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1. GENERAL PROVISIONS

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign designations are available for review at: http://www.dot.ca.gov/hq/traffops/engineering/control-devices/specs.htm

Traffic Sign Specifications for signs referenced with Federal MUTCD sign designations can be found in the Standard Highway Signs Book, or the 2012 Supplement to the Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at: http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

Information on cross-referencing California sign designation with the Federal MUTCD sign designation is available at: http://www.dot.ca.gov/hq/traffops/engineering/control-devices/specs.htm

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 25 feet. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

These special provisions are consistent with the plain language 2015 Caltrans Standard Specifications, found in Section 82-2 Sign Panels.

2. QUALITY CONTROL

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of its quality control plan for signs to the Transportation Laboratory, Materials Engineering and Testing Services (METS), Telephone (916) 227-7291. METS will have 10 working days to review the quality control plan. Sign fabrication shall not begin until METS approves the Contractor's quality control plan in writing. The Contractor shall submit to METS at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

A. Contact information for the person responsible for sign QC
B. Acceptance criteria for incoming raw materials at the fabrication plant
C. Type, method, and frequency of QC testing at the fabrication plant
D. Types and brand names of retroreflective sheeting
E. List of the retroreflective sheeting manufacturer's approved process colors, protective overlay film, and black nonreflective film, including the manufacturer's name and product name for each item
F. Manufacturer's installation and splicing instructions for the retroreflective sheeting
G. Manufacturer's instructions for cleaning each product
H. Method of packaging, transporting, and storing signs

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

A. PROPERTY OF THE STATE OF CALIFORNIA,
B. Sign fabricators name
C. Month and year of fabrication
D. Type of retroreflective sheeting and
E. Sheeting manufacturer's identification and lot number for the retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in $^1/_4$-inch upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic or styrenic alternate substrate signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

A sign with a protective-overlay film must be marked at the fabrication plant with a 3/8-inch-diameter dot. The dot must be placed on the lower border of the sign before applying the protective-overlay film. The fabricator determines the application method and exact location of the dot except the dot must not be placed on the legend or near bolt holes. The dot must be black if placed on a white border and white if placed on a black border.

The retroreflective sheeting on a sign panel with a minor dimension of 48 inches or less must be a single, contiguous sheet without splices except for the splices produced during the manufacture of the retroreflective sheeting. A sign panel with a minor dimension greater than 48 inches may have 1 horizontal splice in the retroreflective sheeting other than the splices produced during the manufacture of the retroreflective sheeting.

Unless the retroreflective sheeting manufacturer's instructions require a different method, splices in the retroreflective sheeting must overlap by at least 1 inch. Splices shall not be placed within 2 inches from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting on either side of a splice must not exhibit a color difference under incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced at the Contractor’s expense.

Repairing sign panels will not be allowed except when approved by the DOT.

The DOT will inspect signs at the Contractor's facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The DOT will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on palettes, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Do not store sign panels directly on the ground. Keep sign panels dry at all times and store the panels:

1. In a dry environment
2. On edge vertically whether indoors or outdoors
3. In enclosed, climate-controlled trailers or containers in areas of high heat and humidity
4. Indoors whenever the panels will be stored more than 30 days

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the DOT test samples of signs and materials used at various stages of production. Sign samples shall be 12" x 12" in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor's work.

3. SHEET ALUMINUM

A sign panel must be fabricated from aluminum sheeting of an alloy and temper complying with ASTM B209.

The Contractor shall furnish the DOT a Certificate of Compliance in accordance to Section 6-2.03C, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

The aluminum sheeting must be pretreated for corrosion resistance as specified in ASTM B449. The surface of the sheeting must be cleaned, deoxidized, and coated with a light, tightly-adherent chromate conversion coating free from powdery residue. The conversion coating must be Class 2 with a weight from 10 to 35 mg/sq ft and an average weight of 25 mg/sq ft. After the cleaning and coating process, the aluminum sheeting must be protected from exposure to grease, oils, dust, and contaminants.

The aluminum sheeting must be free from buckles, warps, dents, cockles, burrs, and other defects resulting from fabrication.

The base plate for standard route markers must be die cut.

4. RETROREFLECTIVE SHEETING

Retroreflective sheeting used for the background and legend must comply with ASTM D4956 and must be on the Authorized Material List for signing and delineation materials.

Unless otherwise requested by the DOT, retroreflective sheeting for background and legend shall be matched components from the same manufacturer.

Retroreflective sheeting must be applied to sign panels at the fabrication plant under the retroreflective sheeting manufacturer's instructions without appreciable stretching, tearing, or other damage.

Type III, IV, VIII, IX, and XI retroreflective sheeting must have Class 1, 3, or 4 adhesive backing. Type II retroreflective sheeting may have Class 1, 2, 3, or 4 adhesive backing. The adhesive backing must be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the DOT's visual test will govern.

5. PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the DOT a Certificate of Compliance in accordance to Section 6-2.03C, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the DOT's visual test will govern.

The fabricator must perform all patterns, layouts, and set-ups necessary for the screening process.

Colored retroreflective sheeting must be used for the background except signs with green, red, blue, or brown backgrounds may use reverse-screened-process color on white retroreflective sheeting for the background color.

The coefficient of retroreflection for reverse-screened-process colors used on white retroreflective sheeting must be at least 70 percent of the coefficient of retroreflection specified in ASTM D4956 for the corresponding colored retroreflective sheeting.

Screened-process colors and nonreflective, opaque, black film must have outdoor weather ability characteristics equivalent to those specified for retroreflective sheeting in ASTM D4956.

Nonreflective, opaque, black film must be a vinyl or acrylic material.

Cured, screened-process colors must not peel off if transparent cellophane tape with a tensile breaking strength of at least 14 lb/in width measured under ASTM D3759/D3759M is applied over the color and removed in a single, quick motion at a 90 degree angle to the sign's face.

6. LAMINATED PANEL

A laminated panel must have a honeycomb core and extruded aluminum frame laminated between 2 sheets of aluminum to produce a flat, rigid panel 1-inch or $2^1/_2$-inch nominal thickness.

The face sheet must be a single contiguous sheet of 0.063-inch-thick aluminum sheeting, alloy 6061-T6 or 5052-H32. The back sheet must be a single, contiguous sheet of 0.040-inch-thick aluminum sheeting, alloy 3003-H14. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The core material must be 0.26 lb/sq ft phenolic-impregnated kraft paper that:

1. Is impregnated with 18 percent phenolic resin
2. Has 1/2-inch honeycomb cell size
3. Is fungus resistant under MIL-STD-401B

The adhesive used to laminate the face and back sheets to the honeycomb core and extruded aluminum frame must produce a bond that is strong, permanent, and resistant to oil and water.

The panel must withstand a wind load of 33 lb/sq ft with a bending safety factor of 1.25 when tested for the simple span lengths shown in the following table:

Panel Type	Nominal Panel Thickness	Simple Span Length
A	1 inch	9 feet 0 inch
B	1 inch	9 feet 0 inch
	$2^1/_2$ inch	14 feet 6 inches
H	$2^1/_2$ inch	14 feet 6 inches

The tensile strength of the panel must be at least 40 lb/sq in when tested under ASTM C297 and C481, Cycle B, after aging. Instead of spraying with hot water, the specimen must be immersed in water at 160 degrees F. When requested by the DOT or the Transportation Laboratory, at least one test sample of 12” x 12” in size shall be taken for every 2,000 square feet of the panel production cycle or of the total factory production order, whichever occurs first.

After lamination, 3/16-inch-diameter rivets must be placed at each corner of the perimeter frame through the face and back sheets. The rivets must be made of aluminum alloy 5052 and be anodized or treated with a conversion coating. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed. Rivets or stainless steel screws shall be placed in holes drilled during fabrication in the perimeter frame.

Sealant must be placed at the corners of the perimeter frame to prevent water intrusion.

On laminated multiple panel signs, a closure H-Section shall be placed in the top channel of the bottom panel. Perimeter frame of adjoining panel shall accommodate the closure H-Section in the closed position.

An individual laminated panel must not exceed 24 feet in length and 5 feet in depth. An individual panel must be fabricated as a single unit without horizontal and vertical joints, splices, or seams.

Use 2 panels for signs exceeding 5 feet in depth. You may use 3 panels to avoid placing the legend over a horizontal joint if authorized.

Welds are not required on the side of the framing members where the face and back sheets will be placed.

The face of a fabricated panel must be flat to within ±3/32 in/ft of the panel dimensions as measured by a straightedge placed in any direction across the plane of the panel. Wherever the panels adjoin, the gap between the adjoining edges must not deviate by more than 1/32 inch from a straightedge placed from corner to corner. Nonadjoining edges must not deviate by more than 1/8 inch from a straightedge placed from corner to corner. The face and back sheets must be flush with the perimeter frame. All panel edges must be smooth.

A panel must be from −1/2 to +1/8 inch of the dimensions shown. The difference in the length between adjoining panels of multiple-panel signs must not be greater than 1/2 inch.

A laminated panel for a roadside sign must be Type B or Type H. Type B panels shall have a nominal thickness of 1 inch or $2^1/_2$ inches. Type H panels shall have a nominal thickness of $2^1/_2$ inches.

The perimeter frame of Type B panels shall consist of extruded channel edges. The interior and exterior sides of the channels, except the sides touching the face and back sheet aluminum, shall be welded at the joint. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

Each side of the vertical tube spacers of Type B panels shall be welded to the perimeter frame, except the sides touching the front and back sheet aluminum.

The perimeter frame of Type H panels shall consist of extruded channel edges on the vertical sides and consist of extruded tube channel edges on the horizontal sides. The perimeter frame shall be connected by self-tapping hex head stainless steel screws. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

For Type H panels with a length of 17 feet or longer, centerline panel tube shall be placed along the horizontal centerline of the panel. The ends of the centerline panel tube shall be firmly and securely affixed to the perimeter frame.

Each side of the vertical tube spacers of Type H panels shall be welded to the perimeter frame and the centerline panel tube, except the sides touching the front and back sheet aluminum.

The Contractor shall furnish mounting hardware for roadside laminated panel signs, such as closure H-sections, lags, bolts, nuts, and washers.

A laminated panel for an overhead sign must be Type A and have a nominal thickness of 1 inch.

For overhead laminated signs with a length of 24 feet or less, the laminated panels shall be fabricated with no vertical joints, splices or seams. If a panel length is not shown for a sign exceeding 24 feet in length, the Engineer determines the length.

The perimeter frame of Type A overhead laminated panels shall be connected by self-tapping hex head stainless steel screws. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration. The perimeter frame of Type A panels shall consist of extruded channel edges on the vertical sides and consist of modified "H" section extrusion on the horizontal sides. The modified "H" section extrusion acts as an integral retainer track for affixing the bolts to provide blind fastening of panels to the structure support.

The Contractor shall furnish mounting hardware for overhead laminated panel signs, such as closure H-sections, clamps, bolts, nuts, and washers. The clamps shall be cast aluminum alloy with a minimum tensile strength of 25 kips per square inch. Bolt torque used for installing clamps shall not exceed 100 inch-pounds.

7. FORMED PANEL

A formed panel must be fabricated from a single, contiguous sheet of 0.063-inch-thick aluminum sheeting, alloy 5052-H32. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

Aluminum sheeting must be attached to struts with 3/16-inch-diameter anodized aluminum rivets. The rivets must be placed through the sign face at the spacing shown after applying the background material and legend. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed.

A fabricated formed-panel sign must be within ±1/16 inch of the dimensions shown and flat to within ±1/8 in/ft of the panel dimensions in any direction as measured by a straightedge placed in any direction across the plane of the panel.

The Contractor shall furnish mounting hardware for roadside and overhead formed panel signs. Hardware for the overhead formed panel signs shall include bolts, nuts, and washers.

The formed edges must be square. The drilled mounting holes must be straight and perpendicular to the front and back surfaces of the formed edges.

8. SINGLE SHEET ALUMINUM SIGN (FRAMED AND UNFRAMED)

The aluminum sheeting for framed and unframed panels must be aluminum alloy 6061-T6 or 5052-H38. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions.

A single-sheet aluminum panel must not have a vertical splice in the aluminum sheeting. A panel with a depth greater than 48 inches may have 1 horizontal splice in the sheeting.

For a framed panel, the framing members must be aluminum channel or rectangular aluminum tubing. The lengths of the framing members must be within ±1/8 inch of the lengths shown. The aluminum sheeting must be attached to the frame with 3/16-inch-diameter rivets. The rivets must be placed at least 1/2 inch from the web channel edges. The rivets must be made of aluminum alloy 5052 and be anodized or treated with a conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

A fabricated single-sheet, aluminum panel must be within ±1/8 inch of the dimensions shown. The panel must be flat to within ±1/32 in/ft of the panel dimensions as measured by a straightedge placed in any direction across the plane of the panel.

Aluminum channels or rectangular aluminum tubing must be welded together using the inert gas-shielded arc welding process and E4043 aluminum-electrode filler wires. The filler diameter must be equal to the wall thickness of the smallest welded channel or tubing.

9. Optional Protective Spray-on Coating

The Contractor may receive sign orders from DOT that will specify a protective spray-on coating, rather than a sign sheeting manufacturer's matched component premium overlay film. If requested, the Contractor will contact one of the following Spray-on coating product vendors to supply product for Contractor to complete sign order, as requested:

Krystal Kote CTF Tradewinds International, Incorporated P.O. Box 18498 Long Beach, CA 90807 Telephone: 562-424-1739	GPA-200 (Graffiti Proofer Anti-Stick) SEI Chemical 3137 East 26th St Vernon, CA 90058 Telephone: 323-266-7111
PrmaKote Visual Pollution Technologies, Inc. P.O. Box 12833 Scottsdale, AZ 85267 Telephone: 480-657-9183	PermaShield Premium (Product # 5600) Monopole Incorporated P.O. Box 250534 Glendale, CA 91225 Telephone: 818-500-8585

10. Alternate Sign Substrate Materials

The Contractor may receive sign orders from DOT that will specify signs manufactured with alternate substrate for single-sheet aluminum (non-framed) panels 48 inches, or smaller, in length or depth. Alternate substrate signs shall not be incorporated into framed panel assemblies. Because fiberglass reinforced plastic (FRP), or styrenic ABS panels cannot be die-stamped, a coupon of aluminum shall be die-stamped and affixed to the back of alternate substrate with di-bond tape to provide identification for the required notation placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post.