

Junction boxes will be measured in units of each and will be paid for at the contract unit price per each. This price shall include concrete collars, frames and covers, tools to remove the cover, ground rods, ground conductors, grounding lugs, knockouts, cable racks, aggregate, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

These prices shall include providing the required finish.

Test bores will be measured in units of each and will be paid for at the contract unit price per each. This price shall include the test bore, rock sampling and determination of the soil and rock condition.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete foundation (Standard, type, and size)	Each or cubic yards
Electrical service (Standard and type)	Each
Luminaire arm (Length)	Each
Lighting pole (Standard, luminaire mounting height, and length of luminaire arm)	Each
Signal pole (Standard, length, number, and length of arms)	Each
Overhead sign structure (Location)	Each
Bridge-mounted sign structure (Location)	Each
Sign post (Type and size)	Linear foot
Pedestal pole (Standard and length)	Each
Wood pole (Class and length)	Each
Conductor cable (Size/number)	Linear foot
Conduit (Type and size)	Linear foot
Trench excavation (Standard)	Linear foot
Junction box (Standard)	Each
Test bore	Each

SECTION 701—TRAFFIC SIGNS

701.01—Description.

This work shall consist of furnishing, fabricating, refurbishing and erecting signs as specified on the plans.

701.02—Materials.

Reflective sheeting shall conform to the requirements of Section 247.

701.03—Procedures.**(a) Fabrication:**

1. **Aluminum welds:** Aluminum shall be welded in accordance with the requirements of Section 407.
2. **Sign panels:** Panels shall be fabricated of aluminum 0.100-inch thickness and shall be smooth, flat and free of metal burrs and splinters. Sign panels for overlays shall be 0.080-gage aluminum alloy conforming to the requirements of Section 229.02(a).
3. **Applying reflective background sheeting:** Sheeting shall be applied in accordance with the requirements of the manufacturer's recommendations.

A single piece of applied sheeting shall be at least 4 by 4 feet on sign panels 16 square feet or more in area, except for sign panels fabricated with fluorescent prismatic lens orange sheeting. Sign panels 16 square feet or more in area and fabricated with fluorescent prismatic lens orange sheeting shall consist of sheeting at least 4 by 2 feet, except that one piece of sheeting may be less than 2 feet wide to obtain the exact dimension required. Joints, splices or laps will not be permitted on sign panels less than 16 square feet in area except for the following:

- a. One factory splice from the roll will be permitted.
- b. One joint will be permitted on fluorescent prismatic lens orange signs when one dimension of the panel is greater than 36 inches and less than 48 inches.

When more than one width of sheeting, except fluorescent prismatic lens orange, is applied to a sign panel, sheeting edges shall form a vertical butt joint or may overlap not more than 3/8 inch. Where horizontal joints are used, except for fluorescent prismatic lens orange sheeting, the bottom edge of the top sheeting shall lie over the top edge of the next lower sheeting in a shingle lap of not more than 3/8 inch. Multiple pieces of fluorescent prismatic lens sheeting shall be installed with 1/32 inch to 1/16-inch gap between the edges. Sheeting shall be carefully matched to maintain uniform shading and prevent contrast between widths of sheeting.

The finished sign shall be free from cracks, gaps, streaks, wrinkles, blisters, discoloration, buckles, and warps and shall have a smooth surface of uniform color.

4. **Letters, numerals, arrows, symbols, borders, and other features of the sign message:** Features of the sign message shall conform to

the requirements of the *MUTCD*. Units of the sign message shall be formed to provide a continuous stroke width with smooth edges; present a flat surface free from warps, blisters, wrinkles, burrs, and splinters; and conform to the following:

- a. **Type L1, screen process, applied:** Features shall be produced by a direct or reverse screening process approved by the Engineer. Sign messages and borders that are darker than the sign field shall be applied to the reflective sheeting by a direct process. Sign messages and borders that are lighter than the sign field shall be produced by the reverse process in which the message and border are outlined by a color that is darker than the paint or the sheeting on the sign field. Transparent colors, inks, and paints used in the screening process shall be of the type and quality recommended by the sheeting manufacturer.

Screening shall produce a uniform color and tone. Edges of the legend and borders shall not have blemishes.

Signs shall be air dried or baked in accordance with the requirements of the manufacturer's recommendations to provide a smooth, hard finish.

- b. **Type L2, plastic film sheeting, applied:** Features of the sign message shall be cut from plastic film sheeting of the color specified on the plans. Sheeting shall be an elastomeric pigmented film suitably compounded and processed, coated on one side with an adhesive, and covered with a paper liner that shall be removable from the adhesive without being moistened. Adhesive shall be activated by heat or a solvent recommended by the sheeting manufacturer and shall be suitable for use with a hand roller, squeeze roller, or vacuum applicator that will form a durable bond to wood, metal, plastic, porcelain enamel, paint lacquer, and reflective sheeting. Sheeting shall be at least 0.002 and not more than 0.0035 inch in thickness and sufficiently opaque so that its color will be unaffected by the color of the sign field.
- c. **Type L3, cutout, reflective sheeting, and pressure applied:** Features of the sign message shall be cut from approved reflective sheeting of the color specified on the plans. Sheeting shall have heat-activated or pressure-sensitive adhesive and be applied to the background sheeting in accordance with the requirements of the manufacturer's recommendations.
- d. **Type L4, overlay film, pressure applied:** Features of the sign message are created by using a background sheeting of the color needed for the sign message and then applying the over-

lay film with the sign message areas removed from the film. The overlay film shall be transparent and shall be of the color needed to provide the correct background color of the sign.

5. **Joining sign base panels:** Horizontal joints will not be permitted. Where multiple vertical panels adjoin, the face and edges shall be milled or finished to a tolerance of $\pm 1/32$ inch from a straight plane such that no gap more than $1/16$ inch is allowed between panels.
 6. **Applying the sign message:** Features shall be straight, properly spaced, smooth, and free from irregular edges.
 7. **Sign finishing:** The complete outer edge, splices, messages, and borders of signs shall be sealed after application to the sign panel. Sealant material and its application shall be in accordance with the requirements of the sheeting manufacturer's recommendations.
 8. **Rejected sign messages:** Sign messages rejected by the Engineer shall be immediately obliterated by the Contractor.
- (b) **Transporting and Storing Signs From the Fabricator:** Signs shall be transported in accordance with the requirements of either of the following methods.
1. Signs shall be transported in cardboard cartons with a slipsheet covering the sheeting. The slipsheet shall be paper with a plastic coating on one side with the plastic placed toward the sign sheeting in accordance with the requirements of the sheeting manufacturer's recommendations. Not more than 10 signs may be placed in one carton. Signs shall alternate face-to-face, back-to-back, throughout the carton. A microfoam pad at least $1/16$ inch in thickness shall be placed between signs placed face to face. Cartons shall be placed vertically within a container designed to elevate boxes above ground level and provide lateral structural support. Cartons shall not be exposed to moisture during transportation.
 2. Signs shall be transported on an open truck or trailer bed with vertical racks for attachment of signs. Racks shall be designed to provide lateral structural support and allow the free flow of air around the sign face. Large signs may be transported on an open truck or trailer bed in shipping containers consisting of framing around edges of signs. Framing shall be nontreated lumber that will provide support for the sign without allowing pressure on the sign sheeting. Each container may house two signs positioned with the sign sheeting facing toward the inside. Signs shall be held in place in containers through the use of metal stiffeners attached to the framing, T-bars and Z-bars, and horizontal stiffeners. Shipping containers shall be secured in the vertical position for transportation.

Signs transported in cardboard cartons shall be stored in original shipping containers in a dry, enclosed location providing protection from extreme heat and humidity. Signs transported on racks or in wooden containers shall be stored on vertical racks designed to elevate signs above ground level, provide lateral structural support, and allow the free flow of air around the sign face. Signs shall not be stored where they are subjected to water runoff.

Signs may be removed from storage and installed on their structural supports before the structure is erected. The structure along with the sign shall be erected within 24 hours after removal of the sign from storage. During this time period, the sign and its structural support shall be stored at a sufficient angle to facilitate water runoff from the sign while preventing the sign from coming in contact with the ground.

Signs shall not be banded together, covered with tarps, stored flat, or subjected to pressure on the sign sheeting.

Signs transported or stored in cardboard cartons that have been exposed to moisture to the extent that moisture has entered the cartons will be rejected. The Contractor shall immediately obliterate the sign message and remove rejected signs from the project.

- (c) **Transporting and Storing Relocated Signs:** Relocated signs shall be transported and stored in a manner that will not allow pressure to be placed on the sign sheeting. Relocated signs shall be stored in their vertical position above ground level. Relocated signs that have been removed from their structure shall be stored in accordance with the requirements of (b) herein.
- (d) **Erection:** Vertical clearance for overhead and bridge mounted sign structures shall be no less than 19 feet 0 inch and no more than 21 feet 0 inch from the bottom of the lowest mounted sign panel to the crown of the roadway, unless otherwise specified on the plans. Walkway or luminaire assemblies shall have a vertical clearance of no less than 17 feet 6 inches from the bottom of the assembly to the crown of the roadway. Sign panels shall be installed during a sequence of construction as required to provide necessary traffic control. When possible, sign panels shall be installed at a time when covering of the sign message will not be needed. When this is not possible, a porous cloth cover rendering the sign message nonvisible shall be placed over the sign sheeting, folded over the sign edges, and secured to the back of the sign panel. Sign panels shall be securely fastened to posts or supports and erected plumb. Stud breakage of 10 percent or less of the total number of studs may be repaired with rivets. If breakage exceeds 10 percent, the sign panel will be rejected.

Ground-mounted signs shall be horizontally angled at 93 degrees between the face of the sign and the centerline of the roadway.

Vertical and horizontal spacing between signs shall be 1 inch.

A neoprene gasket 1/16 inch in thickness shall be used between the seat of the galvanized steel post clamps and the framing unit.

Illumination of signs shall be in accordance with the requirements of Section 705.

Damage to reflective sheeting may be repaired and edge sealed in accordance with the requirements of the manufacturer's recommendations and the following: Sign patch material shall be of the same type and color as the surrounding sheeting and shall have at least the same life expectancy. Patching will not be permitted on any letter, numeral, arrow, symbol, or border. Where the number, size, or spacing of patches is more than the following, the sign will be rejected and shall be replaced at the Contractor's expense:

Sign Face Area (sq ft)	Max. No. of Patches	Max. Size of Patches (sq in)	Min. Spacing Between Patches (in)
24.99 or smaller	No patching allowed		
25 to 49.99	1	1	0
50 to 99.9	2	1	6
100 to 199.9	3	2	6
200 or larger	4	3	12

Superficial damage to sign panels may be repaired using proper methods to obtain a smooth and flat panel. Sign panels that have more than superficial damage will be rejected and shall be replaced at the Contractor's expense.

Overlayment of existing sign panel: Overlays and demountable message including borders existing on the signs shall be removed to facilitate the installation of the new overlayment. Bullet holes and bent sections shall be flattened so that the sign face is free of projections and large indentations to facilitate installation of the new overlayment.

Overlayments 3 feet or less in total horizontal dimension shall be accomplished with one panel. Overlayments greater than 3 feet in total horizontal dimension shall be accomplished with panels no less than 3 feet wide; except that, one panel per overlayment may be less than 3 feet wide to obtain the exact horizontal dimension required. All joints shall be tightly butted and not overlapped.

Overlay panels shall be erected with aluminum rivets. Rivets shall be no less than 3/16 inch diameter and of such length as to securely fasten the panels and form a head conforming to the manufacturer's recommenda-

tions. Rivets shall be located on 1-foot centers (positioned 1 inch from each panel's edge) around the sign's perimeter. Where overlayment panels are 30 inches or greater in width, a column of rivets shall be installed on 1-foot centers down the centerline of the panel. Rivets shall be installed in such a sequence as to prevent buckling of the panels.

In the Hampton Roads District, at installations where the existing sign panel is attached by stud welds to the horizontal supports 3/8-inch galvanized bolts, washers, nuts and fiber washers shall be used in addition to rivets to attach the overlay panels. Bolts shall be located in alignment with each horizontal support (z-bar, t-bar), positioned 1 foot from each panel's edge and spaced on 1-foot maximum spacings along each horizontal support. At locations where existing stud welds and panel clips are in the area of the proposed bolt locations, the bolts shall be relocated as needed to miss these. Nuts shall be tightened only to the point just before the sign panel begins to buckle in that area.

701.04—Measurement and Payment.

Sign panels will be measured in square feet and will be paid for at the contract unit price per square foot. This price shall include background sheeting, sign messages, and framing units.

Overlay sign panels will be measured in square feet of sign panels without deductions for rounding corners. Overlay sign panel will be paid for at the contract unit price per square foot, which price shall be full compensation for verifying the size and color of overlayment panel, removal of existing overlayment and demountable messages including borders; fabricating, furnishing and installing overlayment.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Sign panel	Square foot
Overlay Sign panel	Square foot

SECTION 702—DELINEATORS

702.01—Description.

This work shall consist of furnishing and installing road edge, barrier or guardrail delineators of the type specified in accordance with these Specifications and in reasonably close conformity with the lines and dimensions on the plans or as established by the Engineer.