ASTM A563. Washers must conform to ASTM F436/F436M. High strength bolts, nuts and washers must be zinc coated.

2.1.5 Wood

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NOTE: Wood species and preservative type conforming to applicable state DOT standards and specifications may be specified in lieu of the requirements below.

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Wood posts must be dry no. 1 grade Douglas fir, southern or Ponderosa pine, hemlock, spruce, or western larch conforming to AASHTO M 168. Treat the posts with water-borne preservative according to AASHTO M 133, AWPA T1 and AWPA U1.

2.2 FLAT ALUMINUM SIGN PANELS

Aluminum sign panels must conform to ASTM B209M ASTM B209, alloy-temper 6061-T6 or 5052-H38. The blanks must be free from laminations, blisters, open seams, pits, holes, other defects that may affect their appearance or use. The thickness must be uniform and the blank commercially flat.

2.3 EXTRUDED ALUMINUM SIGN PANELS

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NOTE: Extruded aluminum sign panels are used for large signs.

Delete aluminum edge molding if not used.

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Conform to ASTM B221MASTM B221, alloy 6063-T6. The maximum allowable deviation from flat on the face is 4.2 mm per meter 0.05 inches per foot. [Aluminum edge molding must be in accordance with ASTM A320/A320M or SAE J405d austenitic steel, minimum yield strength of 207 MPa 30,000 psi.]

2.4 TRAFFIC SIGN RETROREFLECTIVE SHEETING

All background sheeting applied to flat sheet and extruded panel signs must be in accordance with ASTM D4956, Type III, IV, VII, VIII, IX or XI retroreflective sheeting and must have Class 1, 3, or 4 adhesive backing. Retroreflective sheeting must be high intensity that is an unmetallized micro prismatic reflective material.

Retroreflective sheeting must have sufficient adhesion, strength and flexibility such that the sheeting can be handled, processed and applied according to the manufacturer's recommendations without appreciable stretching, tearing, cracking or other damage.

2.4.1 Legend and Border

Apply retroreflective sheeting as legend and border in accordance with ASTM D4956, Type IX, XI, or AASHTO M 268 Type C or D, Class 1. Retroreflective sheeting must be an unmetallized cube corner microprismatic reflective material. Retroreflective sheeting applied as legend and border for specific signing applications, without a datum mark on the surface of the sheeting, must be evaluated for rotational sensitivity in accordance with AASHTO M 268, Section 3.3.1 and fabricated in accordance with AASHTO M 268, Section 3.3.2.

2.4.2 Screen Printed Transparent Colored Areas

For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficient of retroreflection (RA) must be no less than 70 percent of the original values for the corresponding color.

2.4.3 Adhesive Performance

Adhesive performance for retroreflective sheeting must be in accordance with ASTM D4956. The sheeting surface must be in condition to be readily screen processed and compatible with transparent overlay films, plus recommended transparent and opaque screen process colors. Furnish manufacturer's information as to the type of solvent or solvents that may

be used to clean the surface of the sheeting without detrimental loss of performance and durability.

2.5 LETTERS, NUMERALS, ARROWS, SYMBOLS, AND BORDERS

Apply letters, numerals, arrows, symbols, and borders on the retroreflective sheeting or opaque background of the sign using the direct or reverse screen process. Apply messages and borders of a color darker than the background to the paint or the retroreflective sheeting using the direct process. Messages and borders must be of a color lighter than the sign background and applied using the reverse screen process. Use opaque or transparent colors, inks, and paints of the type and quality recommended by the retroreflective sheeting manufacturer in the screen process. Perform the screening in a manner that results in a uniform color and tone, with sharply defined edges of legends and borders and without blemishes on the sign background that will affect intended use. Air dry or bake the signs after screening according to the manufacturer's recommendations to provide a smooth hard finish. Reject any signs with blister's or other blemishes.

2.6 DELINEATOR POSTS

2.6.1 Steel Posts

Fabricate posts from steel conforming to ASTM A36/A36M or ASTM A499 and having a minimum yield strength of 207 MPa 30 ksi and a minimum tensile strength of 345 MPa 50 ksi. Galvanize posts after punching in accordance with ASTM A123/A123M.

2.6.2 Flexible Posts

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NOTE: Indicate the color of post on the drawings.
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Provide [one-piece driveable] [or] [two-piece with driveable steel anchor] flexible posts. Posts must be impact-resistant, integrally colored UV stabilized polymer or polycarbonate extrusion or fiberglass reinforced composite material. Other materials are subject to approval by the Contracting Officer's Representative. Include a retroreflective sheeting plate with each post as indicated.

2.7 DELINEATOR RETROREFLECTORS

2.7.1 Circular Prismatic Reflectors

Retroreflectors attached to steel posts must be a 75 mm 3-inch minimum diameter acrylic plastic lens with prismatic optical elements and a smooth, clear, transparent face. Fabricate the back from similar material and fuse to the lens around the entire perimeter to form a homogeneous unit. Permanently seal the units against the intrusion of dust, water, or air. Mount the retroreflector unit in a housing fabricated from 1.6 mm 0.063-inch aluminum alloy or similar, or from cold-rolled, hot dip, galvanized steel, having a thickness of 1.6 mm 0.064 inches. Provide the indicated color.

2.7.2 Retroreflective Sheeting

A retroreflective sheeting plate must be applied to each flexible post by

the post manufacturer and must be in accordance with ASTM D4956, Type III, IV, V, VII, VIII, IX or XI retroreflective sheeting. Retroreflective sheeting must be high intensity that is an unmetallized cube corner micro prismatic reflective material. Provide the size and color of the retroreflective sheeting plate as indicated.

2.8 HARDWARE

Bolts, nuts, post clips, lock and flat washers must be either aluminum alloy or commercial quality stainless steel, hot-dip galvanized or cadmium plated after fabrication. [Bolts/nuts must be an approved tamper resistant design.] Provide fiber washers of commercial quality.

2.9 CONCRETE

ASTM C94/C94M, using 19 mm 3/4 inch maximum aggregate, and having minimum compressive strength of 21 MPa 3000 psi at 28 days.

PART 3 EXECUTION

3.1 SIGN POSTS

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NOTE: Sign supports located within the roadway clear zone must be designed to yield, fracture, or separate when impacted by a vehicle. Although the clear roadside concept is still the goal of the designer, compromises are often required in urban or restricted environment areas. Chapter 10 of the AASHTO Roadside Design Guide provides guidance for roadside safety in urban or restricted area. In these areas, sign supports located within the enhanced lateral offset should be designed to yield, fracture, or separate when impacted by a vehicle.

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3.1.1 [Steel Flanged Channel Section] [Perforated Square Steel Tube] [Round Steel Tube]

Sign posts consist of a base post and sign post. [Drive steel sign base posts with a suitable driving head. Attach sign posts to base posts. Replace any base posts damaged during driving or otherwise at no additional cost to the Government.] [Embed steel sign base posts in concrete as indicated.] [Install manufactured triangular slip bases in accordance with the manufacturer's instructions.]

3.1.2 Structural Steel H Section Posts

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NOTE: Ensure the drawings indicate the procedure for tightening bolts and the required torque.

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Tighten all breakaway assembly bolts in a systematic manner to the prescribed torque indicated. Loosen each breakaway assembly bolt and re-tighten to the required torque in the same order as the initial tightening. Burr the threads at the nut using a center punch to prevent the nut from loosening. Tighten nuts on hinge plate bolts to the required minimum bolt tension values indicated.

3.1.3 Wood

Drill holes in the post as indicated.

3.2 SIGN PANELS

Clean, degrease and etch the face of metal panels using methods recommended by the retroreflective sheeting manufacturer. After cleaning and degreasing, apply retroreflective sheeting material to the sign panels as recommended by the manufacturer. Perform shearing, cutting and punching prior to preparing the blanks for application of reflective material. Do not field drill holes in any part of the panel. Use nylon washers recommended by the sign sheeting manufacturer between the bolt heads and sign faces on flat sheet aluminum signs. Replace any damaged sign panels at no additional cost to the Government.

3.3 DELINEATORS

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NOTE: Flexible delineators driven into the soil require a manufacturer's installation tool to install.

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Drive steel delineator posts into the ground in a manner that will not damage the post. Attach flexible delineator posts to steel anchors [or drive into the soil in accordance with the manufacturer's instructions]. Demonstrate the method of installation for the Contracting Officer's Representative to verify that posts will be installed without being damaged.

3.4 LOCATION AND POSITION OF SIGNS

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NOTE: Some State DOT single post sign mounting details bend the sign panel. If this type of mounting detail is used, delete the requirement for flat sign face surface.

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Locate and erect all signs in accordance with the drawings and MUTCD. Vertically mount signs at right angles to the direction of, and facing, the traffic that they are intended to serve. Where mirror reflection from the sign face is encountered to such a degree as to reduce legibility, turn the sign slightly away from the road. Turn signs that are placed 9 m 30 feet or more from the pavement edge toward the road. On curved alignments, determine the angle of placement by the direction of approaching traffic rather than by the roadway edge at the point where the sign is located. Mounted signs must present a smooth flat surface varying no more than 10 mm 3/8 inch from a 1.2 m 4-foot straightedge placed in any position on the face of the sign after erection. Mount signs on traffic signal posts with strap or clamp type sign supports. Each installed sign will be inspected by the Contracting Officer's representative prior to acceptance by the Government.

-- End of Section --