Section 6F.60 Portable Changeable Message Signs

Support:
- Portable changeable message signs (PCMS) are TTC devices installed for temporary use with the flexibility to display a variety of messages. In most cases, portable changeable message signs follow the same provisions for design and application as those given for changeable message signs in Chapter 2L. The information in this Section describes situations where the provisions for portable changeable message signs differ from those given in Chapter 2L.
- Portable changeable message signs are used most frequently on high-density urban freeways, but have applications on all types of highways where highway alignment, road user routing problems, or other pertinent conditions require advance warning and information.

The primary purpose of Portable Changeable Message signs in temporary traffic control zones is to advise the road user of unexpected situations.

Some typical applications include the following:
A. Where the speed of motor vehicle traffic is expected to drop substantially;
B. Where significant queuing and delays are expected;
C. Where adverse environmental conditions are present;
D. Where there are changes in alignment or surface conditions;
E. Where advance notice of ramp, lane, or roadway closures is needed;
F. Where crash or incident management is needed; and/or
G. Where changes in the road user pattern occur.

Guidance:
The components of a Portable Changeable Message sign should include: a message sign panel, control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material. 

Standard:
The components of a portable changeable message sign should include: a message sign, control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material.
Portable changeable message signs shall comply with the applicable design and application principles established in Chapter 2A. Portable changeable message signs shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages.

Support:
- Section 2L.02 contains information regarding overly simplistic or vague messages that is also applicable to portable changeable message signs.

Standard:
- The colors used for legends on portable changeable message signs shall comply with those shown in Table 2A-5.

Guidance:
- Portable changeable message signs should be visible from 1/2 mile under both day and night conditions.

Option:
- For portable changeable message signs mounted on service patrol trucks or other incident response vehicles, a letter height as short as 10 inches may be used. Shorter letter sizes may also be used on a portable changeable message sign used on low speed facilities provided that the message is legible from at least 650 feet.
- The portable changeable message sign may vary in size.

Guidance:
- Messages on a portable changeable message sign should consist of no more than two phases, and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read. Messages should be centered within each line of legend. If more than one portable changeable message sign is simultaneously legible to road users, then only one of the signs should display a sequential message at any given time.

Support:
- Portable changeable message signs shall comply with the applicable design and application principles established in Chapter 2A. Portable changeable message signs shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages.

Support:
- Section 2L.02 contains information regarding overly simplistic or vague messages that is also applicable to portable changeable message signs.

Standard:
- The colors used for legends on portable changeable message signs shall comply with those shown in Table 2A-5.

Guidance:
- Portable changeable message signs should be visible from 1/2 mile under both day and night conditions.

Option:
- For portable changeable message signs mounted on service patrol trucks or other incident response vehicles, a letter height as short as 10 inches may be used. Shorter letter sizes may also be used on a portable changeable message sign used on low speed facilities provided that the message is legible from at least 650 feet.
- The portable changeable message sign may vary in size.

Guidance:
- Messages on a portable changeable message sign should consist of no more than two phases, and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read. Messages should be centered within each line of legend. If more than one portable changeable message sign is simultaneously legible to road users, then only one of the signs should display a sequential message at any given time.

Support:
Road users have difficulties in reading messages displayed in more than two phases on a typical three-line portable changeable message sign.

**Standard:**
- Techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, travelling horizontally or vertically across the face of the sign, or other dynamic elements shall not be used.

**Guidance:**
- When a message is divided into two phases, the display time for each phase should be at least 2 seconds, and the sum of the display times for both of the phases shall be a maximum of 8 seconds.
- All messages should be designed with consideration given to the principles provided in this Section and also taking into account the following:
  - A. The message should be as brief as possible and should contain three thoughts (with each thought preferably shown on its own line) that convey:
    1. The problem or situation that the road user will encounter ahead.
    2. The location of or distance to the problem or situation, and the recommended driver action.
  - B. If more than two phases are needed to display a message, additional portable changeable message signs should be used. When multiple portable changeable message signs are needed, they should be placed on the same side of the roadway and they should be separated from each other by a distance of at least 1,000 feet on freeways and expressways, and by a distance of at least 500 feet on other types of highways.

When the word messages shown in Tables 1A-1 or 1A-2 need to be abbreviated on a portable changeable message sign, the provisions described in Section 1A.15 shall be followed.

In order to maintain legibility, portable changeable message signs shall automatically adjust their brightness under varying light conditions.

The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.

Portable Changeable Message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.

On portable changeable message signs, the system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.

Portable changeable message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.

Based on MUTCD Committee 12/8/10. Add federal italicized wording.
The mounting of Portable Changeable Message signs shall be such that the bottom of the message sign panel for vehicle-mounted boards shall be a minimum of 1.8 m (6 ft) and for trailer-mounted boards shall be a minimum of 2.2 m (7 ft) above the roadway when it is in the operating mode.

GUIDANCE
Portable Changeable Message signs should be used as a supplement to and not as a substitute for segmental signs.

When Portable Changeable Message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to exit the affected highway.

The Portable Changeable Message signs shall be sited and aligned to ensure legibility. Multiple Portable Changeable Message signs should be placed on the same side of the roadway, separated from each other at distances based on Table 6C.1.

Portable Changeable Message Signs should be placed off the shoulder whenever possible.

STANDARD
If a Portable Changeable Message Sign is placed on the shoulder of the roadway, it shall be placed a minimum of 4 feet from the edge of the traveled lane, and it shall be delineated with a partial shoulder closure taper.

GUIDANCE
When Portable Changeable Message signs are not being used, they should be removed; if not removed, they should be shielded; or if the previous two options are not feasible, they should be delineated with retroreflective temporary traffic control devices. Portable Changeable Message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.

STANDARD
If a Portable Changeable Message Sign is used as an Arrowboard, it shall meet all the requirements of an arrowboard and shall be used solely as an Arrowboard.

6F.56 Arrow Panels
STANDARD
An arrow panel shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging operation when failure of the primary power source occurs.

GUIDANCE
When portable changeable message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.

When Portable Changeable Message signs are used as a supplement to and not as a substitute for conventional signs and pavement markings.

Portaledge Changeable Message signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign.

STANDARD
Portable Changeable Message Signs should be placed off the shoulder whenever possible.

GUIDANCE
When Portable Changeable Message signs are not being used to display TTC messages, they should be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic. If relocation or shielding is not practical, they should be delineated with retroreflective TTC devices.

If a Portable Changeable Message Sign is placed on the shoulder of the roadway, it shall be placed a minimum of 4 feet from the edge of the traveled lane, and it shall be delineated with a partial shoulder closure taper. If the 4 foot clearance cannot be met, then a full shoulder closure shall be provided.

GUIDANCE
When portable changeable message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.

STANDARD
Portable Changeable Message signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign.

Portaledge Changeable Message Signs should be placed off the shoulder.

STANDARD
If a Portable Changeable Message Sign is used as an arrowboard, it shall meet all the requirements of an arrowboard and shall be used solely as an arrowboard.

Section 6F.61 Arrow Boards
STANDARD
An arrow board shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a TTC messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.

GUIDANCE
Portable Changeable Message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.

When Portable Changeable Message signs are used as a supplement to and not as a substitute for conventional signs and pavement markings.

Portable Changeable Message Signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign.

STANDARD
If a Portable Changeable Message Sign is used as an arrowboard, it shall meet all the requirements of an arrowboard and shall be used solely as an arrowboard.

Section 6F.61 Arrow Boards
STANDARD:
and controlling road users through or around a temporary traffic control zone.

**GUIDANCE**

An arrow panel in the arrow or chevron mode should be used to advise approaching traffic of a lane closure along major multi-lane arterial roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures.

An arrow panel should be used in combination with appropriate signs, channelizing devices, or other temporary traffic control devices.

**Arrow Panels should be placed off the shoulder whenever possible.**

**STANDARD**

If an arrow panel is placed on the shoulder of the roadway, it shall be placed a minimum of 1.2 m (4 ft) from the edge of the traveled lane, and it shall be delineated with an appropriate shoulder closure taper.

**GUIDANCE**

It should be delineated with retroreflective temporary traffic control devices, or when within the clear zone, shielded with a barrier or crash cushion. When an arrow panel is not being used, it should be removed; if not removed, it should be shielded; or if the previous two options are not feasible, it should be delineated with retroreflective temporary traffic control devices.

**STANDARD**

Arrow panels shall meet the minimum size, legibility distance, number of elements, and other specifications shown on Figure 6F-6.

**SUPPORT**

Type A arrow panels are appropriate for use on low-speed urban streets. Type B arrow panels are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C arrow panels are intended to be used on high-speed, high-volume motor vehicle traffic control projects. Type D arrow boards are intended for use on vehicles authorized by the State or local agency.

**STANDARD**

Type A, B, and C arrow boards shall have solid rectangular appearances. A Type D arrow board shall conform to the shape of the arrow.

**GUIDANCE**

The minimum mounting height of an arrow panel should be 2.1 m (7 ft) from the roadway to the bottom of the panel, except on vehicle-mounted panels, which should be 1.8 m (6 ft).

| An arrow board shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a TTC zone. |
| Guidance: |
| An arrow board in the arrow or chevron mode should be used to advise approaching traffic of a lane closure along major multi-lane roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures. |
| Guidance: |
| An arrow board in the arrow or chevron mode should be used to advise approaching traffic of a lane closure along major multi-lane roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures. |
| Guidance: |
| An arrow board should be placed on the shoulder of the roadway or, if practical, farther from the traveled lane. |
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| Guidance: |
| An arrow board should be placed on the shoulder of the roadway or, if practical, farther from the traveled lane. |
A vehicle-mounted arrow panel should be provided with remote controls.

**STANDARD**

Arrow panel elements shall be capable of at least a 50 percent dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow boards.

**GUIDANCE**

Full brilliance should be used for daytime operation of arrow panels. The arrow panel shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.

**STANDARD**

An arrow board consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.

**FIGURE 6F-6 Advance Warning Arrow Display Specifications**

**STANDARD**

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 nor more than 40 flashes per minute.

An arrow panel shall have the following three mode selections:

A. A Flashing Arrow, or Sequential Chevron mode;
B. A flashing Double Arrow mode; and
C. A flashing Caution mode (4 or more lamps which do not indicate any direction).

An arrow panel in either the flashing arrow mode or the chevron mode shall be used for stationary or mobile lane closures in high-speed, multi-lane roadways.

**CAUTION**

An arrow panel in the arrow or chevron mode may be used for stationary, or mobile lane closures on low-speed, multi-lane roadways.

**STANDARD**

An arrow panel shall be used only in the caution mode for shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway.

**GUIDANCE**

For a stationary lane closure, the arrow panel should be located on the shoulder at the beginning of the shifting or merging taper. Where the shoulder is narrow, the arrow panel should be located in the closed lane.

**STANDARD**

When arrow panels are used to close multiple lanes, a separate arrow panel shall be used for each closed lane.

**GUIDANCE**

The minimum mounting height, measured vertically from the bottom of the board to the roadway below it or to the elevation of the near edge of the roadway, of an arrow board shall be 7 feet. Exception: Vehicle-mounted arrow boards, which should be no more than 8 feet.

A vehicle-mounted arrow board shall be provided with remote controls.

**STANDARD**

Arrow board elements shall be capable of at least a 50 percent dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow boards.

**GUIDANCE**

Full brilliance should be used for daytime operation of arrow boards.

**STANDARD**

The arrow board shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.

**GUIDANCE**

If an arrow board consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.

**FIGURE 6F-6 Advance Arrowboard Display Specifications**

**STANDARD**

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

An arrow board shall have the following three mode selections:

A. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode;
B. A flashing Double Arrow mode; and
C. A flashing Caution or Alternating Diamond mode.

An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

**GUIDANCE**

If an arrow board consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.

**FIGURE 6F-6 Advance Arrowboard Display Specifications**

**STANDARD**

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

An arrow board shall have the following three mode selections:

A. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode;
B. A flashing Double Arrow mode; and
C. A flashing Caution or Alternating Diamond mode.

An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

**GUIDANCE**

For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode.

**FIGURE 6F-6 Advance Arrowboard Display Specifications**

**STANDARD**

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

An arrow board shall have the following three mode selections:

A. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode;
B. A flashing Double Arrow mode; and
C. A flashing Caution or Alternating Diamond mode.

An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

**GUIDANCE**

For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode.
GUIDANCE
When arrow panels are used to close multiple lanes, if the first arrow panel is placed on the shoulder, the second arrow panel should be placed in the first closed lane at the beginning of the merging taper. [See Layouts 6F-54 and 6F-60]. When the first arrow panel is placed in the first closed lane, the second arrow panel should be placed in the second closed lane at the downstream end of the second merging taper.
For mobile operations where a lane is closed, the arrow panel should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

STANDARD
A vehicle displaying an arrow panel shall be equipped with rotating lights or strobe lights.
A single arrow panel shall not be used to laterally shift traffic.

6F.57  High-Level Warning Devices (Flag Trees)

OPTION
A high-level warning device (flag tree) may supplement other temporary traffic control devices in temporary traffic control zones.

SUPPORT
A high-level warning device is designed to be seen over the top of typical passenger cars. A typical high-level warning device is shown in Figure 6F-2.

STANDARD
A high-level warning device shall consist of a minimum of two flags with or without a Type B high-intensity flashing warning light. The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be not less than 2.0 m (6.6 ft). The flag shall be 0.4 m (16 in) square or larger and shall be orange or fluorescent red-orange in color.

OPTION
An appropriate warning sign may be mounted below the flags.

SUPPORT
High-level warning devices are most commonly used in high-density road user situations to warn road users of short-term operations.

6F.58  Channelizing Devices

SUPPORT
The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and temporary raised locations.

19 For a stationary lane closure, the arrow board should be located on the shoulder at the beginning of the merging taper.
20 Where the shoulder is narrow, the arrow board should be located in the closed lane.

Standard:
21 When arrow boards are used to close multiple lanes, a separate arrow board shall be used for each closed lane.

Guidance:
22 When arrow boards are used to close multiple lanes, if the first arrow board is placed on the shoulder, the second arrow board should be placed in the first closed lane at the upstream end of the second merging taper. [See Figure 6H-37]. When the first arrow board is placed in the first closed lane, the second arrow board should be placed in the second closed lane at the downstream end of the second merging taper.

23 For mobile operations where a lane is closed, the arrow board should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

Standard:
24 A vehicle displaying an arrow board shall be equipped with high-intensity rotating, flashing, oscillating, or strobe lights.

Option:
25 Arrow boards shall only be used to indicate a lane closure. Arrow boards shall not be used to indicate a lane shift.

Section 6F.62  High-Level Warning Devices (Flag Trees)

Option:
26 A portable changeable message sign may be used to simulate an arrow board display.

Section 6F.63  Channelizing Devices

Option:
27 An appropriate warning sign may be mounted below the flags.

Support:
28 High-level warning devices are most commonly used in high-density road user situations to warn road users of short-term operations.
islands.

Channelizing devices provide for smooth and gradual motor vehicle traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to separate motor vehicle traffic from the workspace, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of motor vehicle traffic.

STANDARD

Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision. Where barricades are used to channelize pedestrians, there shall be continuous detectable bottom and top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 200 mm (8 in) above the ground surface.

OPTION

A gap not exceeding 150 mm (6 in) between the bottom rail and the ground surface may be used to facilitate drainage.

STANDARD

If drums, cones, or tubular markers are used to channelize pedestrians, they shall be located such that there are no gaps between the bases of the devices. In order to create a continuous bottom, and the height of each individual drum, cone, or tubular marker shall be no less than 300 mm (12 in) to be detectable to users of long canes.

There are three types of channelizing devices, Type A, B, and C as shown in Figure 6F-7.

The spacing, and the appropriate MN MUTCD section for each channelizing device is shown in Table 6F-2.

GUIDANCE

Channelizing devices should be constructed and ballasted to perform in a predictable manner when inadvertently struck by a vehicle. Channelizing devices shall be crashworthy. Fragments or other debris from the device or the ballast shall not pose a significant hazard to road users or workers in the immediate area.

Compliance Date: January 17, 2010

The spacing of channelizing devices should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of channelizing devices should be between 0.6 times to 1.2 times the posted speed limit in mph (2.0 to 4.0 times the posted speed limit in mph) when used for tangent channelization.

When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Layout 6F-6, the channelizing devices should be extended a distance in meters (feet) of 0.4 times the speed limit in km/h (2.0 times the speed limit in mph)

Standard:

- Designs of various channelizing devices shall be as shown in Figure 6F-7. All channelizing devices shall be crashworthy.

Support:

- The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices.

- Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to channelize vehicular traffic away from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.

STANDARD

Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision.

Where channelizing devices are used to channelize pedestrians, there shall be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the top surface shall be no higher than 2 inches above the ground. The top of the top surface shall be no lower than 32 inches above the ground.

Option:

- A gap not exceeding 2 inches between the bottom rail and the ground surface may be used to facilitate drainage.

Guidance:

- Where multiple channelizing devices are aligned to form a continuous pedestrian channelizer, connection points should be smooth to optimize long-cane and hand trailing.

GUIDANCE

- The spacing between cones, tubular markers, vertical panels, drums, and barricades should not exceed a distance in feet equal to 1.0 times the speed limit in mph when used for taper channelization, and a distance in feet equal to 2.0 times the speed limit in mph when used for tangent channelization.

- The spacing between Type A and B channelizing devices should not exceed a distance in feet equal to 1.0 times the speed limit prior to work starting in mph when used for taper channelization, and a distance in feet equal to 2.0 times the speed limit prior to work.
When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Figure 6F.39, the channelizing devices should be extended a distance in feet of 2.0 times the speed limit in mph beyond the downstream end of the transition area.

SUPPORT
The spacing of channelizing devices shown in the temporary traffic control layouts are based on the distances contained in Table 6F.3.

OPTION
Warning lights may be added to channelizing devices used alone or in a cluster to warn of a condition. Warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

STANDARD
Warning lights shall flash when placed on channelizing devices used alone in a cluster to warn of a condition. Except for the sequential flashing warning lights discussed in Paragraphs 12 and 13, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

Option:
- Warning lights (see Section 6F.83) may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

Standard:
- Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Except for the sequential flashing warning lights discussed in Paragraphs 12 and 13, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

Option:
- A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

Standard:
- When used, the successive flashing of the sequential warning lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55 nor more than 75 times per minute.

- The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night.

Option:
- The name and telephone number of the highway agency, contractor, or supplier may be displayed on the non-reflective surface of all types of channelizing devices.

Standard:
- The letters and numbers of the name and telephone number shall be non-reflective and not over 50 mm (2 in) in height.

FIGURE 6F-7 Channelizing Devices Sheets 1 & 2

GUIDANCE
Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.

STANDARD
The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night.

FIGURE 6F-7 Channelizing Devices
Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced (see the Quality Standards in Section 6K).

6F.59 Cones
STANDARD
Cones shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle (see Figure 6F-7). For daytime and low-speed roadways, cones shall be not less than 150 mm (6 in) in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 200 mm (8 in) in height.

For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of 150 mm (6 in) or larger cones shall be provided by a white band 150 mm (6 in) wide located 75 to 100 mm (3 to 4 in) from the top of the cone and an additional 100 mm (4 in) wide white band approximately 50 mm (2 in) below the 150 mm (6 in) band.

Cones shall not be used on unattended work sites.

OPTION
Traffic cones may be used to mark hazards or close roadways for short term emergency situations. Traffic cones may be used in short term and intermediate term temporary traffic control zones to channelize road users, divide opposing motor vehicle traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short term maintenance and utility work.

GUIDANCE
The spacing of cones should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of cones should not exceed a distance in meters (feet) equal to 0.6 times the posted speed limit in mph (2.0 times the posted speed limit in mph) when used for channelization.

Steps should be taken to ensure that cones will not be blown over or displaced by wind or moving vehicular traffic. Cones should not be used for pedestrian channelization or as pedestrian barriers in temporary traffic control zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

OPTION

Traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration maintenance and utility work.

Guidance:

Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.

FIGURE 6F-7 Channelizing Devices

Guidance:

Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.

Standard:

Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced (see the Quality Standards in Section 6K).

6F.64 Cones
STANDARD
Cones (see Figure 6F-7) shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. For daytime and low-speed roadways, cones shall be not less than 18 inches in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 28 inches in height.

For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retro-reflectorization of cones that are 28 to 36 inches in height shall be provided by a 6-inch wide white band located 3 to 4 inches from the top of the cone and an additional 4-inch wide white band located approximately 2 inches below the 6-inch band.

Retro-reflectorization of cones that are more than 36 inches in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 4 to 6 inches wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflective spaces between the orange and white stripes shall not exceed 3 inches in width.

Option:

Traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short term maintenance and utility work.

Guidance:

Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.
Cones may be doubled up to increase their weight.

SUPPORT
Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings that can be dropped over the cones and onto the base to provide added stability.

GUIDANCE
Ballast should be kept to the minimum amount needed.

Section 6F.60 Tubular Markers

SUPPORT
Tubular markers are portable devices constructed with weighted bases, or weights such as sandbag rings that can be dropped over the tubes and onto the base to provide added stability.

STANDARD
Tubular markers shall be predominately orange, and shall be made of a material that can be struck without causing damage to the impacting vehicle (see Figure 6F-7). For daytime and low-speed roadways, tubular markers shall not be less than 450 mm (18 in) high and 50 mm (2 in) in diameter. When tubular markers are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, tubular markers shall be a minimum of 900 mm (36 in) high and 100 mm (4 in) in diameter.

For nighttime use, tubular markers shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of 900 mm (36 in) or larger tubular markers shall be provided by a white band 100 mm (4 in) wide located 75 to 100 mm (3 to 4 in) from the top of the marker and an additional 100 mm (4 in) wide white band approximately 50 mm (2 in) below the 100 mm (4 in) band.

Tubular markers shall not be used to mark hazards or close roadways.

GUIDANCE
Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices. Tubular markers should be stabilized by using weighted bases, or weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability. The weighted base should weigh at least 6.4 kg (12 pounds).

OPTION
Tubular markers may be used effectively to divide opposing lanes of road users, divide motor vehicle traffic lanes when two or more lanes are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of other more visible devices.

Section 6F.65 Tubular Markers

SUPPORT
Tubular markers are portable devices constructed with weighted bases, or weights such as sandbag rings that can be dropped over the tubes and onto the base to provide added stability.

STANDARD
Tubular markers shall be tubular, shall be predominately orange, and shall be made of a material that can be struck without causing damage to the impacting vehicle (see Figure 6F-7). For daytime and low-speed roadways, tubular markers shall not be less than 18 inches high and 2 inches wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.

Tubular markers shall be a minimum of 28 inches in height when they are used on freeways and other high-speed highways, on all highways during nighttime, or whenever more conspicuous guidance is needed.

For nighttime use, tubular markers shall be retroreflectorized.

Retroreflectorization of tubular markers that have a height of less than 42 inches shall be provided by two 3-inch wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of tubular markers that have a height of 42 inches or more shall be provided by four 4- to 6-inch wide alternating orange and white stripes with the top stripe being orange.

Tubular markers shall not be used to mark hazards or close roadways.

GUIDANCE
Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices. Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability. Ballast should be kept to the minimum amount needed.
GUIDANCE
The spacing of tubular markers should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of tubular markers should not exceed a distance in meters (feet) equal to 0.6 times the posted speed limit in mph (2.0 times the posted speed limit in mph) when used for tangent channelization.

Tubular markers should not be used for pedestrian channelization or as pedestrian barriers in temporary traffic control zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

6F.60.1 Surface Mounted Delineators
OPTION
Surface mounted delineators are delineation devices that may be used as center lane dividers to separate opposing motor vehicle traffic on a two-lane, two-way operation.
Surface mounted delineators may also be used to provide other traffic delineation.
STANDARD
Surface mounted delineators shall be predominantly orange, and shall be made of a material that can be struck without causing damage to the impacting vehicle (see Figure 6F-7). Surface mounted delineators shall be attached to the pavement surface to assure they remain inplace. If a non-cylindrical tubular marker is used, it shall be attached to the pavement in a manner to display a minimum 65 mm (2.5 in) width to all approaching road users.
Surface mounted delineators shall not be less than 900 mm (36 in) high and 65 mm (2.5 in) wide facing road users. The delineator shall be retroreflective for nighttime visibility with a white band 100 mm (4 in) wide located 75 to 100 mm (3 to 4 in) from the top of the delineator and an additional 100 mm (4 in) wide white band approximately 50 mm (2 in) below the 100 mm (4 in) band.

6F.60.2 Weighted Channelizers
STANDARD
Weighted Channelizers used for road user warning or channelization shall be predominantly orange in color and shall be constructed of lightweight, deformable materials (see Figure 6F-7). They shall be a minimum of 1000 mm (42 in) in height having a conical cross section a minimum of 100 mm (4 in) width at the top, regardless of orientation, and a minimum cross sectional area of 120,000 mm² (200 in²). The weighted base shall be a minimum of 2.25 kg (16 lb). The markings on weighted channelizers shall be horizontal, circumferential, alternating orange and white retroreflective stripes.

| OPTION: | Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving vehicular traffic are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of larger devices. |
| STANDARD: | A tubular marker shall be attached to the pavement to display the minimum 2-inch width to the approaching road users. |

Option: Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving vehicular traffic are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of larger devices. Not needed since we require the marker to be tubular.
<table>
<thead>
<tr>
<th>Section 6F.66 Vertical Panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard:</td>
</tr>
<tr>
<td>o Vertical panels (see Figure 6F-7) shall have retroreflective striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Option: Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used. Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.</td>
</tr>
<tr>
<td>Option:</td>
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<tr>
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</tr>
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</tr>
<tr>
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</tr>
</tbody>
</table>

**Vertical Panels**

- **Standard:**
  - Vertical panels shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height (see Figure 6F-4). They shall have retroreflective orange and white striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used. Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

- **Option:**
  - Vertical panels shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height (see Figure 6F-4). They shall have retroreflective orange and white striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used. Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

- **Option:**
  - Vertical panels shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height (see Figure 6F-4). They shall have retroreflective orange and white striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used. Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

- **Option:**
  - Vertical panels shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height (see Figure 6F-4). They shall have retroreflective orange and white striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used. Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

**Markings**

- **Guidance:**
  - Weighted channelizers may have a handle or lifting device, which extends above the 1060 mm (42 in) minimum device height.
  - Weighted channelizers have less visible area than other devices and should therefore be used only where space is limited or the presence of larger devices will restrict sight. The spacing of weighted channelizers should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of weighted channelizers should not exceed a distance in meters (feet) equal to 0.6 times the posted speed limit in mph (2.0 times the posted speed limit in mph) when used for tangent channelization.

- **Option:**
  - Weighted channelizers may be used effectively to divide opposing lanes of traffic and delineate the edge of pavement drop-offs. Although weighted channelizers are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

**Guidance**

- **Guidance:**
  - Where the height of the vertical panel itself is 600 mm (36 in) or greater, a panel stripe width of 150 (6 in) shall be used.

- **Option:**
  - Where the height of the vertical panel itself is less than 600 mm (36 in), a panel stripe width of 100 mm (4 in) may be used.

**Markings for vertical panels**

- **Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward at an angle of 45 degrees in the direction motor vehicle traffic is to pass. Vertical panels used on expressways, freeways, and other high-speed roadways shall have a minimum of 174,000 mm² (270 in²) retroreflective area facing motor vehicle traffic.**

**Option:**

- **Option:**
  - Where space is limited, vertical panels may be used to channelize motor vehicle traffic, divide opposing lanes, or replace barricades.
GUIDANCE
The spacing of vertical panels should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of tubular markers should not exceed a distance in meters (feet) equal to 0.6 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for tangent channelization.

6F.62 Drums
STANDARD
Drums used for road user warning or channelization shall be constructed of lightweight, deformable materials (see Figure 6F-7). They shall be a minimum of 0.300 (36 in) in height and have at least a 0.150 (18 in) minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 0.100 to 0.150 mm (4 to 6 in) wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflective spaced between the horizontal orange and white stripes, shall not exceed 0.050 mm (2 in) wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.

SUPPORT
Drums are highly visible, have good target value, give the appearance of being formidable obstacles and, therefore, command the respect of road users. They are portable enough to be shifted from place to place within a temporary traffic control zone in order to accommodate changing conditions, but are generally used in situations where they will remain in place for a prolonged period of time.

OPTION
Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

GUIDANCE
Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user. The spacing of drums should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of drums should not exceed a distance in meters (feet) equal to 0.6 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for tangent channelization.

STANDARD
Ballast shall not be placed on the top of a drum.

Section 6F.67 Drums
STANDARD:
Drums (see Figure 6F-7) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 36 inches in height and have at least an 18-inch minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4 to 6 inches wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflective spaced between the horizontal orange and white stripes shall not exceed 3 inches wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.

Support:
Drums are highly visible, have good target value, give the appearance of being formidable obstacles and, therefore, command the respect of road users. They are portable enough to be shifted from place to place within a TTC zone in order to accommodate changing conditions, but are generally used in situations where they will remain in place for a prolonged period of time.

Option:
Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

Guidance:
Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user.
6F.63 Type I, II, or III Barricades

Standard:
- Ballast shall not be placed on the top of a drum.

Section 6F.68 Type 1, 2, or 3 Barricades

Support:
- A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way. Barricades are classified as Type I, Type II, or Type III. (See Figure 6F-7)

STANDARD
- Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. As shown in Figure 6F-7, barricades are classified as Type 1, Type 2, or Type 3.

Standard:
- Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Except as provided in Paragraph 4, the stripes shall be 6 inches wide.

Option:
- When rail lengths are less than 36 inches, 4-inch wide stripes may be used.

STANDARD
- The minimum length for Type I and Type II Barricades shall be 600 mm (24 in) and the minimum length for Type III Barricades shall be 1200 mm (48 in). Each barricade rail shall be 200 to 300 mm (8 to 12 in) wide. Barricades used on expressways, freeways and other high-speed roadways shall have a minimum of 1274,000 mm² (270 in²) of retroreflective area facing road users.

GUIDANCE
Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.
Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades.

Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades. Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.

The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.

Barricade rail supports should not project into pedestrian circulation routes more than 100 mm (4 in) from the support between 625 mm (27 in) and 2000 mm (80 in) from the surface as described in Section 4.4.1 of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 3A.11).
OPTION
For Type I Barricades, the support may include other unstriped horizontal panels necessary to provide stability.

GUIDANCE
Barricades should be crashworthy as they are located adjacent to motor vehicle traffic flow and are subject to impact by errant vehicles.

Compliance Date: January 17, 2010

On high-speed expressways or in other situations where barricades may be susceptible to overturning in the wind, ballasting should be used.

OPTION
Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

STANDARD
Ballast shall not be placed on top of any striped rail. Barricades shall not be ballasted by non-deformable objects such as rocks or chunks of concrete. Ballast shall not extend into the accessible passage width of 1500 mm (60 in).

Support:
Type I or Type II Barricades are intended for use in situations where road user flow is maintained through the temporary traffic control zone.

GUIDANCE
The spacing of Type I and Type II barricades should not exceed a distance in meters (feet) equal to 0.3 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization. The spacing of type I and Type II barricades should not exceed a distance in meters (feet) equal to 0.6 times the posted speed limit in mph (2.0 times the posted speed limit in mph) when used for tangent channelization.

OPTION
Barricades may be used alone or in groups to mark a specific condition or they may be used in a series for channelizing road users. Type I barricades may be used on conventional roads or urban streets.

GUIDANCE
Type II or Type III Barricades should be used on expressways and freeways or other high-speed roadways. Type III Barricades should be used to close or partially close a road.

OPTION
Type III Barricades used at a road closure may be placed completely across a roadway or from curb to curb.

GUIDANCE
Where provision is made for access of authorized equipment and vehicles, the responsibility for Type III Barricades should be assigned to a person to ensure proper closure at the end of each workday.

Support:
Type I Barricades may be used alone or in groups to mark a specific condition or they may be used in a series for channelizing road users. Type 1 Barricades may be used on conventional roads or urban streets.

GUIDANCE
Type 2 or Type 3 Barricades should be used on freeways and expressways or other high-speed roadways. Type 3 Barricades should be used to close or partially close a road.

Option:
Type 2 or Type 3 Barricades should be used on freeways and expressways or other high-speed roadways. Type 3 Barricades should be used to close or partially close a road.

Support:
Where provision is made for access of authorized equipment and vehicles, the responsibility for Type 3 Barricades should be assigned to a person to ensure proper closure at the end of each workday.
When a highway is legally closed but access must still be allowed for local road users, barricades usually are not extended completely across the roadway.

STANDARD

1. Installing retroreflective sheeting on both sides of the barricade boards; or
2. By installing barricade boards back-to-back on the barricade.

STANDARD

Option:

1. Signs may be installed on barricades (see Section 6F.03).

STANDARD

Section 6F.69 Direction Indicator Barricades

Standard:

1. The Direction Indicator Barricade (see Figure 6F-7) shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally aligned, retroreflective rail (see Figure 6F-7, sheet 2 of 2). The One-Direction Large Arrow (W1-6) sign shall be black on an orange background. The stripes on the bottom panel shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 200 mm (4 in) wide. The One-Direction Large Arrow (W1-6) sign shall be 600 x 200 mm (24 x 12 in). The bottom panel shall have a length of 600 mm (24 in) and a height of 200 mm (8 in).

When Direction Indicator Barricades are used on two-lane, two-way roadways, they shall only be used in shifting or shoulder tapers. The Direction Indicator Barricade should be crushworthy.

GUIDANCE

The Direction Indicator Barricade is intended to be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.

GUIDANCE

If used, Direction Indicator Barricades should be used in series to direct the driver through the transition and into the intended travel lane.

The spacing of directional indicator barricades shall not exceed a distance in meters (feet) equal to 0.2 times the posted speed limit in mph (1.0 times the posted speed limit in mph) when used for taper channelization.

STANDARD

M1.0 STANDARD

If used, Direction Indicator Barricades may be used in series to direct the driver through the transition and into the intended travel lane.
Section 6F.70 Temporary Traffic Barriers as Channelizing Devices
Support:
Temporary traffic barriers are not TTC devices in themselves; however, when placed in a position identical to a line of channelizing devices and marked and/or equipped with appropriate channelization features to provide guidance and warning both day and night, they serve as TTC devices.

Standard:
Temporary traffic barriers serving as TTC devices shall comply with requirements for such devices as set forth throughout Part 6.

Temporary traffic barriers (see Section 6F.85) shall not be used solely to channelize road users, but also to protect the work space. If used to channelize vehicular traffic, the temporary traffic barrier shall be supplemented with delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility.

Guidance:
Temporary traffic barriers should not be used for a merging taper except in low-speed urban areas. Temporary traffic barriers should not be used for a constricted/restricted temporary traffic control zone. When it is necessary to use a temporary traffic barrier for a merging taper in low-speed urban areas or for a constricted/restricted temporary traffic control zone, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.

When used for channelization, temporary traffic barriers should be of a light color for increased visibility.

Section 6F.71 Longitudinal Channelizing Devices
Support:
Longitudinal channelizing devices are lightweight, deformable channelizing devices that can be used singly as Type 1, 2, or 3 barricades, or connected together to form highly visible channelizing devices.

Standard:
If used singly as Type 1, 2, or 3 barricades, longitudinal channelizing devices shall comply with the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for channelizing devices described in Chapter 6F.

Guidance:
When used for channelization, temporary traffic barriers should be of a light color for increased visibility.

Section 6F.71 Longitudinal Channelizing Devices
Support:
Longitudinal channelizing devices are lightweight, deformable devices that are highly visible, have good target value, and can be connected together.

Standard:
If used singly as Type 1, 2, or 3 barricades, longitudinal channelizing devices shall comply with the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for the devices described in this Chapter.

Guidance:
If used to channelize vehicular traffic at night, longitudinal channelizing devices should be supplemented with retroreflective...
<table>
<thead>
<tr>
<th>Section 6F.72 Temporary Lane Separators</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Option:</strong></td>
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</tr>
<tr>
<td>o Temporary lane separators may be used to channelize road users, to divide opposing vehicular traffic lanes, to divide lanes when two or more lanes are open in the same direction, and to provide continuous pedestrian channelization.</td>
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</tr>
<tr>
<td><strong>Standard:</strong></td>
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</tr>
<tr>
<td>o Temporary lane separators shall be crashworthy. Temporary lane separators shall have a maximum height of 4 inches and a maximum width of 1 foot, and shall have sloping sides in order to facilitate crossover by emergency vehicles.</td>
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</tr>
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<td><strong>Option:</strong></td>
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</tr>
<tr>
<td>o Temporary lane separators may be supplemented with any of the approved channelizing devices contained in this Chapter, such as tubular markers, vertical panels, and opposing traffic lane dividers.</td>
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</tr>
<tr>
<td><strong>Standard:</strong></td>
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</tr>
<tr>
<td>o If appropriate channelizing devices are used to supplement a temporary lane separator, the channelizing devices shall be retroreflectORIZED to provide nighttime visibility. If channelizing devices are not used, the temporary lane separator shall contain retroreflectORIZAtion to enhance its visibility.</td>
<td>o If appropriate channelizing devices are used to supplement a temporary lane separator, the channelizing devices shall be retroreflectORIZED to provide nighttime visibility. If channelizing devices are not used, the temporary lane separator shall contain retroreflectORIZAtion to enhance its visibility.</td>
</tr>
</tbody>
</table>
Guidance:
- A temporary lane separator should be stabilized by affixing it to the pavement in a manner suitable to its design, while allowing the unit to be shifted from place to place within the TTC zone in order to accommodate changing conditions.

Standard:
- At pedestrian crossing locations, temporary lane separators shall have an opening or be shortened to provide a pathway that is at least 60 inches wide for crossing pedestrians.

Section 6F.73 Other Channelizing Devices
Option:
- Channelizing devices other than those described in this Chapter may be used in special situations based on an engineering study.

Guidance:
- Other channelizing devices should comply with the general size, color, stripe pattern, retroreflection, and placement characteristics established for the devices described in this Chapter.

Section 6F.74 Detectable Edging for Pedestrians
Support:
- Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings are not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

Guidance:
- When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least \(6\text{ inches} \times 2.5\text{ inches} \) above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of \(2.5\text{ inches} \) above the surface. This edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed-in-place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly attached to the ground or to other devices. Adjacent sections of this edging should be interconnected such that the edging is not displaced by pedestrian or vehicular traffic or work operations, and such that it does not constitute a hazard to pedestrians, workers, or other road users.

Support:
- Examples of detectable edging for pedestrians include:
  A. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
  B. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.

Example:
- A. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.

C. Sections of lumber interconnected and fixed in place to form a continuous edge.

D. Formed-in-place asphalt or concrete curb.

E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.

F. Continuous temporary traffic barrier or longitudinal channelizing devices located at intervals along the edge of the sidewalk or walkway.

G. Chain link or other fencing equipped with a continuous bottom rail.

GUIDANCE
Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.

6F.69 Temporary Raised Islands

STANDARD
Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.

OPTION
A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of 4,000 to 15,000 average daily traffic (ADT) and on freeways having a vehicular traffic volume range of 22,000 ADT to 60,000 ADT.

Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the temporary traffic control zone is not required.

GUIDANCE
Temporary raised islands should have the basic dimensions of 100 mm (4 in) high by 450 mm (18 in) wide and have rounded or chamfered corners.

The temporary raised islands should not be designed in such a manner that they would cause a driver to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.

STANDARD
At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 600 mm (60 in) wide pathway for the crossing pedestrian.

6F.70 Opposing Traffic Lane Divider Sign (W6-4)

SUPPORT
The Opposing Traffic Lane Divider (W6-4) sign is a delineation device suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.

C. Sections of lumber interconnected and fixed in place to form a continuous edge.

D. Formed-in-place asphalt or concrete curb.

E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.

F. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway.

G. Chain link or other fencing equipped with a continuous bottom rail.

GUIDANCE
Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.

Section 6F.75 Temporary Raised Islands

STANDARD
Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.

Option:
A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of 4,000 to 15,000 average daily traffic (ADT) and on freeways having a vehicular traffic volume range of 22,000 ADT to 60,000 ADT.

Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the TTC zone is not required.

GUIDANCE
Temporary raised islands should have the basic dimensions of 4 inches high by at least 12 inches wide and have rounded or chamfered corners.

The temporary raised islands should not be designed in such a manner that they would cause a motorist to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.

STANDARD
At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 60-inch wide pathway for the crossing pedestrian.

Section 6F.76 Opposing Traffic Lane Divider and Sign (W6-4)

STANDARD
The Opposing Traffic Lane Divider (W6-4) sign is a delineation device suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.

C. Sections of lumber interconnected and fixed in place to form a continuous edge.

D. Formed-in-place asphalt or concrete curb.

E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.

F. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway.

G. Chain link or other fencing equipped with a continuous bottom rail.

GUIDANCE
Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.

Section 6F.75 Temporary Raised Islands

STANDARD
Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.

Option:
A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of 4,000 to 15,000 average daily traffic (ADT) and on freeways having a vehicular traffic volume range of 22,000 ADT to 60,000 ADT.

Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the TTC zone is not required.

GUIDANCE
Temporary raised islands should have the basic dimensions of 4 inches high by at least 12 inches wide and have rounded or chamfered corners.

The temporary raised islands should not be designed in such a manner that they would cause a motorist to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.

STANDARD
At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 60-inch wide pathway for the crossing pedestrian.

Section 6F.76 Opposing Traffic Lane Divider and Sign (W6-4)
Support:
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Standard:
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Odd-even STANDARDS
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

STANDARD
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Support:
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Standard:
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Support:
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Standard:
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Support:
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Standard:
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Support:
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Standard:
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Support:
- Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.

Standard:
- Opposing traffic lane dividers shall not be placed across pedestrian crossings.
- The Opposing Traffic Lane Divider (W6-4) sign shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.
Pavement marking obliteration shall leave a minimum of pavement scars and shall remove old marking material. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.

OPTION
Removable, nonreflective, preformed tape may be used where markings need to be covered temporarily.

Section 6F.78 Interim Pavement Markings
SUPPORT
Interim pavement markings are those that are allowed to remain in place until the earliest date when it is practical and possible to install pavement markings that meet the Part 3 standards for pavement markings.

GUIDANCE
Interim pavement markings should not be in place for more than 14 calendar days unless justified by an engineering study. White lane lines and yellow centerlines, including no passing zones should be installed before opening the roadway to traffic. If it is not possible or practical to install these markings before opening the roadway to traffic the interim markings should be installed at the end of each working day or provided by signing in accordance with the provisions of this section.

GUIDANCE (moved from lower in the section)
The temporary use of edge lines, channelizing lines, lane reduction transitions, gore markings, and other longitudinal markings, and the various non-longitudinal markings (such as stop lines, railroad crossings, crosswalks, words or symbols) should be in accordance with the State’s or highway agency’s policy.

STANDARD
All interim pavement markings, including pavement markings for no-passing zones, shall conform to the requirements of Chapters 3A and 3B with the following exceptions:

- Where it is safe to pass white broken lane lines and yellow broken center lines shall use the same cycle length as permanent markings and be at least 0.4 m (2 ft) wide.
- In no passing zones, full no passing zone markings in accordance with Part 3B shall be installed or the no passing zones shall be marked using signs as allowed below. The 0.4 m (2 ft) interim broken markings shall not be used in any no passing zone without the

For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical. Pavement marking obliteration shall remove the non-applicable pavement marking material, and the obliteration method shall minimize pavement scarring. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.

Option:
Removable, non-reflective, preformed tape that is approximately the same color as the pavement surface may be used where markings need to be covered temporarily.

Is grey allowed???
### Guidance:
- All pavement markings and devices used to delineate road user paths should be reviewed during daytime and nighttime periods.

#### Option:
- Half-cycle lengths with a minimum of 2-foot stripes may be used on roadways with severe curvature (see Section 3A.06) for broken line center lines in passing zones and for lane lines.

For temporary situations of 14 days or less, for a two- or three-lane road, no-passing zones may be identified by using DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (W14-3) signs (see Sections 2B.28, 2B.29, and 2C.45) rather than pavement markings. Also, DO NOT PASS, PASS WITH CARE, and NO PASSENGING ZONE signs may be used in lieu of pavement markings on roads with low volumes for longer periods in accordance with the State’s or highway agency’s policy.

- If used, the NO CENTER LINE sign should be placed in accordance with Sections 2B.28, 2B.29, and 2C.45.

### Option:
- If used, the NO CENTER LINE sign should be placed in accordance with Section 6F.47.

### Standard:
- If no interim markings are used a NO CENTER STRIPE sign (W8-12) shall be used for each direction of travel in accordance with Section 6F.44. This sign shall be repeated at major intersections or on one-mile intervals, whichever is greater.
- If interim no passing zone markings are not installed but interim broken markings are installed a NO CENTER STRIPE sign (W8-12) shall be installed in advance of each no passing zone.
- If not already in place, a NO PASS sign (R4-1) shall be installed on the right side of the road at the beginning of the zone opposite of the NO PASSING ZONE sign (W14-3).
- A PASS WITH CARE sign (R4-2) shall be installed on the right side of the road at the end of the no passing zone.

**Support:**
Details for these applications are found in Figures 6F-8a and 6F-8b.

### Option:
- If used, the NO CENTER LINE sign should be placed in accordance with Section 6F.47.

### On low volume roads with an ADT (Average Daily Traffic) of less than 400 vehicles, the signs may be used in lieu of pavement markings for up to 14 calendar days (see Section 5A.1).

### Standard:
- If no interim markings are used a NO CENTER STRIPE sign (W8-12) shall be used for each direction of travel in accordance with Section 6F.44. This sign shall be repeated at major intersections or on one-mile intervals, whichever is greater.
- If interim no passing zone markings are not installed but interim broken markings are installed a NO CENTER STRIPE sign (W8-12) shall be installed in advance of each no passing zone.
- If not already in place, a NO PASS sign (R4-1) shall be installed on the right side of the road at the beginning of the zone opposite of the NO PASSING ZONE sign (W14-3).
- A PASS WITH CARE sign (R4-2) shall be installed on the right side of the road at the end of the no passing zone.

### Support:
Details for these applications are found in Figures 6F-8a and 6F-8b.

### Option:
- If used, the NO CENTER LINE sign should be placed in accordance with Section 6F.47.

### On low volume roads with an ADT (Average Daily Traffic) of less than 400 vehicles, the signs may be used in lieu of pavement markings for up to 14 calendar days (see Section 5A.1).

### Standard:
- If no interim markings are used a NO CENTER STRIPE sign (W8-12) shall be used for each direction of travel in accordance with Section 6F.44. This sign shall be repeated at major intersections or on one-mile intervals, whichever is greater.
- If interim no passing zone markings are not installed but interim broken markings are installed a NO CENTER STRIPE sign (W8-12) shall be installed in advance of each no passing zone.
- If not already in place, a NO PASS sign (R4-1) shall be installed on the right side of the road at the beginning of the zone opposite of the NO PASSING ZONE sign (W14-3).
- A PASS WITH CARE sign (R4-2) shall be installed on the right side of the road at the end of the no passing zone.
pavement markers may be used to delineate center/lane lines at the same cycle length as permanent markings (See Section 6F-67).

GUIDANCE (moved to higher in this section)
The temporary use of edge lines, channelizing lines, lane reduction transitions, gore markings, and other longitudinal markings, and the various non-longitudinal markings (such as stop lines, railroad crossings, crosswalks, words or symbols) should be in accordance with the State’s or highway agency’s policy.

6F.73 Raised Pavement Markers

STANDARD

If raised pavement markers are used to substitute for broken line segments, a group of at least three retroreflective markers shall be equally spaced at no greater than N/8. The value of N for a broken or dotted line shall equal the length of one segment plus one gap. If raised pavement markers are used to substitute for solid line segments, the markers shall be equally spaced at no greater than N/5. All markers used for substitution shall be retroreflective or internally illuminated. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that may be adjacent to or may extend the solid lines (see Chapter 3B).

GUIDANCE

If raised pavement markers are used to substitute for broken line segments, at least two retroreflective markers shall be placed, one at each end of a segment of 0.6 m (2 ft) to 1.5 m (5 ft). For segments over 1.5 m (5 ft), a group of at least three retroreflective markers shall be equally spaced at no greater than N/8. Raised pavement markers should be considered for use along surfaced diversions (bypasses) or temporary roadways, and other changed or new travel-lane alignments, because of the need to accentuate changed travel paths and their wet weather capabilities.

OPTION

Retroreflective or internally illuminated raised pavement markers, or non-reflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may replace or supplement markings prescribed in Chapters 3A and 3B.

Section 6F.79 Temporary Raised Pavement Markers

Option:
- Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may be used for markings of other types in TTC zones.

Standard:
- If used, the color and pattern of the raised pavement markers shall simulate the color and pattern of the markings for which they substitute.
- If temporary raised pavement markers are used to substitute for broken line segments, a group of at least three retroreflective markers shall be equally spaced at no greater than N/8 (see Section 3B.14). The value of N for a broken or dotted line shall equal the length of one segment plus one gap.
- If temporary raised pavement markers are used to substitute for solid lines, the markers shall be equally spaced at no greater than N/5, with retroreflective or internally illuminated units at a spacing no greater than N/2. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Section 3B.11).

STANDARD

If temporary raised pavement markers are used to substitute for broken line segments by using at least two retroreflective markers placed at each end of a segment of 2 to 5 feet in length, using the same cycle length as permanent markings.

Guidance:
- Temporary raised pavement markers may be used to substitute for broken line segments by using at least two retroreflective markers placed at each end of a segment of 2 to 5 feet in length, using the same cycle length as permanent markings.
- If temporary raised pavement markers are used to substitute for solid lines, the markings shall be equally spaced at no greater than N/5, with retroreflective or internally illuminated units at a spacing no greater than N/2. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Section 3B.11).

STANDARD

If used, post mounted delineators shall combine with or supplement other temporary traffic control devices. They shall be

Standards: Section 6F.79 Temporary Raised Pavement Markers

Option:
- Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may also be used in TTC zones to supplement markings as prescribed in Chapters 3A and

STANDARD

If used, post mounted delineators shall combine with or supplement other temporary traffic control devices. They shall be

Standards: Section 6F.79 Temporary Raised Pavement Markers

Option:
- Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may also be used in TTC zones to supplement markings as prescribed in Chapters 3A and
mounted on crashworthy supports so that the reflecting unit is approximately 1.2 m (4 ft) above the near roadway edge. The standard color for post mounted delineators used along both sides of two-way streets and highways and the right side of one-way roadways shall be white. Post mounted delineators used along the left side of one-way roadways shall be yellow.

GUIDANCE

Spacing along roadway curves should be as set forth in Section 3D.4 and should be such that several delineators are always visible to the driver.

OPTION

Post mounted delineators may be used in temporary traffic control zones to indicate the alignment of the roadway and to outline the required vehicle path through the temporary traffic control zone.

6F.75 Lighting Devices

GUIDANCE

Lighting devices should be provided in temporary traffic control zones based on engineering judgment. When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

SUPPORT

Five types of lighting devices are commonly used in temporary traffic control zones: Floodlights, flashing warning beacons, warning lights, steady-burn electric lamps, and roadway lighting.

OPTION

Lighting devices may be used to supplement retroreflectORIZED signs, barriers, and channelizing devices. During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle.

STANDARD

Although vehicle hazard warning lights are permitted to be used to supplement rotating or strobe lights, they shall not be used instead of rotating or strobe lights.

6F.76 Floodlights

SUPPORT

Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when motor vehicle traffic volumes are lower. Large construction projects are sometimes operated on a double-shift basis requiring night work.

GUIDANCE

When nighttime work is being performed, floodlights should be used to illuminate the work area, flagger stations, equipment crossings,

TTC zones to supplement markings as prescribed in Chapters 3A and 3B.

Section 6F.80 Delineators

Standard:

○ When used, delineators shall combine with or supplement other TTC devices. They shall be mounted on crashworthy supports so that the reflecting unit is approximately 4 feet above the near roadway edge. The standard color for delineators used along both sides of two-way streets and highways and the right-hand side of one-way roadways shall be white. Delineators used along the left-hand side of one-way roadways shall be yellow.

Guidance:

○ Spacing along roadway curves should be as set forth in Section 3F.04 and should be such that several delineators are constantly visible to the driver.

Option:

○ Delineators may be used in TTC zones to indicate the alignment of the roadway and to outline the required vehicle path through the TTC zone.

Section 6F.81 Lighting Devices

Guidance:

○ Lighting devices should be provided in TTC zones based on engineering judgment.

○ When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Option:

○ Lighting devices may be used to supplement retroreflectORIZED signs, barriers, and channelizing devices.

○ During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle.

Standard:

○ Although vehicle hazard warning lights are permitted to be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights, they shall not be used instead of high-intensity rotating, flashing, oscillating, or strobe lights.

Section 6F.82 Floodlights

Support:

○ Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when motor vehicle traffic.
**Flashing warning beacons**

Flashing warning beacons are often used to supplement a temporary traffic control device.

**Standard**

Flashing warning beacons shall comply with the provisions of Chapter 1A. A flashing warning beacon shall be a flashing yellow light with a minimum nominal diameter of 200 mm (8 in).

**Guidance**

Flashing warning beacons should be operated 24 hours per day.

**Support**

During normal daytime maintenance operations, the functions of flashing warning beacons are adequately provided by rotating lights or strobe lights on a maintenance vehicle.

The temporary terminus of a freeway is an example of a location where flashing warning beacons alert drivers to the changing roadway conditions and the need to reduce speed in transitioning from the freeway to another roadway type.

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**Warning Lights**

Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

**Standard**

Warning lights shall be in accordance with the current ITE "Purchase Specification for Flashing and Steady-Burn Warning Lights" (see Section 1A.11).

When warning lights are used, they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

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**Emergency Flashing Warning Lights (Section 6G.77)**

- **Support**
  - When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.

**Guidance**

- When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.

- The adequacy of the floodlight placement and elimination of potential glare should be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically.

- Support:
  - Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 5 foot candles can be adequate for general activities. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot candles.

- Flushing warning beacons shall comply with the provisions of Chapter 1A. A flashing warning beacon shall be a flashing yellow light with a minimum nominal diameter of 200 mm (8 in).

- Support:
  - Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 5 foot candles can be adequate for general activities. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot candles.

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**Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when vehicular traffic volumes are lower. Large construction projects are sometimes operated on a double-shift basis requiring night work. (see Section 6G.19).**

**Guidance:**

- When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.

- The adequacy of the floodlight placement and elimination of potential glare should be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically.

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**Section 6F.83 Warning Lights**

Support:

- Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

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**Warning lights shall be in accordance with the current ITE Specification for Flashing and Steady-Burn Warning Lights**
### Warning Specification for Flashing and Steady-Burn Warning Lights

**Warning lights shall be in accordance with the current ITE Standard.**

**Guidance:**
- The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

**Support:**
- The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention. Option:
- A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.
  
  **Standard:**
  - A series of sequential flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet. Type B High-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.
  - If a series of sequential flashing warning lights is used, the successive flashing of the lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each flashing warning light in the sequence shall be flashed at a rate of not less than 55 or more than 75 times per minute. Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

  **Option:**
  - Type A Low-Intensity Flashing warning lights may be placed on channelizing devices.

**Support:**
- Type A Low-Intensity Flashing warning lights and Type C Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 300 m (1,000 ft). Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.

**Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.**

**Support:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

**Option:**
- Type B warning lights are designed to operate 24 hours per day and

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**Type A Low-Intensity Flashing lights**

- Type A Low-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 300 m (1,000 ft). Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.

**Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.**

**Support:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

**Option:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

**Warning lights shall be in accordance with the current ITE Standard.**

**Guidance:**
- The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

**Support:**
- The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention. Option:
- A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.
  
  **Standard:**
  - A series of sequential flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet. Type B High-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.
  - Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.

**Support:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

**Option:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

---

**Type B High-Intensity Flashing lights**

- Type B High-Intensity Flashing warning lights shall be used in either a steady-burn or flashing mode.

**Guidance:**
- The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

**Support:**
- The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention. Option:
- A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.
  
  **Standard:**
  - A series of sequential flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet. Type B High-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.
  - Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.

**Support:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

**Option:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

---

**Type C Steady-Burn lights**

- Type B High-Intensity Flashing warning lights shall be used in either a steady-burn or flashing mode.

**Guidance:**
- The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

**Support:**
- The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention. Option:
- A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.
  
  **Standard:**
  - A series of sequential flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet. Type B High-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.
  - Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.

**Support:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

**Option:**
- Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.
### Guidance

**Option:**
- Type A warning lights may be mounted on channelizing devices.
- Type B High-Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area.
- Type C Steady-Burn warning lights and Type D 360-degree Steady-Burn warning lights may be used during nighttime hours to delineate the edge of the traveled way.

**Guidance:**
- When used to delineate a curve, Type C and Type D 360-degree warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.

### Standard

**Support:**
- Type B High-Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area.
- Type B warning lights are designed to operate 24 hours per day and may be mounted on advance warning signs or on independent supports.
- Type C Steady-Burn warning lights and Type D 360-degree Steady-Burn warning lights may be used during nighttime hours to delineate the edge of the traveled way.

**Guidance:**
- When used to delineate a curve, Type C and Type D 360-degree warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.

---

**6F.78.1 Warning Lights on STOP Signs**

**Support**
- Type A warning lights are portable, powered, red, lens-directed, enclosed lights.

**Standard**
- Warning lights shall be in accordance with the current ITE “Purchase Specification for Flashing and Steady-Burn Warning Lights” except that they shall be red in color.
- When warning lights on STOP signs are used, they shall be mounted on the sign in such a manner, that if hit by an errant vehicle, they will not be likely to penetrate the windshield.
- Warning lights shall flash when placed on STOP signs.
- Type A Low-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 900 m (3,000 feet).

**6F.79—Steady-Burn Electric Lamps**

**Support**
- Steady-Burn electric lamps are a series of low-wattage, yellow, electric lamps, generally hard-wired to a 110-volt external power source.

**Option**
- Steady-Burn electric lamps may be used in place of Type C Steady-Burn warning lights (see Section 6F.78).

**6F.79.1 Roadway Lighting**

**Standard**
- To the extent practicable, all roadway lighting shall be shielded or have breakaway bases.

**Option**
- On long-term projects, the use of roadway lighting may be beneficial. Areas that may benefit from the installation of roadway lighting include high hazard areas, high volume areas, crossovers, diversions (bypasses), areas with sudden alignment changes, curves, intersections and transitions from multi-lane divided roadways to two-lane, two-way roadways.
### Section 6F.84 Temporary Traffic Control Signals

**Standard:**
- Temporary traffic control signals (see Section 4D.32) used to control road user movements through TTC zones and in other TTC situations shall comply with the applicable provisions of Part 4.

**Support:**
- Temporary traffic control signals are typically used in work zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

**Guidance:**

#### Where pedestrian traffic is detoured to a temporary traffic control signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals (see Section 4E.09) are needed for crossing along an alternate route.

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<tr>
<td>B. Work staging and operations;</td>
</tr>
</tbody>
</table>

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### Section 6F.84 Temporary Traffic Control Signals

**Support:**
- Temporary traffic control signals are typically used in TTC zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

**Standard:**
- A temporary traffic control signal that is used to control traffic through a one-lane, two-way section of roadway shall comply with the provisions of Section 4H.02.

**Guidance:**

- Where pedestrian traffic is detoured to a temporary traffic control signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals (see Section 4E.09) are needed for crossing along an alternate route.

- When temporary traffic control signals are used, conflict monitors typical of traditional traffic control signal operations should be used.

- Temporary traffic control signals may be portable or temporarily mounted on fixed supports.

---

### Section 6F.84 Temporary Traffic Control Signals

**Guidance:**

- Temporary traffic control signals should only be used in situations where temporary traffic control signals are preferable to other means of traffic control, such as changing the work staging or work zone size to eliminate one-way motor vehicle traffic movements, using flaggers to control one-way or crossing movements, using STOP or YIELD signs, and using warning devices alone.

- Factors related to the design and application of temporary traffic control signals include the following:
  - A. Safety and road user needs;
  - B. Work staging and operations;
B. Work staging and operations;
C. The feasibility of using other TTC strategies (for example, flaggers, providing space for two lanes, or detouring road users);
D. Sight distance restrictions;
E. Human factors considerations (for example, lack of driver familiarity with temporary traffic control signals);
F. Road user volumes including roadway and intersection capacity;
G. Affected side streets and driveways;
H. Vehicle speeds;
I. The placement of other TTC devices;
J. Parking;
K. Turning restrictions;
L. Pedestrians;
M. The nature of adjacent land uses (such as residential or commercial);
N. Legal authority;
O. Signal phasing and timing requirements;
P. Full-time or part-time operation;
Q. Actuated, fixed-time, or manual operation;
R. Power failures or other emergencies;
S. Inspection and maintenance needs;
T. Need for detailed placement, timing, and operation records; and
U. Operation by contractors or by others.

Although temporary traffic control signals can be mounted on trailers or lightweight portable supports, fixed supports offer superior resistance to displacement or damage by severe weather, vehicle impact, and vandalism.

GUIDANCE
Other temporary traffic control devices should be used to supplement temporary traffic control signals, including warning and regulatory signs, pavement markings, and channelizing devices.

Temporary traffic control signals not in use should be covered or removed.

If a temporary traffic control signal is located within 1/2 mile of an adjacent traffic control signal, consideration should be given to interconnected operation.

Standard:
Temporary traffic control signals shall not be located within 200 feet of a grade crossing unless the temporary traffic control signal is provided with preemption in accordance with Section 4D.27, or unless a uniformed officer or flagger is provided at the crossing to prevent vehicles from stopping within the crossing.
**Section 6F.85 Temporary Traffic Barriers**

**Support**

Temporary traffic barriers are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and designed to protect workers, bicyclists, and pedestrians.

There are five primary functions of temporary traffic barriers:

1. To keep motor vehicle traffic from entering work areas, such as excavations or material storage sites;
2. To separate workers, bicyclists, and pedestrians from motor vehicle traffic;
3. To separate opposing directions of motor vehicle traffic; and
4. To separate vehicular traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects; and
5. To protect drop-offs of greater than 300 mm (12 inches) on longer term projects when a suitable buffer lane cannot be provided.

**Option**

Temporary traffic barriers, including shifting portable or movable barrier installations to accommodate varying directional motor vehicle traffic demands, may be used to separate two-way motor vehicle traffic.

**Guidance**

Because of the risks to the driver and the risks involved in placement and removal of temporary traffic barriers, the following alternatives to using them should be strongly considered:

- Buffer lane closures;
- Nightly backfill of excavations;
- Temporary tapers;
- Temporary detours or crossovers;
- For lower speed projects, additional or closer spacing of channelizing devices in conjunction with extra delineation (TRPM's, pavement markings) and extra warning signs (in advance and within work area).

Because the protective requirements of a temporary traffic control situation have priority in determining the need for temporary traffic barriers, their use should be based on an engineering study. The following factors should be considered before using temporary traffic barriers:

- Speed/volume of traffic;
- Vertical/horizontal roadway alignment;
- Severity of hazard/excavation/obstacle;
- Lateral clearance to hazard;
- Duration of exposure;
- Duration of the temporary traffic control zone;
- Hazard presented by barrier itself once in place;
- Hazard presented by barrier itself once in place;

**Guidance**

Because the protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers, their use should be based on an engineering study. The following factors should be considered before using temporary traffic barriers:

- Speed/volume of traffic;
- Vertical/horizontal roadway alignment;
- Severity of hazard/excavation/obstacle;
- Lateral clearance to hazard;
- Duration of exposure;
- Duration of the temporary traffic control zone;
H. Hazard presented to workers and traffic during barrier placement.

Tables 6F-4a and 6F-4b should be used to determine when temporary traffic barrier in edge drop-off situations.

STANDARD
Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if they are used to channelize motor vehicle traffic. The delineation color shall match the applicable pavement marking color.

All temporary traffic barriers shall be crashworthy. Short intermittent segments of less than 30 m (100 feet) of temporary traffic barrier shall not be used because they nullify the containment and re-directive capabilities of the temporary traffic barrier, increase the potential for serious injury both to vehicle occupants and pedestrians, and encourage the presence of blunt, leading ends. All upstream leading ends that are present shall be appropriately flared or protected with properly installed and maintained crashworthy cushions. Adjacent temporary traffic barrier segments shall be properly connected in order to provide the overall strength required for the temporary traffic barrier to perform properly.

For lane closures, the merging taper shall use channelizing devices and the temporary traffic barrier shall be placed beyond the transition area. FROM SECTION 6G

In order to mitigate the effect of striking the end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO’s “Roadside Design Guide” (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments (see Section 6F.76). See Figure 6F-9 for temporary traffic barrier placement and end treatments.

OPTION
End attenuation may be necessary at both ends of barrier used on a two-lane two-way roadway.

GUIDANCE
Excessive/acute tapers and pronounced turns/corners should be avoided. Tapers should be made as smooth as possible.

Sufficient area should be maintained behind the barrier to allow for deflection. Barriers should not be buttressed up to, or mounted on top of curbs or medians. Placing barriers across a curb section should be avoided.

Temporary traffic barriers should be anchored in any location that does not allow adequate area for deflection.

SUPPORT
Temporary traffic barriers are designed to deflect when struck by a vehicle. Tapers, transition areas and barrier used outside of horizontal curves will see more deflection because of possibility higher angle hits. Tangent areas will generally see less deflection.

STANDARD

G. Hazard presented by barrier itself once in place.

H. Hazard presented to workers and traffic during barrier placement.

Tables 6F-4a and 6F-4b should be used to determine when temporary traffic barrier in edge drop-off situations.

STANDARD
Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if they are used to channelize vehicular traffic. The delineation color shall match the applicable pavement marking color.

All temporary traffic barriers, including their end treatments, shall be crashworthy. Each type of temporary traffic barrier (steel, water-filled or concrete, etc.) requires a specific basic minimum length to achieve its crashworthy compliance. Refer to the barrier’s crash testing results to determine the minimum length for predicted crash deflections. Shorter intermittent segments of temporary traffic barrier shall not be used because they nullify the containment and re-directive capabilities of the temporary traffic barrier, increase the potential for serious injury both to vehicle occupants and pedestrians, and encourage the presence of blunt, leading ends. All upstream leading ends that are present shall be appropriately flared or protected with properly installed and maintained crashworthy cushions. Adjacent temporary traffic barrier segments shall be properly connected in order to provide the overall strength required for the temporary traffic barrier to perform properly.

For lane closures, the merging taper shall use channelizing devices and the temporary traffic barrier shall be placed beyond the transition area.

In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO’s “Roadside Design Guide” (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments (see Section 6F.76). See Figure 6F-9 for temporary traffic barrier placement and end treatments.

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SUPPORT
Temporary traffic barriers are designed to deflect when struck by a vehicle. Tapers, transition areas and barrier used outside of horizontal curves will see more deflection because of possibility higher angle hits. Tangent areas will generally see less deflection.

STANDARD
Different designs of barrier shall not be intermixed on the same run of temporary traffic barrier. Barrier runs of different designs on the same project are acceptable, but the barrier runs shall not be connected.

GUIDANCE
Separate shorter runs with different barrier design types should be discouraged if a longer run of one type is possible.

STANDARD
Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are clearly needed.

OPTION
Warning lights or steady-burn electric lamps may be mounted on temporary traffic barrier installations. When in transition/taper areas or close to traffic lanes, retroreflective barrier markers or tape may be placed on barriers. Depending on roadway geometrics, temporary speed reduction may be used in barrier areas. G UIDANCE
When serving the additional function of channelizing motor vehicle traffic, temporary traffic barriers should be a light color for increased visibility.

SUPPORT
Temporary traffic barrier is subjected to considerable abuse. The placement process itself can cause damage to the base and ends. Connection loops can be bent and deformed when being placed. Temporary traffic barrier can also degrade over the long term. Barrier is often in place for long periods and is subject to winter road salt spray and snow plows. Over a period, delamination can result, often to the point of section loss. Also, the repeated process of transport and handling causes a good deal of longitudinal flexure, which can cause cracking.

GUIDANCE
Barrier sections and connections should be routinely inspected for damage.

SUPPORT
More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11).

Option:
- Warning lights or steady-burn lamps may be mounted on temporary traffic barrier installations.

Temporary traffic barriers are designed to deflect when struck by a vehicle. Tapers, transition areas and barrier used outside of horizontal curves will see more deflection because of possibility of higher angle hits. Tangent areas will generally see less deflection.

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GUIDANCE
Barrier sections, connections, and reflective devices should be routinely inspected for damage.

SUPPORT
- Movable barriers are capable of being repositioned laterally using a transfer vehicle that travels along the barrier. Movable barriers enable short-term closures to be installed and removed on long-term projects. Providing a barrier-protected work space for short-term closures and providing unbalanced flow to accommodate changes in the direction of peak-period traffic flows are two of the advantages of using movable barriers.
- Figure 6H-45 shows a temporary reversible lane using movable barriers. The notable feature of the movable barrier is that in both
Phase A and Phase B, the lanes used by opposing traffic are separated by a barrier.
- Figure 6H-34 shows an exterior lane closure using a temporary traffic barrier. Notes 7 though 9 address the option of using a movable barrier. By using a movable barrier, the barrier can be positioned to close the lane during the off-peak periods and can be relocated to open the lane during peak periods to accommodate peak traffic flows. With one pass of the transfer vehicle, the barrier can be moved out of the lane and onto the shoulder. Furthermore, if so desired, with a second pass of the transfer vehicle, the barrier could be moved to the roadside beyond the shoulder.
- More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11).

### Section 6F.86 Crash Cushions

**Support**:
- Crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two types of crash cushions that are used in temporary traffic control zones are stationary crash cushions and truck-mounted attenuators. Crash cushions in temporary traffic control zones help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles, and other obstacles. Specific information on the use of crash cushions can be found in AASHTO’s "Roadside Design Guide" (see Section 1A.11).

**Standard**:
- Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced.

- Crash cushions shall be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.

- Crash cushions shall be used in the same manner as permanent highway installations to protect drivers from the exposed ends of barriers, fixed objects, and other obstacles. More detailed information on the use of portable barriers and crash cushions can be obtained from Figure 6F-9.

**Standard**:
- Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.

**Support**:
- Crash cushions shall be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.

**Cautions**:
- Trucks may be used to protect workers or work equipment from errant vehicles.

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Truck-mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks. If used, the shadow vehicle with the attenuator shall be located in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.</td>
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When trucks are used as protection from errant vehicles, they should be equipped with truck-mounted attenuators, flashing arrows, changeable message signs, and/or rotating/strobe lights. They should be properly located in advance of the workers and/or equipment they are protecting.

The shadow truck should be positioned in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment. Support: Chapter 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11) contains additional information regarding the use of shadow vehicles. Guidance: The truck-mounted attenuator should be used in accordance with the manufacturer’s specifications.

Section 6F.84 Rumble Strips
Support:
- Transverse rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that alert drivers to unusual motor vehicle traffic conditions. Through noise and vibration they attract the driver’s attention to such features as unexpected changes in alignment and to conditions requiring a stop.

Standard:
- If it is desirable to use a color other than the color of the pavement for a longitudinal rumble strip, the color of the rumble strip shall be the same color as the longitudinal line the rumble strip supplements.
- If the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the rumble strip shall be white, black, or orange.
Intervals between rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any rumble strip installation.

GUIDANCE
Transverse rumble strips should be placed transverse to motor vehicle traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions. In urban areas, even though a closer spacing might be warranted, care should be taken not to promote panic braking or erratic steering maneuvers by drivers.

Rumble strips should not be placed on sharp horizontal or vertical curves.

Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 1.2 m (4 ft) is provided at each edge of the roadway or on each paved shoulder as described in AASHTO’s “Guide to the Development of Bicycle Facilities” (see Section 1A.11).

Longitudinal rumble strips should not be placed on the shoulder of a roadway that is used by bicyclists unless a minimum clear path of 1.2 m (4 ft) is also provided on the shoulder.

6F.85 Screens
SUPPORT
Screens are used to block the road users’ view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.

GUIDANCE
Screens should not be mounted where they could adversely restrict motorist visibility and sight distance and adversely affect the safe operation of vehicles.

OPTION
Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.

GUIDANCE
Design of screens should be in accordance with Chapter 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11).

6F.88 – Future and Experimental Devices
SUPPORT
The States, FHWA, AASHTO, the Transportation Research Board, and other organizations conduct research and experimentation on new traffic control and safety devices. Users of this Manual are encouraged to be aware of the results of these efforts, and to consider adopting devices and techniques whose performance is sustained by such research.

Option:
- Intervals between transverse rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any transverse rumble strip installation.
- Transverse rumble strips should be placed transverse to vehicular traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.
- In urban areas, even though a closer spacing might be warranted, transverse rumble strips should be designed in a manner that does not promote unnecessary braking or erratic steering maneuvers by road users.
- Transverse rumble strips should not be placed on sharp horizontal or vertical curves.
- Rumble strips should not be placed through pedestrian crossings or on bicycle routes.
- Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 4 feet is provided at each edge of the roadway or on each paved shoulder as described in AASHTO’s “Guide to the Development of Bicycle Facilities” (see Section 1A.11).
- Longitudinal rumble strips should not be placed on the shoulder of a roadway that is used by bicyclists unless a minimum clear path of 4 feet is also provided on the shoulder.

Section 6F.88 Screens
Support:
- Screens are used to block the road users’ view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.

Guidance:
- Screens should not be mounted where they could adversely restrict road user visibility and sight distance and adversely affect the reasonably safe operation of vehicles.

Option:
- Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.

Guidance:
- Design of screens should be in accordance with Chapter 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11).
encouraged to stay abreast of these current efforts and to use such devices with care so as to avoid presenting road users with unusual or confusing situations that might be abnormal or unexpected.

**STANDARD**

New traffic control devices shall conform to the provisions for design, use, and application set forth in this Manual. New traffic control devices that do not conform with the provisions in this Manual shall be subject to experimentation, documentation, and adoption following the provisions of Section 1A.10.