

912.1

- d. To use an alternate protective coating, obtain approval from the Office of Materials and Research before using it on Department Projects.
6. Assembly Hardware
 - a. Use base attachment hardware that matches the Plans and is as recommended by the manufacturer.
 - b. Ensure that the hardware is protectively coated as in ASTM A 153/A 153M, ASTM B 695 Class 55, or ASTM B 766 Type II, class 12-, whichever is applicable.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Use foundation assemblies that are FHWA-approved for the specific design category for which the unit was evaluated.

Foundation assemblies are evaluated according to AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals, current edition.

D. Materials Warranty

General Provisions 101 through 150.

Section 912—Sign Blanks and Panels

912.1 General Description

This section includes the requirements for aluminum sign blanks and panels, and extruded aluminum sign panels.

912.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

ASTM B 108

ASTM B 209 (B 209M)

ASTM B 221 (B 221M)

ASTM F 467 (F 467M)

ASTM F 468 (F 468M)

ASTM B 211 (B 211M)

912.2 Materials

912.2.01 Aluminum Sign Blanks

A. Requirements

1. Use aluminum sign blanks of the type, size, and shape specified:
 - a. Type I: Signs with an area of 9 ft² (0.84 m²) or less, at least 0.08 in, ± 0.005 in (2 mm, ± 0.125 mm) thick.
 - b. Type II: Signs with an area more than 9 ft² (0.84 m²), at least 0.10 in, ± 0.006 in (2.5 mm, ± 0.150 mm) thick.
2. Use metal for the sign blanks that meets the requirements of ASTM B 209 (B 209M), Alloy 6061-T-6 or 5052-H38.
3. See Table 1 for locations of bolt holes in the sign blanks. Punch or drill bolt holes 10 mm diameter. The table shows where the holes are located for each type and size of blank.
4. Submit to the Engineer at least 1 ft² (0.1 m²) of the sign material for each lot or shipment of each type.

Table 1—Bolt Hole Locations for Sign Blanks and Panels

1. Diamond-Shaped Blanks	
Size	Number of Holes Required and Spacing
24 in (600 mm)	2 holes, 12 in (300 mm) from center on diagonal line
30 in (750 mm)	2 holes, 15 in (375 mm) from center on diagonal line
36 in (900 mm)	2 holes, 18 in (450 mm) from center on diagonal line
48 in (1200 mm)	4 holes, 2 on each side 15 in (375 mm) from both vertical and horizontal center line
2. Square Shaped Blanks	
All sizes to 36 (900 mm)	2 holes, 3 in (75 mm) from edge in center of opposite sides
36 in (900 mm)	2 holes, 6 in (150 mm) from edge in center of opposite sides
NOTE: Drill or punch 24 in (600 mm), 30 in (750 mm), and 36 (900 mm) diamond and square blanks for use as either type.	
3. Rectangular Sign Blanks	
Up to 48 in x up to 15 in (1200 mm x up to 375 mm)	4 holes, 1.5 in (38 mm) from the edge in the center of each side
Up to 48 in x 18 – 24 in (1200 mm x 450 - 600 mm)	4 holes, 3 in (75 mm) from the edge in the center of each side
36 (900) x 48 (1200 mm)	4 holes, 6 in (150 mm) from edge at 6 in (150 mm) from top and bottom edges
48 x 36 in (1200 x 900 mm) and 48 x 60 in (1200 x 1500 mm)	4 holes, 9 in (225 mm) from edge at 6 in (150 mm) from top and bottom edges
Over 48 x 12 in (1200 x 300 mm)	4 holes, 1/6 horizontal dimension from edge at 1.5 in (38 mm) from top and bottom edges
Over 48 x 24 in (1200 x 600 mm)	4 holes, 1/6 horizontal dimension from edge at 3 in (75 mm) from top and bottom edges
Over 48 x over 36 in (1200 x over 900 mm)	4 holes, 1/6 horizontal dimension from edge at 6 (150 mm) from top and bottom edges
4. Octagonal Sign Blanks	
30 x 30 in (750 x 750 mm) and 36 x 36 (900 x 900 mm)	2 holes, 3 in (75 mm) from edge on vertical center line
48 x 48 in (1200 x 1200 mm)	4 holes, 2 on each side, 15 in (375 mm) from both vertical and horizontal center lines
5. Triangular Sign Blanks (with point down)	
36 in (900 mm)	2 holes on vertical center line, spaced 3 in (75 mm) and 24 in (600 mm) from the top
48 in (1200 mm)	2 holes on vertical center line, spaced 4 in (100 mm) and 28 in (700 mm) from the top
60 in (1500 mm)	4 holes, 2 each 15 in (375 mm) from vertical center line, 3 in (75 mm) and 21 in (525 mm) from top
6. Circular Sign Blanks	
30 in (750 mm) Diameter	2 holes on vertical center line 12 in (300 mm) from center
36 in (900 mm) Diameter	2 holes on vertical center line 15 (375 mm) from center

7. Interstate Route Shield Blanks	
24 x 24 in (600 x 600 mm) and 30 x 24 in (750 x 600 mm)	2 holes on vertical center line spaced 3 in (75 mm) and 21 in (525 mm) from top
36 x 36 in (900 x 900 mm) and 45 x 36 in (1125 x 900 mm)	2 holes on vertical center line spaced 6 in (150 mm) and 30 (750 mm) from top
8. Isosceles Triangular Sign Blanks (with point to the right)	
30 x 40 x 40 in (750 x 1000 x 1000 mm)	2 holes, each 12 in (300 mm) from left edge, 7.5 in (188 mm) from horizontal center line
36 x 48 x 48 in (900 x 1200 x 1200 mm)	2 holes, each 15 in (375 mm) from left edge, 9 in (225 mm) from horizontal center line
9. Pentagonal Sign Blanks (with point up)	
30 in (750 mm)	2 holes on vertical centerline, spaced 3 in (75 mm) and 24 in (600 mm) from bottom edge
36 in (900 mm)	2 holes on vertical centerline, spaced 3 in (75 mm) and 27 (675 mm) from bottom edge

B. Fabrication

1. Complete all fabrication, including shearing, cutting, and drilling or punching holes, before treating the metal and applying the face material.
2. Cut the metal blanks to size and shape. Ensure that the blanks are free of buckles, warp, dents, cockles, burrs, and defects resulting from fabrication.
3. Finish each face of the blank to be a plain surface and flat.
4. Metal Treatment

Use conversion coating or anodizing to finish the metal before painting or applying the reflective sheeting.

 - a. Ensure the finished sign blank or panel has a uniform, light-colored appearance, without splotches or stains.
 - b. If the finishing procedure produces an iridescent color, ensure that the shade is uniform.
 - c. Thoroughly clean the metal before finishing.
 - 1) Begin cleaning with an etch-type alkaline cleaner or with a vapor degreaser, using a trichloroethylene or perchloroethylene solvent.
 - 2) Use the cleaner according to the manufacturer's specifications.
 - 3) After using an alkaline etching cleaner, treat the metal with an acid solution or desmutting compound. Use the desmutting agent according to the manufacturer's specifications.
 - d. Finish: Finish the metal with a chromate conversion coating or by anodizing with a chromic acid anodizing solution. Use the conversion coating compound according to the manufacturer's specifications.
 - e. Handling: Carefully handle the metal with a device or with clean cotton gloves between all cleaning and finishing operations and before applying the finish material.

Be sure that the metal never comes in contact with greases, oils, dust, or other contaminants before you apply the finish material.

C. Acceptance

The Department will accept the sign blanks based on results of chemical and physical tests on the materials, approval of methods and procedures for metal treatment, and acceptable quality of work of the finished blank.

D. Materials Warranty

General Provisions 101 through 150.

912.2.02 Extruded Aluminum Sign Panels**A. Requirements**

1. Use extruded aluminum sign panels close to the shape and size shown on the Plans.
2. Ensure that the aluminum meets the requirements of ASTM B 221 (B 221M), Alloy 6063-T6 or 6061-T6.

3. Accessories

Ensure that the accessories for fabricating the signs meet the following:

- a. Bolts: Use bolts for connecting the panels that are 3/8 in (M10x1.5), tolerance grade 16 UNC 2A thread (6G threads), and 3/4 in (19 mm) long. Use bolts that meet the requirements of ASTM F 468 (F 468M), Alloy 2024-T4.
- b. Hex Nuts: Use hex nuts with tolerance grade 4 threads that meet the requirements of ASTM F 467 (F 467M), Alloy 6061-T6.
- c. Washers: Use washers that meet the requirements of ASTM B 209 (B 209M), Alloy 2024-T4.
- d. Posts Clips: Use clips as shown on the Plans and that meet the requirements of ASTM B 108, Alloy 356-T6.
- e. Post Clip Bolts: Use bolts that are 3/8 in (M10x1.5), tolerance grade 16 UNC 2A thread (6G threads), and 1-3/4 in (44 mm) long, and meet the requirements of ASTM F 468 (F 468M), Alloy 2024-T4.
- f. Post Clip Nuts: Use hex locknuts that meet the requirements of ASTM B 211(B 211M), Alloy 2017-T4.
- g. Post Clip Washers: Use washers that meet the requirements of ASTM B 209 (B 209M), Alloy 2024-T4.

4. Tolerances

Ensure that the sections are within the established commercial tolerances of the aluminum industry.

- a. Ensure that all panels 6 in (150 mm) wide have a nominal weight of 1.115 lb/ft (1.7 kg/m). Use these sections only at the top of signs that do not conform to 1 ft (300 mm) modules.
 - b. Ensure that all panels 1 ft (300 mm) wide have a nominal weight of 2.707 lb/ft (4.0 kg/m). Use these sections as the normal sign panel.
 - c. Before supplying an alternate extruded panel section of equal or greater section moduli with dimensions suitable to use hardware, as shown on the Plans, obtain written approval from the Engineer.
5. Submit to the Engineer at least 1 ft² (0.1 m²) of the sign material for each lot or shipment of each type.

B. Fabrication

1. Make the extruded panel signs as shown on the Plans.
2. Finish the extruded panels as specified in Subsection 912.2.01.B.4.

C. Acceptance

The Department will accept these sign panels based on results of chemical and physical tests of materials, approval of methods and procedures for metal treatment, and the quality of workmanship on the finished panel.

D. Materials Warranty

General Provisions 101 through 150.

Section 913—Reflectorizing Materials

913.1 General Description

This section includes the requirements for reflective sheeting.

913.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

AASHTO M 268

ASTM G 7

ASTM D 523

ASTM E 810

ASTM D 4956

QPL 29