SECTION 2
SIGN PANELS

There are three primary types of overhead sign panels and two special types of sign panels. The three primary panel types are overhead formed panels, laminated Type A panels, and single sheet panels. The two special types of panels are extinguishable message signs (EMS) and changeable message signs (CMS). Each of these have there own characteristics, properties, and method of attachment as discussed below. At present, all sign panel types are typically State furnished items.

Photo 2-1.1 On the right of this photo is a mounting clip bolt from an RSPF to a steel clip welded to the truss. This photo also shows elevator head bolts attaching the sign panel to the frame, but new installations use truss head bolts.

2-1 Overhead Formed Panels

Overhead formed panels are three-dimensional sign panels constructed with aluminum material. *Refer to Figure 2-1.1.* Overhead formed panels are only fabricated in 610 mm (2 foot) and 1219 mm (4 foot) widths. Signs longer than 1219 mm (4 feet) are constructed using adjacent overhead formed sign panels. These panels are attached to overhead sign

structures by means of a removable sign panel frame (RSPF) and clip angles as detailed on Sheet S8B of the Standard Plans. *Refer to Photo 2-1.2.* Mounting clip bolts are used to attach panels to RSPF's. *Refer to Photo 2-1.1.* RSPF's are constructed to the details shown on Sheet S8A of the Standard Plans using structural steel angles, tees, and bars. Sheet S8D of the Standard Plans will also need to be referenced for details on constructing a RSPF and connecting it to the sign structure for overhead formed panels greater than 2540 mm (100 inches) in height.

Photo 2-1.2 A removable sign panel frame (RSPF) resting on a rack in a fabricator's yard.

RSPF's are fabricated in such a way that each member is joined together by means of a weld and the face (the side where the panel is attached) remains flat.[1] Failure to fabricate a RSPF with a flat face could potentially lead to problems when attaching the sign panel. The sign panel may become skewed at an angle or a deformation may occur which could cause a significant glare at a specific location.

To prevent problems when attaching the sign panels, the fabricator is required to use a template to drill all holes in a RSPF that are required for mounting the sign panel. At the Contractor's option, he may construct his own template or use the sign panel as a template.[2] The intent of this specification is to ensure that the holes in the RSPF are in line with the holes in the overhead formed sign panel. It has been noted that holes in a RSPF do not always line up with the holes in the sign panel when this specification is not adhered to. The easiest method for a fabricator to put holes in a RSPF is to punch the holes in individual members prior to welding the frame together. However, when this method is used, the heat used in the welding process may cause deformations to occur which result in misalign-

[1] Standard Plans Sheet S8A, Note 4 "WT 75 x 9 [WT 3 x 6] shall be flush with faces of frame angles."

[2] Standard Plans Sheet S8A, Note 2 "Panel mounting holes shall be drilled by template. Sign panel may be considered template."

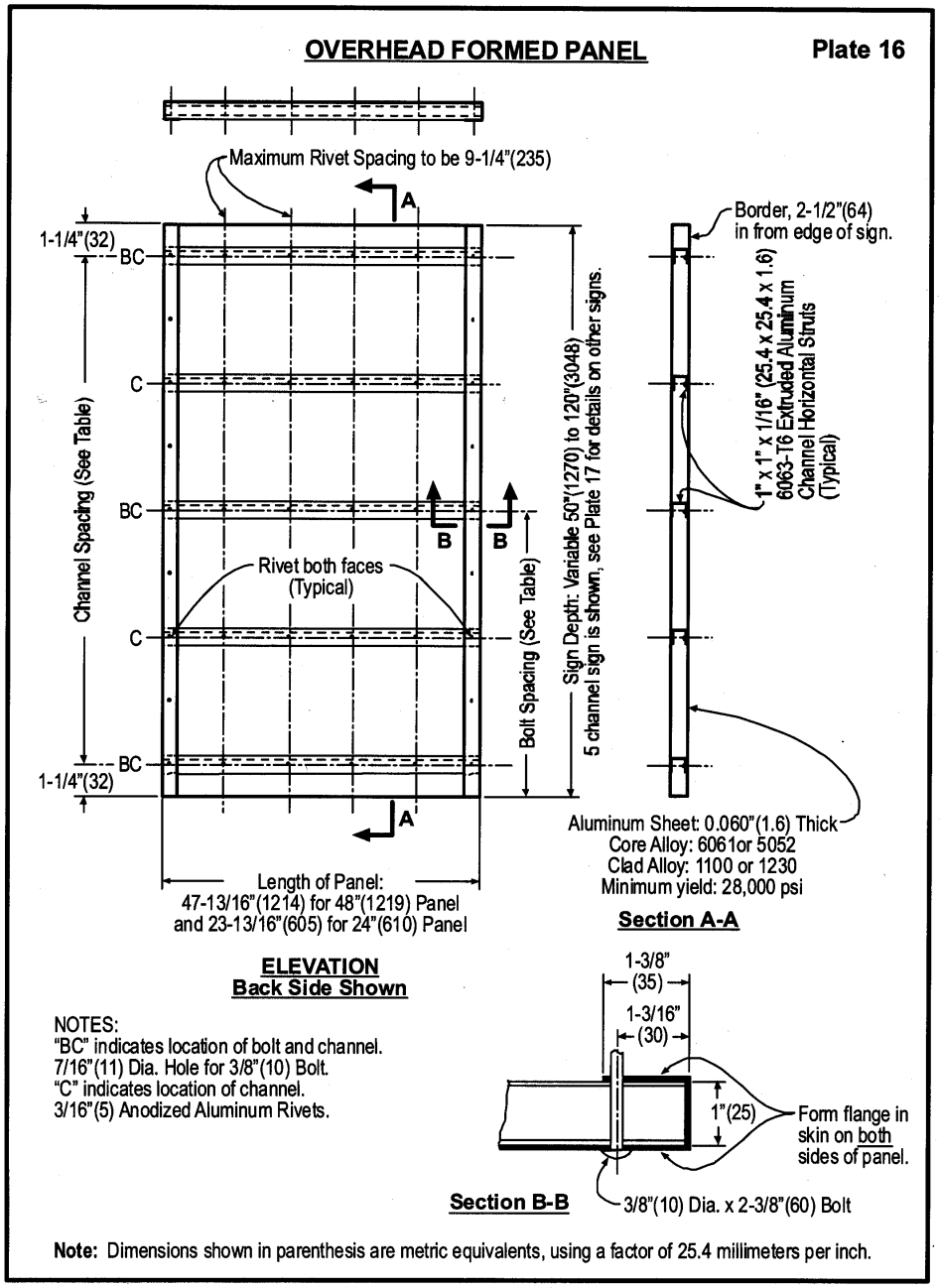

Figure 2-1.1 Information on State furnished overhead formed sign panels - Circa 2001

ment of the bolt holes. Ideally, the Fabricator should weld the frame together, drill holes using a template, and lastly apply the surface finish to the frame.

Attached to the backside of an overhead formed panel are extruded aluminum channel horizontal struts. *Refer to Figure 2-1.1*. The edges of the formed panel are wrapped around to overlap these struts. This method of constructing an overhead formed panel increases the panel's stiffness. Overhead formed panels are fairly light and can easily be attached to an RSPF. These panels can be attached onto a truss, box beam closed truss, or some bridge mounted overhead sign structures.

2-2 Laminated Type A Panels

The laminated Type A panel, similar to the overhead formed panel, is a three-dimensional sign panel. Laminated Type A panels consist of two aluminum sheets laminated to a honeycomb core and an extruded aluminum perimeter frame. *Refer to Figure 2-2.1*. The maximum height for a laminated Type A panel is 1524 mm (60 inches), but two panels can be spliced horizontally to form a sign panel 3048 mm (120 inches) tall. At all horizontal splice locations, an aluminum extrusion is inserted between the sign panels for framing continuity. The maximum length for a laminated Type A panel is 7315 mm (24 feet). Two adjacent panels are needed to form a sign greater than 7315 mm (24 feet) in length.

Photo 2-2.1 Laminated Type A panels stacked up against a partially assembled bridge mounted sign structure.

Laminated Type A panels can be attached to either a truss, lightweight, box beam closed truss, tubular, or bridge mounted overhead sign structure. Specific hardware is required for attachment to each sign structure type. The Standard Plans detail the specific mounting system for each sign structure type. For a truss or lightweight structure, an aluminum clamp system is used. Mounting beams (typically S-beams) are used to connect the laminated panel to the truss. The Stan-

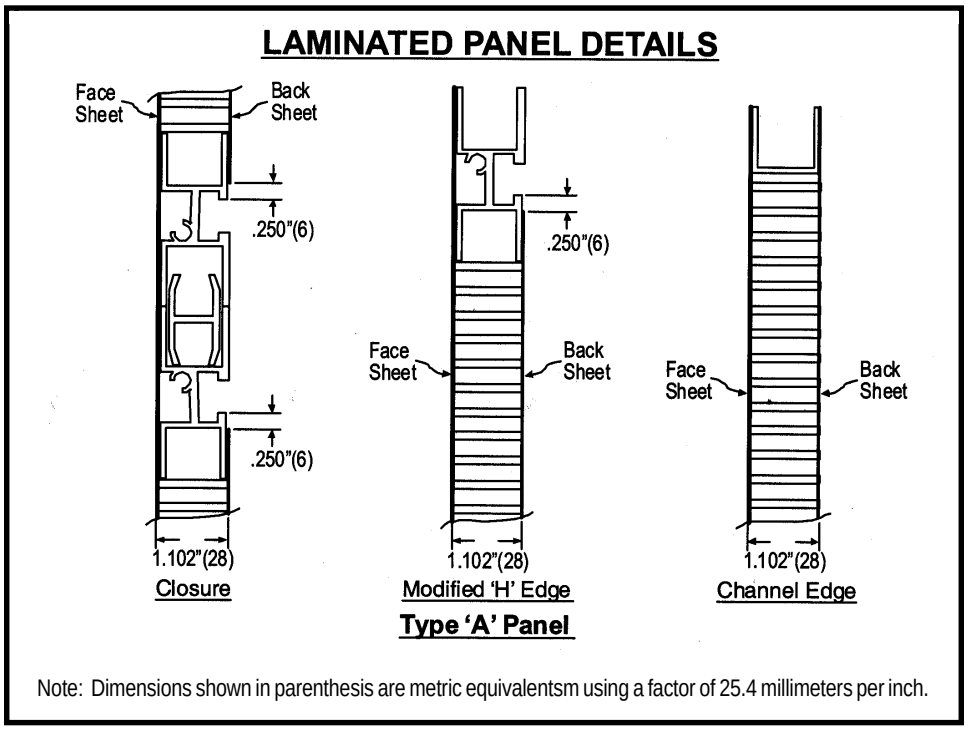

Figure 2-1.1 Sections cut through laminated sign panels.

Photo 2-2.2 Laminated Type A panel connection to sign panel mounting beam to the mast arm of a Lightweight Type B-1 overhead sign structure.

dard Plans specify the quantity and location of these beams (Sheet S8C for a truss and Sheet S18A for a lightweight structure). The mounting beams are clamped to the back of the laminated Type A sign panel with aluminum mounting clamps. These clamps are to be located on both sides of the mounting beam near the top and bottom of the sign panels, including one on each individual panel at any horizontal splice locations. A total of four mounting clamps are used to connect an individual sign panel to the mounting beam. These clamps are then tightened to a specific torque requirement using bolts. *Refer to Photo 2-2.2.* For a truss type overhead sign structure, the mounting beams are

also clamped to the chord angle using high-strength bolts and steel plates. These bolts shall be tightened to a wrench tight condition as discussed in the Bolting Memorandums found in Appendix D. For lightweight overhead sign structures, a U-bolt is used to connect the mounting beam to the structures mast arms. The one exception to this system is the lightweight balanced single steel post sign structure that is detailed on Sheet S14B of the Standard Plans. For this structure, a C-channel with a welded plate to form a double-sided flange is used as a mounting beam instead of an S-beam. The rest of the connection for this structure is very similar to that described above.

Box beam closed truss, tubular, and bridge mounted overhead sign structures use a different system for attaching the sign panels to the structure. A cadmium plated steel elevator head bolt is bolted through the laminated sign panel and a structural steel angle or channel at this connection. *Refer to Photo 2-2.3.* It is important that the aluminum clamping system is not substituted for this system on these structures. The aluminum clamping system is only designed to be used on a double-sided flange beam. Flanges on some structural steel members decrease in thickness away from the web. An aluminum clamp may tend to loosen and slip on beams with only a single-side flange. Ensuring that the correct attachment system is used is vital to prevent the sign panel from becoming loose or falling off the structure.

Photo 2-2.3 Connection of laminated Type A panel to a bridge mounted sign structure with a through bolt.

One advantage of the laminated Type A panel compared to the overhead formed panel is that the laminated panel can be attached at various locations. It is fairly simple to shift the panel to either direction for proper alignment whereas the overhead formed panel is restricted by the placement of its RSPF. A disadvantage of the laminated Type A panel is its size. Typically an overhead formed panel can be easily attached to the structure, but a crane is needed to lift a large laminated sign panel into place. For a truss overhead sign structure, it is possible that the mounting beam and chord angle clamp on a laminated Type A panel may interfere with the trusses vertical or diagonal angles. However, proper planning and accurate working drawing detailing can ensure proper alignment.

2-3 Single Sheet Sign Panels

A single sheet sign panel is a two-dimensional flat panel typically constructed out of steel or aluminum. A RSPF is used to attach these panels to overhead sign structures. Single sheet sign panels are an old design that is typically no longer used on most overhead sign structures. However, there are still a lot of single sheet sign panels in service, most of which can be found on either a truss, box beam closed truss, or bridge mounted overhead sign structure. It is possible that these sign panels will be encountered on a construction project, but they typically will be replaced with an overhead formed panel. Sheet S8B of the Standard Plans provides details for installing an overhead formed panel where an existing single sheet sign panel previously existed on a RSPF. *Refer to Figure 2-4.1.*

2-4 Extinguishable Message Signs

An extinguishable message sign (EMS) is an internally illuminated unit that provides a clearly visible message only when internally illuminated. EMS units are not State-furnished items and are to be constructed per details provided in the contract documents. Sheets ES-14A, ES-14B, and ES-14C of the Standard Plans contains details for an EMS including a lightweight overhead sign structure specifically designed for an EMS. Flashing beacon's are typically installed on these sign structures adjacent to the EMS panel and operate in conjuncture with the EMS. Additionally, for contracts containing an EMS on an overhead sign structure, Section 10-3, "Signals, Lighting, and Electrical Systems," of the special provisions contains a section addressing these panels.

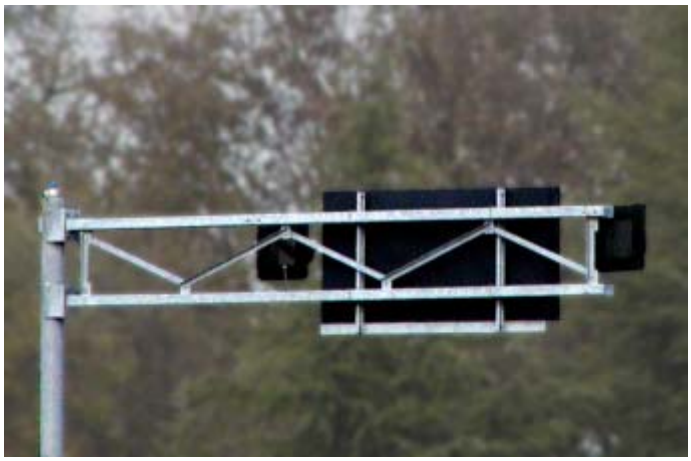

Photo 2-4.1 An EMS structure viewed from the back.

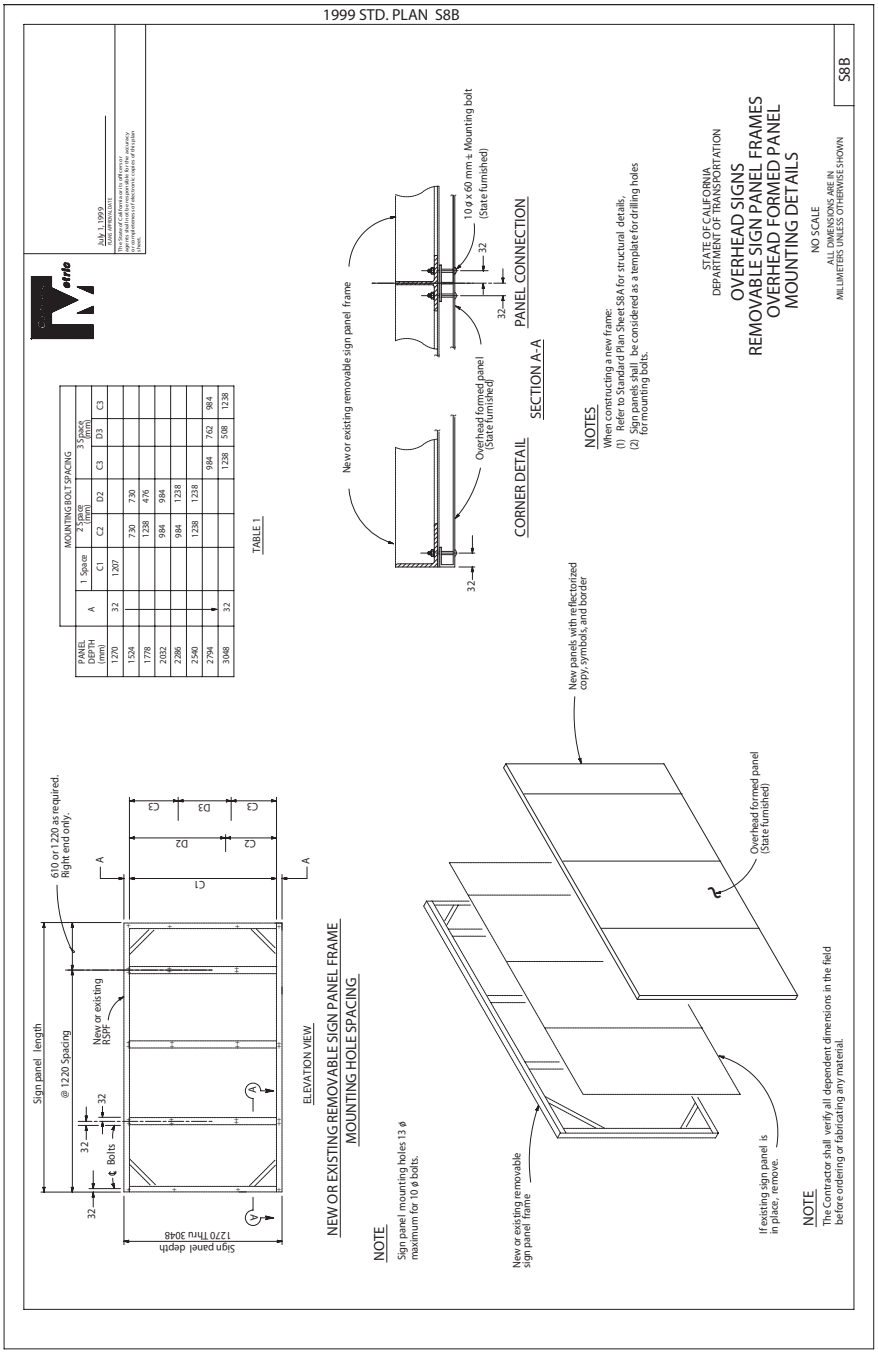

Figure 2-4.1 Sheet S8B of the Standard Plans shows mounting a new formed panel to an existing or new removeable sign panel frame.

Photo 2-5.1 CMS sign with warning and advice.

2-5 Changeable Message Signs

Changeable message signs (CMS) are designed to provide real-time information that advises drivers of a problem and, in some cases, a suggested course of action. The Caltrans Model 500 is the standard CMS system used by the Department of Transportation. This CMS displays its message by means of a bulb matrix system. In addition to the Model 500, other CMS models (such as the Caltrans Model 510 and 520) can be found throughout the State using various methods to create the changeable message. However, the Model 500 CMS is the preferred model for Caltrans CMS projects unless unique circumstances exist.

CMS units can be installed on a truss or bridge mounted overhead sign structure with a special design from the Office of Design and Technical Services. Installation on the truss type overhead sign structure

Photo 2-5.2 An Unbalanced Butterfly Model 500 CMS sign structure viewed from the back.

Photo 2-5.3 Z-bar on a CMS sign panel.

is the most common. For a truss overhead sign structure, the CMS unit is attached to the sign structure by aluminum "Z"-bars. *Refer to Photos 2-5.3 and 2-5.4.* These members are directly attached to the CMS unit and bolted with high strength bolts to structural steel angles that are attached to the overhead sign structure. At these locations, typical torque requirements imposed on a high-strength connection could cause unwanted deformation to the aluminum member. Therefore, these bolts shall be tightened to a wrench tight condition. Hardened steel washers shall be used to protect the aluminum "Z"-bar and steel element from the bolt head and nut. It is required, when noted on the plan, that a lock washer be used under the nut in addition to the hardened flat washer. The memorandum included in Appendix D specifically addresses the bolted connection at this location.

Photo 2-5.4 Connection of a Z-bar to the lower shelf angle.