

## SECTION 91

### TRAFFIC CONTROL DEVICES

#### 91.1 DESCRIPTION

##### A. General

Signs, barricades, barrels, delineators, vertical panels and other traffic control devices, except signs or cones used only during daylight hours, shall be reflectorized with high intensity (Type III or higher) sheeting applied to a satisfactory backing. Signs, barricade, delineators and vertical panels shall be readable to the traveling public. The contractor shall certify that the sheeting meets the requirements of AASHTO M 268.

##### B. Related Work:

Section 90 Traffic Control  
Section 92 Traffic Signals and Roadway Lighting  
Section 93 Pavement Marking and Permanent Signage

#### 91.2 FABRICATION

A. Background colors shall be as specified in Part VI of the MUTCD or as specified by the Engineer.

##### B. Legend

Message and borders shall be copy of the color specified in Part VI of the MUTCD. The non-removable copy may be Screened Processed or Direct Applied. Mounting holes will not be drilled or punched in any part of the non-removable copy.

##### 1. Screened Process

Message borders shall be processed on reflective sheeting using mechanical equipment, materials and operational methods and procedures as prescribed by the manufacturer. Processing shall be accomplished by the direct or reverse screen method using opaque or transparent processing material. Screening may be accomplished either before or after application of the sheeting to the base panels. Free-hand painting will not be permitted on any part of the finished sign face.

## 2. Direct Applied

Cutout message and borders shall be reflective sheeting or opaque lettering film applied directly to clean, dust free, reflective sheeting background. Message and borders shall be, in accordance with the operational methods and procedures prescribed by the sheeting manufacturer. The finished letter, numerals, symbols and borders shall be cut with smooth regular outline, free from ragged or torn edges.

3. Removable copy will be allowed only if approved by the Engineer. Removable copy shall be of design so as not to become tilted or partially or wholly removed by wind, moisture, or other natural disturbances. Removable copy not bolted to the overall sign shall not be allowed during the hours of darkness.

### 91.3 TRAFFIC CONTROL DEVICE STANDARDS

All types of traffic control devices shall be maintained in satisfactory condition.

- A. Barricades shall conform to the requirements in Table I:

**TABLE I**

	BARRICADE CHARACTERISTICS		
	TYPE I (Single Rail)	TYPE II (Double Rail)	TYPE III (Triple Rail)
Width of Rail	8 in. min. - 12 in. max.	8 in. min. - 12 in. max.	8 in. min. -12 in. max.
Length of Rail	2 ft. min.	2 ft min	4 ft min
Width of Stripes*	6 in.	6 in.	6 in.
Height	3 ft. min.	3 ft. min.	3 ft. min.
No. of Reflectorized Rail Faces	2 (1 ea. direction)	4 (2 ea. direction)	3 (if facing traffic in 1 direction); OR 6 (if facing traffic in 2 directions)

\*For rails less than 3 feet long, 4-inch wide stripes shall be used.

For wooden barricades, nominal lumber dimensions will be satisfactory.

Barricades may be fabricated from lumber, metal or other suitable material and shall be frangible when struck by a vehicle at 35 mph. Markings for barricade rails shall be alternate reflectorized white and orange. Stripes shall slope downward at an angle of 45 degrees from the vertical in the direction traffic is to pass.

Striping material shall be high intensity (Type III).

- B. Flashing Beacons (Flashing Electric Lights) shall be power- operated (excludes batteries) and shall follow the design specifications for standard traffic signals, which include the following.
1. Each signal unit lens shall have a visible diameter of not less than eight inches, pursuant to requirements of Part IV, MUTCD.
  2. The illuminating element, lens, reflector and visor shall render the beacon clearly visible to drivers it faces for a distance of at least 1/4 mile under normal atmospheric conditions unless obstructed.
  3. The color of the lens shall be red for a stop condition or yellow for a warning condition. The lens colors shall be in accordance with the requirements of the Institute of Traffic Engineers Standard for Adjustable Face Vehicle Traffic Control Signal Heads.

The flashing beacon shall be controlled by a device located in a separate housing unit located in a protected location. The flasher mechanism shall provide the continuous intermittent illumination of the lens or lenses of the beacon. Flashing contacts shall be equipped with filters for suppression of radio interference.

Beacons shall flash not less than 50, nor more than 60 times per minute. The illuminated period of each flash shall be not less than 1/2 and no more than 2/3 of the total cycle.

- C. Barricade Warning Lights shall be portable, lens directed, enclosed lights meeting the requirements of Table II. The lens of the unit shall not be less than seven inches in diameter and shall be amber in color. They may be used in either steady burn or flashing mode.

Barricade warning lights shall be in accordance with the requirements of "ITE Standard for Flashing and Steady-Burn Barricade Warning Lights" and MUTCD, and shall be certified by the manufacturer based on results of tests made by an independent testing laboratory.

**TABLE II**

	TYPE A (Low Intensity)	TYPE BI (High Intensity)	TYPE C (Steady Burn)
Lens Directional Faces	1 or 2	1	1 or 2
Flash Rate/min	55 to 75	55 to 75	Constant
Flash Duration*	10%	8%	Constant
Min. Effective Intensity**	4.0 Candela	35 Candela	
Min. Beam Candle Power**			2 Candles
Hours of Operation	Dusk to Dawn	24 hr/day	Dusk to Dawn

\* Length of time that instantaneous intensity is equal to or greater than effective intensity.

\*\* These values must be maintained within an elliptical pattern 9 degrees on each side of the vertical axis and 5 degrees above and below the horizontal axis.

Barricade warning lights shall flash (Type A or B) when mounted on a barricade or sign used to identify a hazard or hazardous condition. Signs or barricades used along a traveled way to identify a change in alignment shall have steady burn (Type C) warning lights.

D. Hazard Warning Lights, when mounted shall be as follows:

1. Barricades and portable standards  
A minimum height of 36 inches from the bottom of the lens to the roadway.
2. Signs  
The light shall be above the center of the sign and not be more than 24 inches above the top of the sign. The light or its housing shall not obstruct the face of the sign.
3. Vertical channelizing devices and independent supports  
The light shall be a minimum height of 36 inches above the pavement.

E. Cones and Vertical Panels shall be in accordance with the following requirements:

1. Traffic cones and tubular markers of various configurations shall be a minimum of 18 inches in height for daytime use, with a broadened base and shall withstand impact without damage to themselves or to vehicles. Orange shall be the predominate color of these devices.

Traffic cones and tubular markers shall be a minimum of 28 inches in height when used on interstate highways or when used on any highway at night.

For nighttime use, cones shall be reflectorized or equipped with lighting devices for maximum visibility. Reflectorized material shall have a smooth, sealed outer surface, which will display the same color day and night.

Reflectorization of tubular markers shall be a minimum of two, 3-inch white bands placed a maximum of two inches from the top with a maximum of six inches between the bands. Reflectorization of cones shall be provided by a minimum 6-inch white band placed a maximum of three inches from the top and a 4-inch white band spaced a minimum two inches below the 6-inch band.

2. Vertical panels shall be 8 to 12 inches in width and a minimum of 24 inches in height. The stripes shall be alternating reflectorized white and orange slanting downward at 45° degrees from the vertical toward the side on which traffic is to pass. For panels less than three feet in height, 4-inch stripes shall be used.

Mounting shall be on a single, frangible or breakaway support assembly. The mounting and base support shall be constructed to minimize hazards to motorists.

The panel shall be mounted with the top a minimum of 36 inches above the roadway.

- F. Mounting posts for construction signs shall yield upon impact to minimize hazards to motorists and shall be of a height adequate to properly display the signs. Wood posts with a cross sectional area greater than 24 square inches shall be drilled to provide breakaway capability.

Portable frames for mounting traffic control signs may be used where sign mobility is required. The portable frames shall provide a minimum sign mounting height of 1 foot above the roadway and shall be frangible when struck by a vehicle at 35 mph.

- G. Pilot cars shall be four-wheel motor vehicles with appropriate signing.
- H. Temporary Pavement Marking Tape shall be provided on all roads open to traffic and shall be applied in accordance with the manufacturer's recommendations and meet the following requirements:
  1. Temporary Pavement Marking Tape - Type 1 shall consist of a retro-reflective film on a conformable backing, pre-coated with a pressure sensitive adhesive. The adhesive shall retain the tape on the pavement under project traffic and climatic conditions for required service life for the project. The film shall retain retro-reflective characteristics during the required service life.
  2. Temporary Pavement Marking Tape - Type 2 shall meet physical requirements of Temporary Pavement Marking Tape Type 1 and shall be removable without scarring

or damaging the roadway surface. The contractor shall provide assurance that the tape is removable as noted on product literature or through field-testing.

- I. Temporary Road Markers shall consist of a yellow or white plastic body providing a vertical area + 3 1/2 inches in width and + 2 inches in height with an adequate base for bonding to the pavement.

A strip of reflective tape 1/4-inch minimum width shall be bonded horizontally along the top of the vertical area.

The marker shall yield when contacted by a vehicle tire and return to a vertical position after the tire has passed over it.

The marker base shall be provided with an adhesive to securely bond the marker to the pavement. The adhesive shall be resistant to the effects of weather and capable of retaining the marker in position during the time it is required to function.

The plastic shall be polyurethane or other suitable plastic material.

The reflective tape shall be acrylic baked metalized polycarbonate micro prism retro-reflective material or equal. The tape shall have a minimum reflectance of 1,800 candlepower per foot-candle per square foot at 1/10 degree observation and 0-degree entrance angle.

#### **91.4 METHOD OF MEASUREMENT**

Field measurement for the item "Traffic Control Devices" will not be made.

#### **91.5 BASIS OF PAYMENT**

When an item for Traffic Control is included in the proposal, payment will be made at the lump sum contract price and shall be considered as full compensation for costs incidental thereto. Payment will be full compensation for installation, maintenance, relocation, and removal of the traffic control devices.

**END OF SECTION**