

984.1 GENERAL

Work zone traffic control devices, including signs, drums, cones, and tubular markers shall be reflectorized with super high intensity or very high intensity sheeting applied to a satisfactory backing. Super high intensity is defined as that which meets the standards of Type V, VII, or VIII as defined by AASHTO M268 (ASTM D4956). Very high intensity is defined as that which meets the standards of Type IX as defined by AASHTO M268 (ASTM D4956). Orange colored material shall be fluorescent. Barricades and vertical panels shall be sheeted with high intensity, super high intensity, or very high intensity non-fluorescent material. High intensity material is defined as that which meets the standards of Type III as defined by AASHTO M268 (ASTM D4956). Engineering grade (Type I) material will be allowed for daytime use only on signs and cones.

984.2 FABRICATION

- A. Background Color:** The background color shall be as specified in Part 6 of the MUTCD.
- B. Legend:** Message and borders shall be nonremovable copy of the color specified in Part 6 of the MUTCD. The nonremovable copy may be screened processed or direct applied. Mounting holes will not be drilled or punched in any part of the nonremovable 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:** Cut out 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, and free from ragged or torn edges.

984.3 TRAFFIC CONTROL DEVICE STANDARDS

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

- A. Barricades:** Barricades shall conform to the requirements shown in the MUTCD.
- B. Flashing Beacons (Flashing Electric Lights):** Flashing beacons 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 8 inches (200 mm).
 - 2.** The illuminating element, lens, reflector, and visor shall render the beacon clearly visible to drivers it faces for a distance of a least $\frac{1}{4}$ mile (0.4 kilometer) 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 Transportation 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. 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 not be less than $\frac{1}{2}$ and nor more than $\frac{2}{3}$ of the total cycle.

- C. Warning Lights:** Warning lights shall be portable with lens directed enclosed lights. The lens of the unit shall not be less than seven inches (175 mm) in diameter and shall be amber in color. They may be used in either the steady burn or flashing mode.

Warning lights shall be in accordance with the requirements of Equipment and Materials Standards of the Institute of Transportation Engineers (ITE) Publication No. ST 017, Purchase Specification for Flashing and Steady-Burn warning Lights. The lights shall be certified by the manufacturer.

The use of the warning lights shall be in accordance with Part 6 of the MUTCD.

Hazard warning lights, when mounted shall be as follows:

1. **Barricades and Portable Standards:** A minimum height of 30 inches (750 mm) from the bottom of the lens to the roadway.
2. **Signs:** The light shall not be less than 12 inches (300 mm) nor more than 24 inches (600 mm) above the sign. The light or housing shall not obstruct the face of the sign.
3. **Vertical Channelizing Devices and Independent Supports:** The light shall be a minimum height of 30 inches (750 mm) above the pavement.

- D. Channelizing Devices:** Channelizing devices, including cones, tubular markers, vertical panels, and drums shall conform to the requirements of Part 6 of the MUTCD.

Forty-two inch cones are a special type of cone which have a greater target value than regular cones and can sometimes be used in lieu of drums. Their construction is similar to other cones, but must have reflective material similar to that of drums as dictated by the MUTCD.

- E. Temporary Sign Supports:** Mounting for construction signs shall yield upon impact to minimize hazards to motorists, be in compliance with NCHRP 350, and shall be of a height adequate to properly display the signs.

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 one foot (300 mm) above the roadway and shall meet all breakaway requirements of NCHRP 350.

- F. Pilot Car:** Pilot cars shall be a pickup truck or automobile. A 36"x18" (1m x 0.5m) sign reading "Pilot Car Follow Me" shall be mounted on the rear of the vehicle and an oscillating or rotating yellow flashing light shall be mounted on the roof of the vehicle.
- G. Temporary Pavement Marking Tape:** Temporary pavement marking tape shall not contain metallic foil and shall consist of a mixture of high quality polymeric materials and pigments, with glass beads. The glass beads shall be throughout the pigmented portion of the film, and a reflective layer of beads bonded to the top surface. The film shall be precoated with a pressure sensitive adhesive. A nonmetallic medium shall be incorporated to facilitate removal.

The film, without adhesive, shall have a minimum thickness of 39 mils (1.0 mm).

Temporary pavement marking tape, type 2 shall be completely removable from asphalt and Portland cement concrete, intact or in large pieces, either manually or with a roll up device at temperatures above 40° F (4° C) without use of heat, solvents, grinding, or sandblasting.

- H. Temporary Road Markers:** Temporary road markers shall consist of a yellow or white plastic body providing a horizontal width and length of approximately $\pm 3\frac{1}{2}$ inches (± 90 mm) in both dimensions and approximately ± 2 inches (± 50 mm) high. If flexible vertical markers are used they shall be approximately ± 4 inches (± 100 mm) wide and approximately $\pm \frac{3}{4}$ inches (± 20 mm) high.

A strip of reflective tape $\frac{1}{4}$ inch (6 mm) minimum width shall be bonded horizontally along the top of the vertical area.

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 markers shall consist of a methyl methacrylate, polycarbonate, polystyrene, or suitably compounded acrylonitrile butadiene (ABS) shell fitted with retroreflective lenses. The exterior surface shall be smooth.

The marker reflector shall have a minimum coefficient of (retroreflected) luminous intensity conforming to Table I.

TABLE I

**Minimum Coefficient of (Retroreflected) Luminous Intensity in
Millicandelas per lux or (Candelas per footcandle)**

Observation	Entrance	Luminous Intensity for Each Color		
Angle in	Angle in	in Millicandelas per lux		
Radians	Radians	(Candelas per footcandle)		
(Degrees)	(Degrees)	White	Yellow	Red
0.0035	0.0	279	167	70
(0.2°)	(0°)	(3.0)	(1.8)	(0.75)
0.0035	0.349	112	67	28
(0.2°)	(20°)	(1.2)	(0.72)	(0.3)

The reflective tape shall be acrylic baked metalized polycarbonate microprism retroreflective material, methyl methacrylate, or equal.