

SECTION 608

PERMANENT SIGNING

SIGN BLANKS

608.01 Description. This work shall consist of furnishing of flat sheet aluminum sign blanks conforming to the requirements for size, corner radii, holes, and other details in drawings contained in "Standard Highway Signs" Federal Highway Administration, US Department of Transportation.

Any details not specifically addressed by the "Standard Highway Signs" book will be provided, on requested, by the Engineer.

A. Sign Blanks. The sign blanks shall be aluminum that complies with ASTM B 209 Alloys 6061-T6, 5052-H38, or 5154-H38. The following minimum thickness of aluminum shall be used:

Sign Width* (Inches)	Blank Thickness (Inch)
Up to 48	0.080
48 or more	0.100

* For signs having a horizontal edge, width is measured on that edge. For diamond shapes and pennant shapes, the width is measured on the slope of the sign edge.

B. Fabrication. Sign blanks shall be fabricated of a single piece of aluminum. Metal shall be cut to the proper sign blank size and bolt holes provided. All edges, including holes, shall be true and smooth. Bolt holes shall be punched before surface preparation.

C. Surface Preparation. Before application of reflective sheeting, the surfaces of the sign blanks shall be prepared as

follows:

1. Degreasing. Blanks shall be degreased by one of two methods:

a. Immerse in a saturated vapor of trichloroethylene or perchloroethylene, or

b. Immerse in a tank containing alkaline solutions, controlled and titrated to the solution manufacturer's specifications, for sufficient time to remove soil, and then rinsed thoroughly with running water.

2. Etching. After degreasing, blanks shall be well etched using one of these two methods:

a. Immerse in a tank containing a 6% to 8% phosphoric acid solution or proprietary acid etching solution and rinsed thoroughly with cold running water, followed by a hot water rinse, or

b. Immerse in a tank containing an alkaline etching solution that is controlled by titration at the temperature and concentration recommended by the solution manufacturer. Rinse thoroughly. Remove smut with an acidic, chromium compound type solution as specified by the solution manufacturer and then rinsed thoroughly.

3. Coating. After etching, blanks shall be treated with a light and tightly adherent chromate conversion coating that is free of any powdery residue, and ranging in color from a silvery iridescent to a pale yellow. This coating shall conform to ASTM B 449, Class 2, 10-33 mg/sq.ft., with a median of 25 mg/sq.ft.

D. Acceptance of Aluminum Sign Blanks. Mill Test Reports and Materials Certifications shall be furnished by the manufacturer or supplier, and shall accompany each

shipment of aluminum sign blanks. The Mill Test report shall identify various heats and/or lots of aluminum. The chemical and physical properties shall conform to the requirements of the specified alloy. Production lots shall be identifiable upon receipt at the SCDOT facility. Failure to provide Mill Test Reports and Materials Certifications may result in the rejection of all materials and require replacement at the supplier's expense.

608.02 Measurement and Payment. Work and materials under this item will not be measured for separate payment, but will be included in the price and payment for other items of work.

REFLECTIVE SHEETING

608.03 Description. This work shall govern the furnishing and application of reflective sheeting for traffic control devices and shall be fabricated and applied in accordance with the details shown on the plans and in conformity to the requirements of this specification and any special provision pertaining thereto.

MATERIAL

608.04 Material Requirements. Reflective Sheeting shall meet the requirements of AASHTO M 268 *Standard Specification for Reflective Sheeting for Traffic Control*, latest edition.

In addition to the requirements of AASHTO M 268, the following provisions will apply:

A. Pre-qualification. Manufacturers wishing to supply reflective sheeting material for Department projects must submit their material for testing by the National Transportation Product Evaluation Program (NTPEP). Requirements for sample submission can be obtained from NTPEP, 444 N. Capital St., NW, Suite 249, Washington, DC 20001, telephone (202) 624-5800. The NTPEP test results will be

made available to the Department, and an Approved Supplier listing will be made up from NTPEP test results according to *SCDOT Research and Materials Laboratory's Approval Policy 20*. Manufacturers must be on the Department's approved supplier list before furnishing sheeting for Department work.

Each delivery of material to a project shall be accompanied by a certificate signed by an officer of the reflective sheeting manufacturer that the material fully complies with all requirements of this specification and the provisions of the performance warranty. The Department, at its option, may require testing by an independent commercial laboratory approved by the Department. The cost of testing shall be borne by the Contractor.

B. Performance Warranty. The reflective sheeting manufacturer shall provide, upon delivery to the Department, a warranty covering the full replacement cost, including sign blank, sheeting fabrication and erection of any sheeting installed according to the recommended procedure on aluminum or any other Department approved sign blanks, which fails to meet the following performance requirements:

1. Sheeting shall maintain the following reflective intensity values for the indicated number of years:

Type I - 50% of minimum reflective values given in Table 1 of AASHTO M 268 for a service life of 7 years with the exception of orange sheeting, which shall have a service life of 5 years.

Type II - 50% of minimum reflective values given in Table 3 of AASHTO M 268 for a service life of 10 years with the exception of orange sheeting, which shall have a service life of 3 years.

Type III - 80% of minimum reflective values given in

Table 4 of AASHTO M 268 for a service life of 10 years with the exception of orange sheeting, which shall have a service life of 3 years.

Type IV - 80% of minimum reflective values given in Table 5 of AASHTO M 268 for a service life of 7 years.

2. The sheeting shall remain free of cracks, scaling, blisters, or delamination for the service life of each type specified in above.

3. The sheeting shall not show any appreciable change in color when compared to unexposed sheeting specimens.

4. The sheeting shall remain free of any form of deterioration that would render the sign ineffective for its intended purpose for the specified service life.

5. The Contractor shall replace, at his expense, any traffic control device that fails to perform satisfactorily for either its daytime or nighttime purpose, due to deterioration of the reflective material.

C. Screening Inks. The manufacturer furnishing reflective sheeting must be able to make available screening inks compatible with their sheeting. Upon request, the manufacturer shall provide a color match formula from his ink series at no charge to the Department.

Screening inks shall be warranted for the same period as the reflective sheeting on which they are applied as outlined in the Performance Warranty in Subsection **608.04B**.

APPLICATION

608.05 Application of Reflective Sheeting. Reflective Sheeting material shall be applied in accordance with the sheeting manufacturer's specifications with the following additions:

1. Splices in reflective sheeting shall be unacceptable, except for signs that cannot be covered with a single piece of the widest material available from the sheeting manufacturer.
2. Only one splice is permitted per sign and it shall be on a centerline of the sign or barricade.
3. Splices shall overlap not less than 3/16 inch, except for butt splices that may be used on signs processed with transparent colors.
4. In horizontal overlapped splices, the top portion shall overlap the bottom portion, as viewed when the sign is in an upright position.
5. The gap at butt splices shall not be greater than 1/32 inch.
6. No screening paints are permitted between the sheeting of overlapped splices.
7. When splicing is necessary, the reflective sheeting must be carefully matched for color to provide uniform appearance during both day and night.
8. The reflective sheeting material should always be applied evenly to surfaces so that the sheeting will be smooth and adhere firmly.

608.06 Measurement and Payment. Work and materials

under this item will not be measured for separate payment, but will be included in the price and payment for other items of work.

U-SECTION POSTS

608.07 Description. This work shall consist of furnishing galvanized metal rail steel U-sections used as sign posts and fabricated in accordance with the details shown on the plans

and typical; and in conformity to the requirements of this specification and any special provision pertaining thereto.

608.08 Metal Sign Posts. The metal sign posts shall be of the normal dimensions required for 2-pound or 3-pound posts and shall be provided in the designated or required lengths and sizes. The 2-pound or 3-pound designation indicates the weight of the post per linear foot (\pm 5%) before galvanizing. They shall be made of hot-rolled rail steel or an equivalent steel conforming to the physical properties of ASTM A 499, Grade 60 (latest edition), and conforming to the chemical requirements of ASTM A 1 (latest edition) for rails having nominal weight of 91 pounds or heavier per yard of length. After fabrication the full length and total area of each post shall be hot dipped galvanized in accordance with ASTM A 123.

Standard 3/8-inch diameter holes shall be punched before applying the galvanized finish. The 2-pound posts shall have a minimum of 58 holes one inch on center, beginning one from the top of the post. The 3-pound posts shall have holes placed one inch on center, starting one inch from top and extending to within 6 feet from the bottom, and 2 inches on center for the remainder of the post length. Additional holes, at not less than one inch on center, may be placed, if necessary, to conform to standard punching procedures.

The vendor shall furnish a certification with each shipment verifying compliance with the physical properties of

ASTM A 499 (latest edition), the chemical requirements of ASTM A 1 (latest edition) for rails having a nominal weight of 91 pounds or heavier per yard of length, and prescribed fabrication and finish.

608.09 Measurement and Payment. Work and materials under this item will not be measured for separate pay, but will be include in the price and payment of other items of work.

TELESCOPIC SQUARE TUBING

608.10 Description. This work shall consist of furnishing galvanized four-sided telescopic tubing fabricated in accordance with the details shown on the plans and in conformity to the requirements of this specification and any special provision pertaining thereto.

608.11 Square Tubing. The tubing shall be either 12 U.S.S. Gage (0.105 inch) or 14 U.S.S. Gage (0.083 inch) steel conforming to the standard specifications for hot rolled carbon sheet steel, structural quality, ASTM A 653, Grade 50, Class 1. The steel shall be carefully formed to size and be welded directly in the corner by high frequency resistance welding and externally scarfed to form corner radii.

The tubing shall be capable of being used in sign support systems and yielding breakaway barricade applications. The tubing shall be capable of telescoping when consecutive size tubes are telescoped one inside another with free movement and without excess side movement. The tubing shall be capable of performing as a yielding breakaway system for signs and barricades when properly installed and shall be approved by the Federal Highway Administration for use on the Highway System.

The components shall be of the dimensions as specified on the plans or in the special provisions with a length tolerance of $\pm 1/4$ inch. The tubing shall be of good workmanship, compatible, and interchangeable with telescoping tubing systems already installed as sign supports across the state's highway

system.

The tubing shall contain standard clean-punched open 7/16 ($\pm 1/64$) inch diameter holes. The holes shall be punched one inch on center along the centerline of each of the four sides, beginning one inch from the tube end with vertical spacing accuracy of 1/8 inch in 20 feet of tube length. All holes and cut-off ends shall be free from plugs and burrs and will not be required to be zinc treated after fabrication.

The coating shall be hot dipped galvanized steel conforming to the requirements of ASTM A 653, Coating Designation G 90. After galvanizing, the post shall be coated with a chromate conversion coating and a clear organic polymer topcoat. Both the interior and the exterior of the post shall be galvanized.

Mill Test Reports and a Materials Certification shall accompany each shipment of square tubing. The Mill Test report shall identify various lots of tubing. The chemical and physical properties shall conform to the requirements of the specified alloy. Production lots shall be identifiable upon receipt at the SCDOT facility. Failure to provide Mill Test Reports and Materials Certifications may result in the rejection of all materials and require replacement at the supplier's expense.

608.12 Measurement and Payment. Work and materials under this item will not be measured for separate pay, but will be include in the price and payment of other items of work.

DIVISION 700
STRUCTURES

SECTION 701

**PORTLAND CEMENT
AND
PORTLAND CEMENT CONCRETE**

701.01 Description. This work shall consist of furnishing, storing, and handling of the materials; and the proportioning, mixing, and delivery of portland cement concrete for structures.

Portland cement concrete for structures shall be composed of cement, fine aggregate, coarse aggregate, water, air-entraining admixture and other admixtures when permitted or required. Fly ash, water granulated blast-furnace slag, and silica fume may be added or used as a replacement portion of the portland cement and shall be considered as cement in the water cement ratio unless otherwise designated. The materials shall conform to the requirements hereinafter specified, and the mixture shall be prepared and delivered in accordance with these specifications.

The designation of the ten classes of concrete normally used by the Department are listed below:

<u>New Designation</u>	<u>Previous Designation</u>
Class 2500	Class B
Class 3000	Class A
Class 4000	Class D
Class 4000DS	--