

**DRAFT 10-21-09**

**Section ZZZ.— SIGNING UPGRADE**

**Description**

**Include the following for projects requiring assessment and inventory, and installation of permanent warning, regulatory, and white on green guide signs.**

**ZZZ.01** This project consists of assessing, inventorying, and removing & installing [INSERT ground-mounted sign panels OR ground-mounted sign panels and sign supports] to comply with the minimum retroreflectivity requirements of Section 2A.09, of the Manual on Uniform Traffic Control Devices (MUTCD).

The work is located along [INSERT ROUTE ID OR ROADWAY SYSYEM] in [INSERT COUNTY] County, [INSERT STATE].

**Include the following for projects requiring only installation of warning, regulatory, and white on green guide sign panels (when agency provides list of signs to be replaced).**

**XXX.01** This project consists of removing and installing [INSERT ground-mounted sign panels OR ground-mounted sign panels and sign supports].

The work is located along [INSERT ROUTE ID OR ROADWAY SYSYEM] in [INSERT COUNTY] County, [INSERT STATE].

**Include the following for projects requiring installation of permanent warning, regulatory, and white on green guide sign panels OR insert agency standard. Edit specific material items as appropriate. Edit Subsection numbers as appropriate.**

**Material**

**ZZZ.02 Sign Panels.** Conform to the Manual on Uniform Traffic Control Devices (MUTCD) and the following:

**(a) Plywood Panels.** Furnish exterior type B-B high-density overlay plywood or better, conforming to NIST specification PS-1 for construction and industrial plywood. Use 1/2-inch thick plywood for sign panels with a facial area 4 square feet or less and the horizontal dimension no greater than the vertical dimension. Use 3/4-inch thick plywood for larger panels.

Abrade, clean, and degrease the face of the plywood panel according to methods recommended by the manufacturer of the retroreflective sheeting. Treat the edges of the plywood panel with an approved edge sealant.

**(c) Aluminum Panels.** Conform to ASTM B 209, alloy 6061-T6 or 5052-H38.

Fabricate all temporary panels and those permanent panels that are 30 by 30 inches or smaller from 0.080-inch thick aluminum sheets. Fabricate larger permanent panels from 0.125-inch thick aluminum sheets.

The blanks shall be free from laminations, blisters, open seams, pits, holes, or other defects that may affect their appearance or use. The thickness shall be uniform and the blank commercially flat. Perform shearing, cutting, and punching before preparing the blanks for application of retroreflective material.

Clean, degrease, and chromate the blanks or otherwise properly prepare the panels according to methods recommended by the sheeting manufacturer.

**ZZZ.03 Sign Retroreflective Sheeting.** Conform to the MUTCD and the following:

Sign retroreflective sheeting shall conform to ASTM D 4956-04. Conform to ASTM D 4956-04 Supplemental Requirement S1, fungus Resistance, if specified.

When an adhesive is used, use ASTM D 4956-04, backing class 1, 2, 3, or 4.

**ZZZ.04 Hardware.** For lag screws, washers, clip angles, wood screws, shear plates, U-bolts, clamps, bolts, nuts, and other fasteners, use galvanized steel or aluminum alloy.

For high-strength steel bolts, nuts, and washers, conform to either AASHTO M 164 or M 253 as specified. Galvanize steel hardware according to AASHTO M 232.

For aluminum alloy bolts, nuts, and washers, conform to American standard heavy hexagon ANSI B18.2. For threads, conform to American standard coarse series, class 2 fit, ANSI specification B1.1.

Furnish oversize bolt heads and oversize neoprene or nylon washers for plastic sign panels.

**ZZZ.05 Letters, Numerals, Arrows, Symbols, and Borders.** Form letters, numerals, and other units to provide a continuous stroke width with smooth edges. Make the surface flat and free of warp, blisters, wrinkles, burrs, and splinters. Conform to one of the following:

**(a) Type L-1 (Screen Process).** Apply letters, numerals, arrows, symbols, and borders on the retroreflective sheeting or opaque background of the sign by direct or reverse screen process. Apply messages and borders of a color darker than the background to the paint or the retroreflective sheeting by direct process. Produce messages and borders of a color lighter than sign background by the reverse screen process.

Use opaque or transparent colors, inks, and paints in the screen process of the type and quality recommended by the retroreflective sheeting manufacturer.

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 manufacturer's recommendations to provide a smooth hard finish. Any signs with blisters or other blemishes will be rejected.

**(b) Type L-3 (Direct Applied Characters).** Cut letters, numerals, symbols, borders, and other features of the sign message from the type and color of the retroreflective sheeting specified, and apply to the sign background's retroreflective sheeting according to the retroreflective sheeting manufacturer's instructions. For the retroreflective sheeting minimum coefficient of retroreflection ( $R_A$ ), conform to ASTM D 4956-04.

**Include the following for projects requiring assessment and inventory of warning, regulatory, and white on green guide signs OR insert agency standard. Edit Subsection numbers as appropriate.**

### Sign Assessment and Inventory

**ZZZ.06 Sign Retroreflectivity Assessment.** Assess sign retroreflectivity according to this Subsection, FHWA's *Maintaining Traffic Sign Retroreflectivity*, Publication No. FHWA-SA-07-020, and Chapter 3 of FHWA's *Method for Maintaining Traffic Sign Retroreflectivity*, Publication No. FHWA-HRT-08-026, November 2007. These two FHWA documents can be accessed at:

[http://safety.fhwa.dot.gov/roadway\\_dept/retro/sa07020/sa07020.pdf](http://safety.fhwa.dot.gov/roadway_dept/retro/sa07020/sa07020.pdf)

[http://safety.fhwa.dot.gov/roadway\\_dept/retro/hrt08026/](http://safety.fhwa.dot.gov/roadway_dept/retro/hrt08026/)

Provide a written narrative detailing the assessment method to be used (Visual Nighttime Inspection, Measured Sign Retroreflectivity, or a combination of these two methods), along with assessment procedures to be followed. Allow 7 days for agency approval of methodology and procedures.

**ZZZ.07 Location.** Perform sign assessment and inventory from [INSERT milepost XX.XX to milepost XX.XX OR station XX+XX to station XX+XX]. Include signs on intersecting roads that are within 50 feet of the edge of traveled way along the main route.

**Include one of the following ZZZ.08 Nighttime Visual Inspection Subsections OR insert agency standard. Edit Subsection numbers as appropriate.**

**ZZZ.08 Visual Nighttime Inspection.**

Before beginning work, provide the following documentation and allow 7 days for approval and sign inspector acceptance:

- (a) Name of inspectors;
- (b) Age of inspectors (minimum 60 year age if using Consistent Parameters Procedure); and
- (c) Written narrative detailing inspection methodology to be used.
- (d) Written documentation of inspection training received.

Sign inspectors must have completed a Traffic Sign Retroreflectivity Inspection training course. Training courses conducted by a Local Technical Assistance Program (LTAP) office, State Department of Transportation, or through a National Association will be accepted.

**ZZZ.09 Retroreflectivity Measurement.** Perform retroreflective measurements using hand –held contact devices. Perform tests according to the manufacturer’s instructions and ASTM Standard Test Method E1709-00e1.

**ZZZ.10 Sign Assessment and Inventory Documentation.** Provide one paper copy and an [INSERT PREFERRED TYPE OF ELECTRONIC FILE] electronic copy of the sign assessment with the following information:

- (a) Project number;
- (b) Date of assessment;
- (c) Name of inspectors;
- (d) Route # and/or name
- (e) [INSERT MP XX.XX to MP XX.XX OR Station XX+XX to Station XX+XX]
- (f) A table with the following information:
  - MUTCD sign number and description

- Location along route by [INSERT mile post to the nearest 0.1 mile, station, latitude and longitude].
- [INSERT Left or right of roadway centerline OR Direction of travel (EB, WB, etc.)].
- Required minimum MUTCD retroreflectivity level
- Reflectivity rating (good, fair, or poor) for visually inspected signs
- Actual reflectivity level for measured signs
- Replacement need (yes or no)
- Sign size, in square feet, for signs warranting replacement
- Meets MUTCD requirements for sign size for signs warranting replacement? (yes or no)
- Inspector comments
- A separate column listing [INSERT sign replacement priority OR sign replacement recommendation] and a corresponding space for agency approval.

See Figure 1 for example inventory documentation.

Allow 14 days for agency review and approval. Acceptance of sign assessment and inventory will be based on agency visual or measured QA/QC.

**Include the following for projects requiring installation of warning, regulatory, and white on green guide sign panels OR insert agency standard. Edit Subsection numbers as appropriate.**

### **Construction Requirements**

**ZZZ.11 General.** Remove and replace all sign panels as determined by the agency.

**ZZZ.12 Panels.** Use ASTM prismatic type III, IV, VIII, IX, or X retroreflective sheeting. Use type L-1 letters, numerals, arrows, symbols, and borders. Cut panels to size and shape and drill or punch all holes. Make panels flat and free of buckles, warp, dents, cockles, burrs, and other defects.

Clean and degrease the face of metal panels using methods recommended by the retroreflective sheeting manufacturer. Abrade, clean, and degrease the face of the plywood panels using methods recommended by the retroreflective sheeting manufacturer. Treat the edges of the plywood panel with an approved edge sealant. Apply the retroreflective sheeting material to the panels. Package sign panels in protective material and transport them in a vertical position.

Mount sign panels with the legend horizontal. Where multiple panels adjoin, limit the gap between adjacent panels to 1/16 inch.

Do not field drill holes in any part of the panel. Use antitheft fasteners where possible. Paint all bolt heads, screw heads, and washers that are exposed on the sign face. Match the color of the paint to the color of the background or message area at the point where the fitting is exposed.

**Include the following for projects requiring installation of warning, regulatory, and white on green guide sign panels OR insert agency standard. Edit Subsection numbers as appropriate.**

### **Acceptance**

**ZZZ.13** Furnish commercial material certification for sign panels,

A commercial certification is a manufacturer's or Contractor's representation that the material complies with all contract requirements. The representation may be labels, catalog data, stamped specification standards, or supplier's certifications indicating the material is produced to a commercial standard or specification.

Material accepted by certification may be sampled and tested at any time. If found not in conformance with the contract, the material will be rejected whether in place or not.

Acceptance for sign legends will be evaluated based on visual inspection of the work for compliance with the contract and prevailing industry standards

### **Measurement**

**Include the following for projects requiring assessment and inventory of warning, regulatory, and white on green guide signs. Edit Subsection numbers as appropriate.**

**ZZZ.14** Measure sign assessment and inventory by lump sum.

**Include the following for projects requiring installation of warning, regulatory, and white on green guide sign panels OR insert agency standard. Edit Subsection numbers as appropriate.**

Measure signs as follows:

- (a) By the nominal dimensions of all the sign panels
- (b) By the square foot of front face.

**Include the following for projects requiring assessment and inventory, and installation of warning, regulatory, and white on green guide sign panels. Edit Subsection numbers as appropriate.**

### Payment

**ZZZ.14** The accepted quantities will be paid at the contract price per unit of measurement for the items listed in the bid schedule. The quantity paid will not exceed the corresponding maximum estimated quantity in the schedule. Payment will be full compensation for the work prescribed in this Section.

<u>Bid Item #</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit Bid Price</u>
001	Sign assessment and inventory, fixed rate	LS	\$_[INSERT AMOUNT]
002	Signs, ___ sqft to ___ sqft	SQFT	\$_____

When the words ‘fixed rate’ appears as a unit bid price, include the Agency inserted amount bid for the item in the total bid amount.

Insert the maximum estimated quantity associated with bid item #002.

Insert unit bid price, in figures, for bid item #002.

Multiply the unit bid price by the quantity for each pay item and show the amount bid. Should any mathematical check made by the Agency show a mistake in the amount bid, the corrected unit price extension shall govern.

Total all of the amounts bid for each pay item and show the total bid amount.

### Evaluation of Bid

**ZZZ.15** Evaluation of bid will be based on the total cost of bid item #002, utilizing the maximum square foot sign quantity estimated and the unit cost.

Figure 1

Project No. \_\_\_\_\_  
 Date \_\_\_\_\_  
 Inspector 1 \_\_\_\_\_  
 Inspector 2 \_\_\_\_\_

State: \_\_\_\_\_  
 Route: \_\_\_\_\_  
 Limits (MP to MP): \_\_\_\_\_

Item #	MUTCO Sign #	Description	Location		MUTCO Min Minimum <sup>1</sup>	Retroreflectivity		Replace Yes No	Sign Size (SF)	Meets MUTCO Sign Size Requirement		Sign Material <sup>4</sup> (W/SJ/AE/MP/P)	Additional Comments	Replacement Priority <sup>5</sup> (1 or 2)		Agency Approval	
			MP or Station	Lt		Rt	Visual <sup>2</sup>			Ratio Measured <sup>3</sup>	Yes			No	Yes	No	Yes
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	

1. Minimum retroreflectivity rating based on MUTCO Table 2A-3.  
 2. Visual rating of Poor, Fair, or Good based on FHWA Publication No. FHWA-HRT-08-026, Nov. 2007, Chapter 3.  
 3. Measured rating based on ASTM Standard Test Method E1709-06e1.  
 4. Sign material: (W) Plywood panel, (S) Steel panel, (A) Aluminum panel, (EA) Embossed aluminum panel, (P) Plastic panel, (FP) Fiberglass reinforced plastic panel.  
 5. Priority: (1) Signs with ratings of Poor or below minimum retroreflectivity, (2) Signs needing replacements for other reasons.

The following supplemental section may be used if sign support installation is anticipated. Insert into Materials Subsection and renumber as appropriate. Include additional column for support type in assessment and inventory table, and bid items, .

## SUPPLEMENTAL SECTION

**ZZZ.XX Posts.** Conform to the MUTCD and the following:

Posts are designated as [INSERT wood, aluminum, galvanized steel, or corrosion resistant steel.]

**(a) Wood Posts.** Furnish posts from 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 ACA, ACZA, or CCA according to AWPA Standard C14 except the minimum preservative retention is 0.40 pounds per cubic foot.

**(b) Aluminum Posts.** Furnish approved standard shapes and thicknesses conforming to ASTM B 221, alloy 6061-T6, 6351-T5, 6063-T6, or 6005-T5.

**(c) Galvanized Steel Posts.** Furnish posts that are straight, smooth, and free from defects affecting strength, durability, or appearance. Conform to the following:

**(1) U-Channel Steel Posts.** Furnish flanged, channel, galvanized steel posts conforming to ASTM A 499, grade 60, and the following:

*(a)* Dimensions of U cross-section

<i>(1)</i> Width of opened end of U including flanges	3.0 – 3.5 inches 1.0 – 1.6 inches
<i>(3)</i> Depth of U	1.0 – 2.0 inches
<i>(4)</i> Thickness of steel	0.12 – 0.20 inches

*(b)* Punching. Starting 1 inch from the top and extending the full length of the post, drill or punch 3/8-inch holes on 1-inch centers along the centerline of the bottom of the U. Remove all burrs and sharp edges.

*(c)* Galvanizing after punching AASHTO M 111

**(2) Square Tubular Steel Posts.** Furnish square tubular galvanized steel posts conforming to ASTM A 1011, grade 55, or ASTM A 715, grade 60, and the following:

*(a)* Dimensions

(1) Outside dimensions	1¾ by 1¾ inches or 2 by 2 inches
(2) Wall thickness	0.083 inches
(3) Mass	1.7 – 2.0 pounds per foot

(b) **Punching.** Starting 1 inch from the top and extending the full length of the post, drill or punch 7/16-inch holes on 1-inch centers along the centerline of all four sides, in true alignment and opposite each other directly and diagonally. Remove all burrs and sharp edges.

(c) Galvanizing after punching (inside and outside of post)	ASTM A 635, coating Z275 designation
--	---

**(d) Corrosion Resistant Steel Posts.** Furnish posts conforming to ASTM A 588 or ASTM A 242.