WORK AREA PROTECTION GUIDE

STREET AND UTILITY REPAIRS

2010
For a complete copy of

The Manual of Uniform Traffic Control Devices

(MUTCD)

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INTRODUCTION

This handbook generally represents minimum requirements for typical situations. It is not intended as a substitute for engineering judgment and may need to be altered to fit the conditions of a particular site. At a minimum all traffic control must be in compliance with the Manual on Uniform Traffic Control Devices (MUTCD) which contains information in addition to what is included in this guide. Proper traffic control must be used when utility operations, or other types of road or street construction occurs on any road open to public travel.

WHY YOU SHOULD FOLLOW THIS BOOK

Federal Regulation: The Manual on Uniform Traffic Control Devices (MUTCD) is incorporated by reference in 23 Code of Federal Regulations (CFR), Part 655, Subpart F and shall be recognized as the national standard for traffic control devices installed on any street, highway, or bicycle trail open to public travel in accordance with 23 U.S.C. 109(d) and 402(a). The policies and procedures of the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices shall be as described in 23 CFR 655, Subpart F.

State Law: 625 ILCS 5/11-304 Local traffic-control devices: Local authorities in their respective maintenance jurisdiction shall place and maintain such traffic-control devices upon highways under their maintenance jurisdiction as required to indicate and carry out the provisions of this Chapter, and local traffic ordinances, or to regulate, warn, or guide traffic. All such traffic control devices shall conform to the State Manual and Specifications and shall be justified by traffic warrants stated in the Manual. Placement of traffic-control devices on township or road district roads also shall be subject to the written approval of the county engineer or superintendent of highways.”
MUTCD DEFINITIONS

**Standard** – a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. The verb **shall** is typically used. Standards are sometimes modified by Options.

**Guidance** – a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or an engineering study indicates the deviation to be appropriate. The verb **should** is typically used. Guidance statements are sometimes modified by Options.

**Option** – a statement of practice that is a permissive condition and carries no requirement or recommendation. Options may contain allowable modifications to a Standard or Guidance. The verb **may** is typically used.

**Support** – an informal statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. The verbs **shall**, **should**, and **may** are not used in Support Statements.

FUNCTION OF GOOD TRAFFIC CONTROL

The primary function of temporary traffic control (TTC) is to provide for the reasonably safe and efficient movement of road users through or around temporary traffic control zones while reasonably protecting workers, responders to traffic incidents, and equipment.

FUNDAMENTAL PRINCIPLES OF TEMPORARY TRAFFIC CONTROL

The needs and control of road users through a TTC zone **shall** be an essential part of highway construction, utility work, maintenance operations, and incident management. Road user and worker safety, and accessibility in TTC zones should be an integral and high priority element of every project from planning, through design, and construction. All TTC zones, including maintenance and utility work zones, should be planned and conducted with the safety and accessibility of all motorists, bicyclists, pedestrians, and workers...
being considered at all times. If the TTC zone includes work at or near a highway rail grade crossing, early coordination with the railroad company should take place.

1) Road user movement should be restricted as little as practical based on the following considerations:

   A. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speed if they clearly perceive a need to do so.

   B. Frequent and abrupt changes in geometrics, such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers should be avoided.

   C. Provisions should be made for the reasonably safe operation of work, particularly on high-speed, high-volume roadways.

   D. Road users should be encouraged to use alternate routes that do not include TTC zones.

   E. Bicyclists and pedestrians should be provided with access and reasonably safe passage through the TTC zone.

   F. Roadway occupancy should be scheduled during off-peak hours and, if necessary, night work should be considered.

   G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before roadway or ramp closings.

2) Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites. Use adequate warning, delineation and channelization devices. Inconsistent devices should be removed or covered.

3) To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:

   A. Individuals who are knowledgeable in the principles of proper TTC should be assigned responsibility for safety in TTC zones.
B. As the work progresses, TTCs and/or working conditions should be modified in order to provide reasonably safe and efficient road user movement and to promote worker safety.

C. TTC zones should be carefully monitored under varying conditions of road user volumes, lighting conditions, and weather to check that applicable TTC devices are effective, clearly visible, clean and in compliance with the TTC plan.

D. Crash records in TTC zones should be monitored to identify the need for changes in TTC plans.

4) Attention should be given to the maintenance of roadside safety devices through the duration of the TTC zone by applying the following principles:

   A. Unencumbered roadside recovery areas or clear zones should be provided, where practical.
   
   B. Work equipment, worker’s private vehicles, materials, and debris should be stored in such a manner as to reduce the probability of impact by run-off-the-road vehicles.

5) Maintaining positive public relations is necessary.

   A. The needs of all road users should be assessed, and adequate advance notice be given to them.
   
   B. News media should be contacted in an effort to publicize TTC zones.
   
   C. The needs of adjoining property owners, residents, and businesses should be assessed.
   
   D. The needs of emergency service providers, railroads and transit, and commercial vehicles should be assessed. Appropriate accommodations should be made.
TEMPORARY TRAFFIC CONTROL ZONE COMPONENTS

Most TTC zones are divided into four areas: The advance warning area, the transition area, the activity area, and the termination area.

1) **Advanced warning area** – the section of highway where road users are informed about the upcoming work zone or incident area.

2) **Transition area** – the section of highway where road users are redirected out of their normal path. When redirection of the road users’ normal path is required, they shall be channelized from the normal path to a new path.

3) **Activity area** – the section of highway where the work activity takes place. It is comprised of the workspace, the traffic space and the buffer space.

4) **Termination area** – shall be used to return road users to their normal path. The termination area shall extend from the downstream end of the work area to the last TTC device.
Figure 6C-1. Component Parts of a Temporary Traffic Control Zone

- **Legend**
  - Arrow: Direction of travel

- **Termination Area**
  - Lets traffic resume normal operations

- **Downstream Taper**

- **Buffer Space (longitudinal)**

- **Work Space**
  - Is set aside for workers, equipment, and material storage

- **Activity Area**
  - Is where work takes place

- **Buffer Space (longitudinal)**
  - Provides protection for traffic and workers

- **Transition Area**
  - Moves traffic out of its normal path

- **Shoulder Taper**

- **Advance Warning Area**
  - Tells traffic what to expect ahead

- **Traffic Space**
  - Allows traffic to pass through the activity area

- **Buffer Space (lateral)**
  - Provides protection for traffic and workers
TAPERS

Tapers may be used in both the transition and termination areas. Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted. Longer tapers are not necessarily better than shorter tapers, because extended tapers tend to encourage sluggish operation and to encourage drivers to unnecessarily delay lane changes. Types of tapers are as follows:

1) **Merging taper** – a merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into a single lane before the end of the transition.

2) **Shifting taper** – a shifting taper is used when a lateral shift is needed. A shifting taper should have a length of approximately 0.5 L

3) **Shoulder taper** – a shoulder taper may be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. Shoulder tapers should have a length of approximately 0.33 L

4) **Downstream taper** – a downstream taper may be useful in termination areas to provide a visual cue to the driver that the original lane or path that was closed is open again. When used, a downstream taper should have a minimum length of approximately 100 ft per lane with devices placed at a spacing of approximately 20 ft.

5) **One-Lane, two-way taper** – the one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction. Traffic should be controlled by a flagger or temporary traffic signals. A short taper having a maximum length of 100 ft with channelizing devices spaced at approximately 20 foot spacing should be used to guide traffic into the one-way section.
TAPERS

Figure 6C-2. Types of Tapers and Buffer Spaces
### Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length (L)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merging Taper</td>
<td>at least L</td>
</tr>
<tr>
<td>Shifting Taper</td>
<td>at least 0.5L</td>
</tr>
<tr>
<td>Shoulder Taper</td>
<td>at least 0.33L</td>
</tr>
<tr>
<td>One-Lane, Two-Way Traffic Taper</td>
<td>30 m (100 ft) maximum</td>
</tr>
<tr>
<td>Downstream Taper</td>
<td>30 m (100 ft) per lane</td>
</tr>
</tbody>
</table>

### Table 6C-4. Formulas for Determining Taper Lengths

<table>
<thead>
<tr>
<th>Speed Limit (S)</th>
<th>Taper Length (L) Meters</th>
<th>Speed Limit (S)</th>
<th>Taper Length (L) Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 km/h or less</td>
<td>( L = \frac{WS^2}{155} )</td>
<td>40 mph or less</td>
<td>( L = \frac{WS^2}{60} )</td>
</tr>
<tr>
<td>70 km/h or more</td>
<td>( L = \frac{WS}{1.6} )</td>
<td>45 mph or more</td>
<td>( L = WS )</td>
</tr>
</tbody>
</table>

Where: \( L \) = taper length in meters (feet)  
\( W \) = width of offset in meters (feet)  
\( S \) = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)
**Table for Taper Length L**

<table>
<thead>
<tr>
<th>Posted Speed (MPH)</th>
<th>Taper Length L</th>
<th>Posted Speed (MPH)</th>
<th>Taper Length L</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>80</td>
<td>45</td>
<td>540</td>
</tr>
<tr>
<td>25</td>
<td>125</td>
<td>50</td>
<td>600</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td>55</td>
<td>660</td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td>60</td>
<td>720</td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td>65</td>
<td>780</td>
</tr>
</tbody>
</table>

**GUIDELINES FOR LONGITUDINAL BUFFER SPACE**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Length (ft)</th>
<th>Speed (mph)</th>
<th>Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 . . . . . .35</td>
<td>170</td>
<td>40 . . . . . . . .120</td>
<td>170</td>
</tr>
<tr>
<td>25 . . . . . .55</td>
<td>220</td>
<td>45 . . . . . . . .220</td>
<td>780</td>
</tr>
<tr>
<td>30 . . . . . .85</td>
<td>280</td>
<td>50 . . . . . . . .280</td>
<td>280</td>
</tr>
<tr>
<td>35 . . . . . .120</td>
<td>335</td>
<td>55 . . . . . . . .335</td>
<td>335</td>
</tr>
</tbody>
</table>
This page intentionally left blank
DETOURS AND DIVERSSIONS

A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone. Detours should be clearly signed over their entire length so road users can easily use existing highways to return to the original highway. A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work area.

ONE-LANE, TWO-WAY TRAFFIC CONTROL

When traffic in both directions must use a single lane for a limited distance, movements from each end shall be coordinated. Provisions should be made for alternate one-way movement through the constricted section. Control points at each end should be chosen to permit easy passing of opposing lanes of vehicles.

Figure 6C-3. Example of a One-Lane, Two-Way Traffic Taper
FLAGGERS

When a one-lane, two-way TTC zone is short enough to allow a flagger to see from one end of the zone to the other, traffic may be controlled by either a single flagger or by a flagger at each end of the section. When a single flagger is used, the flagger should be stationed on the shoulder opposite the constriction or work space, or in a position where good visibility and traffic control can be maintained at all times. When good visibility and traffic control cannot be maintained by one flagger station, traffic should be controlled by a flagger at each end of the section. One of the flaggers should be designated as the coordinator. Flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals.

A flagger shall be a person who provides TTC. Because they are responsible for road user safety, and because they make frequent contact with the public, they should be trained in safe traffic control practices and public contact techniques. Flaggers should be able to satisfactorily demonstrate the following abilities:

A: Ability to receive and communicate specific instructions clearly, firmly, and courteously;
B: Ability to move and maneuver quickly in order to avoid danger from errant vehicles;
C: Ability to control signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers approaching a TTC zone in frequently changing situations;
D: Ability to understand and apply safe traffic control practices, sometimes in stressful or emergency situations; and
E: Ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.
HIGH-VISIBILITY CLOTHING

For daytime work, flaggers shall wear safety apparel meeting the requirements of the ANSI 107-2004 standard performance for Class 2 risk exposure. For nighttime work, safety apparel meeting the requirements of standard performance Class 3 should be considered. The apparel background material color for Class 2 or 3 shall be either fluorescent orange-red or fluorescent yellow-green as defined in the standard. The retroreflective material shall be either orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1000 feet. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

Class 2 vests for law enforcement have different characteristics, mainly shorter length to allow access to their belt. They are labeled as such by the manufacturer.

FLAGGER DEVICES

Hand-signaling devices, such as STOP/SLOW paddles, lights, and red flags, are used to control road users through TTC zones. The STOP/SLOW paddle should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags should be limited to emergency situations.

The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 18” wide (IDOT uses a 24” paddle) with letters at least 6” high and should be fabricated from light semi-rigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

Flags, when used, shall be a minimum of 24” square, made of a good grade of red material, and securely fastened to a staff that is approximately 36” in length. The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds. When used at night, flags shall be retroreflectorized red.
Figure 6E-1. Use of Hand-Signaling Devices by Flaggers

<table>
<thead>
<tr>
<th>PREFERRED METHOD</th>
<th>EMERGENCY SITUATIONS ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP/SLOW Paddle</td>
<td>Red Flag</td>
</tr>
</tbody>
</table>

**TO STOP TRAFFIC**

**TO LET TRAFFIC PROCEED**

**TO ALERT AND SLOW TRAFFIC**
FLAGGER PROCEDURES

The following methods of signaling with paddles shall be used:

1) To stop road users, the flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.

2) To direct stopped road users to proceed, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed.

3) To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.

The following methods of signaling with flags shall be used:

1) To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users’ lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above the shoulder level toward approaching traffic.

2) To direct stopped road users to proceed, the flagger shall stand parallel to the road user movement with flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

3) To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.
FLAGGER STATIONS

Flagger stations **shall** be located far enough in advance of the work space so that approaching road uses will have sufficient distance to stop before entering the work space. Except in emergency situations, flagger stations **should** be preceded by proper advance warning signs. At night, flagger stations **should** be illuminated.

The flagger **should** stand either on the shoulder adjacent to the traffic lane being controlled or in the closed lane prior to stopping road users. A flagger **should** only stand in the traffic lane being used by moving road users after road users have stopped. The flagger **should** be clearly visible to the first approaching road user at all times. The flagger also **should** be visible to other road users. The flagger **should** be stationed sufficiently in advance of the workers to warn them (by horns, whistles etc.) of approaching danger by out-of-control vehicles. The flagger **should** stand alone. Never permit a group of workers to congregate around the flagger station.

TEMPORARY TRAFFIC CONTROL ZONE DEVICES

Traffic control devices **shall** be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide road users, placed on, over, or adjacent to a street, highway, pedestrian facility, or bikeway by authority of a public body or official having jurisdiction. All traffic control devices used on street and highway construction, maintenance, utility, or incident management operations **shall** conform to the applicable provisions of this Manual.
**SPACING FOR CHANNELIZING DEVICES**

Spacings for channelizing devices should not exceed

<table>
<thead>
<tr>
<th>MPH</th>
<th>TANGENT</th>
<th>TAPER</th>
<th>MPH</th>
<th>TANGENT</th>
<th>TAPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>40’</td>
<td>20’</td>
<td>40</td>
<td>80’</td>
<td>40’</td>
</tr>
<tr>
<td>25</td>
<td>50’</td>
<td>25’</td>
<td>45</td>
<td>90’</td>
<td>45’</td>
</tr>
<tr>
<td>30</td>
<td>60’</td>
<td>30’</td>
<td>50</td>
<td>100’</td>
<td>50’</td>
</tr>
<tr>
<td>35</td>
<td>70’</td>
<td>35’</td>
<td>55</td>
<td>110’</td>
<td>55’</td>
</tr>
</tbody>
</table>

Device spacing for one-lane, two-way shall be 20’ regardless of speed.

*Warning lights (optional)*

Note: 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 900 mm (36 in) to be detectable to users of long canes.
Figure 6F-7. Channelizing Devices (Sheet 2 of 2)

* Warning lights (optional)
** Rail stripe widths shall be 150 mm (6 in), except that 100 mm (4 in) wide stripes may be used if rail lengths are less than 900 mm (36 in). The sides of barricades facing traffic shall have retroreflective rail facets.

Note: If 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 900 mm (36 in) above the ground surface.
SIGNS

TTC zone signs convey both general and specific messages by means of words or symbols, and have the same three categories as all road user signs: regulatory, warning, and guide. With few exceptions, warning signs in TTC zones shall have a black legend on an orange background.

All signs used at night shall be either retroreflective with a material that has a smooth, sealed outer surface, or illuminated to show the same shape and similar color both day and night. The requirement for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting.

Ground-mounted signs installed at the side of the road in rural areas shall be mounted at a height at least 5 ft measured from the bottom of the sign to the near edge of the pavement. In business, commercial, and residential districts where parking and/or bicycle or pedestrian movement is likely to occur, or where there are other obstructions to view, the distance between the bottom of the sign and the top of the near edge of the traveled way shall be at least 7 ft.
Sign supports **shall** be crashworthy. Signs mounted on barricades and barricade/sign combinations **shall** be crashworthy. Signs mounted on barricades, or other portable supports, **shall** be no less than 1 ft above the traveled way.

Signs **shall** be properly maintained for cleanliness, visibility, and correct positioning. Signs that have lost significant legibility **shall** be promptly replaced.

*Figure 6F-2. Methods of Mounting Signs Other Than on Posts*
# IDOT Guidelines

## Sign Size Designation

<table>
<thead>
<tr>
<th>Posted Speed Limit</th>
<th>2-Lane Low ADT</th>
<th>2-Lane</th>
<th>Multi-Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤35</td>
<td>30”</td>
<td>36”</td>
<td>48”</td>
</tr>
<tr>
<td>40-50</td>
<td>36”</td>
<td>48”</td>
<td>48”</td>
</tr>
<tr>
<td>≥55</td>
<td>36”</td>
<td>48”</td>
<td>48”</td>
</tr>
</tbody>
</table>

## Sign Spacing

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Distance Between Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Urban Low Speed (&lt;40)</td>
<td>100 ft</td>
</tr>
<tr>
<td>Urban High Speed (45-50)</td>
<td>350 ft</td>
</tr>
<tr>
<td>Rural (55)</td>
<td>500 ft</td>
</tr>
<tr>
<td>Expressway/Freeway</td>
<td>1000 ft</td>
</tr>
</tbody>
</table>
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones
(Sheet 1 of 4)
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones
(Sheet 2 of 4)
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones
(Sheet 3 of 4)

* An optional STREET CLOSED word message sign is shown in the “Standard Highway Signs” book.
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones
(Sheet 4 of 4)

W21-5b  OR  RIGHT SHOULDER CLOSED 1000 FT
W21-6  SURVEY CREW
W21-7  UTILITY WORK AHEAD
W22-1  BLASTING ZONE AHEAD
W22-2  TURN OFF 2-WAY RADIO AND CELL PHONE
W22-3  END BLASTING ZONE
W23-1  SLOW TRAFFIC AHEAD
W24-1  ROAD WORK NEXT 5 MILES
W24-1a  OR  ROAD WORK NEXT 8 KM
W24-1b  END ROAD WORK
G20-1  PILOT CAR FOLLOW ME
G20-2  ROAD WORK
G20-4  ROAD WORK

Figure 6F-5. Exit Open and Closed and Detour Signs

EXIT OPEN  EXIT CLOSED  EXIT ONLY
E5-2  E5-2a  E5-3
M4-8  DETOUR  END DETOUR
M4-8a  END  DETOUR
M4-9  DETOUR
M4-9a  DETOUR
M4-9b  DETOUR
M4-9c  DETOUR
M4-10  DETOUR

M4-8b
SELECTING THE TYPICAL APPLICATION

Each TTC zone is different. Many variables, such as location of work, road type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, cars) and road use speeds affect the needs of each zone. The goal of TTC in work zones is safety with minimum disruption to road users. The key factor in promoting TTC zone safety is proper judgment.

Typical applications of TTC zones are organized according to duration, location, type of work, and highway type. Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.

Duration of Work – work duration is a major factor in determining the number and types of devices used in TTC zones. The duration of a TTC zone is defined relative to the length of time a work operation occupies a spot location. The five categories of work duration and their time at a location shall be:

A. Long-term stationary – work that occupies a location more than 3 days.
B. Intermediate-term stationary – work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
C. Short-term stationary – daytime work that occupies a location for more than 1 hour within a single daylight period.
D. Short duration – work that occupies a location up to 1 hour.
E. Mobile – work that moves intermittently or continuously.
Location of work – the choice of TTC needed for a TTC zone depends upon where the work is located. As a general rule, the closer the work is to road users, the greater the number of TTC devices. Procedures are described later in this book for establishing TTC zones in the following locations:

A. Outside the shoulder – when work is being performed off the roadway, little or no TTC may be needed. As a rule of thumb, work confined to 15 feet or more from the edge of the traveled way generally does not require TTC.

However, TTC is appropriate where distracting situations exist, such as vehicles accessing the work site via the highway and equipment traveling on or crossing the roadway. A single warning sign like ROAD WORK AHEAD should be used.

B. On the shoulder with no encroachment – when paved shoulders of 8ft width or more are closed; at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder.

C. On the shoulder with minor encroachment – when work takes up part of a lane, judgment is required to determine whether the affected lane should be closed. Traffic volume, speed, and road capacity should be taken into account.

If the lane encroachment does not permit a remaining lane width of 10 feet, the lane should be closed.

D. Within the median – if work in the median of a divided highway is within 15 feet from the edge of the traveled way of either direction of travel, TTC should be used.

E. Within the traveled way – follow the appropriate typical application
TYPICAL APPLICATION INDEX

Selected Applications for use by Counties, Municipalities, Townships, and Utility Companies.

<table>
<thead>
<tr>
<th>Location, Roadway Type</th>
<th>Application</th>
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**Roadside (outside of shoulder)**

- All roadways
  - Work beyond the shoulder .................. TA-1

**Shoulder**

- All roadways
  - Work on shoulders.......................... TA-3
  - Mobile operation on shoulder .......... TA-4
  - Shoulder work with minor............... TA-6
    - encroachment

**Within traveled way**

- Rural two-lane
  - Road closure “day labor”................. BLR 17-3
  - Road closure long term .................. BLR 21-6
  - Road closed to thru traffic ............ BLR 22-4
  - Lane closure w/ flaggers................. TA-10
  - Lane closure on low-volume road ...... TA-11
  - Lane closure w/ traffic signals......... TA-12
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  - Work in center of low-volume roads.... TA-15
  - Mobile operation on two-lane road...... TA-17
  - Mobile operation on two-lane road.... BLR 18-4

For additional diagrams see the MUTCD, Chapter 6.
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<thead>
<tr>
<th>Location, Roadway Type</th>
<th>Application</th>
</tr>
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<tbody>
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<td>Sidewalk closure and bypass</td>
<td>TA-28</td>
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<td>TA-29</td>
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<td><strong>Multilane undivided</strong></td>
<td></td>
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<td>Interior lane closure on multilane</td>
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<tr>
<td>Half road closure on multilane</td>
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<td>highway</td>
<td></td>
</tr>
<tr>
<td><strong>Multilane divided</strong></td>
<td></td>
</tr>
<tr>
<td>Lane closure on divided highway</td>
<td>TA-33</td>
</tr>
<tr>
<td>Mobile operation on multilane road</td>
<td>TA-35</td>
</tr>
</tbody>
</table>

For additional diagrams see the MUTCD, Chapter 6.
Table 6H-2. Meaning of Symbols on Typical Application Diagrams

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Arrow panel" /></td>
<td>Arrow panel</td>
</tr>
<tr>
<td><img src="image" alt="Arrow panel support or trailer" /></td>
<td>Arrow panel support or trailer (shown facing down)</td>
</tr>
<tr>
<td><img src="image" alt="Changeable message sign or support trailer" /></td>
<td>Changeable message sign or support trailer</td>
</tr>
<tr>
<td><img src="image" alt="Channelizing device" /></td>
<td>Channelizing device</td>
</tr>
<tr>
<td><img src="image" alt="Crash Cushion" /></td>
<td>Crash Cushion</td>
</tr>
<tr>
<td><img src="image" alt="Direction of temporary traffic detour" /></td>
<td>Direction of temporary traffic detour</td>
</tr>
<tr>
<td><img src="image" alt="Direction of traffic" /></td>
<td>Direction of traffic</td>
</tr>
<tr>
<td><img src="image" alt="Flagger" /></td>
<td>Flagger</td>
</tr>
<tr>
<td><img src="image" alt="High level warning device (Flag tree)" /></td>
<td>High level warning device (Flag tree)</td>
</tr>
<tr>
<td><img src="image" alt="Luminaire" /></td>
<td>Luminaire</td>
</tr>
<tr>
<td><img src="image" alt="Pavement markings that should be removed for a long term project" /></td>
<td>Pavement markings that should be removed for a long term project</td>
</tr>
<tr>
<td><img src="image" alt="Sign (shown facing left)" /></td>
<td>Sign (shown facing left)</td>
</tr>
<tr>
<td><img src="image" alt="Surveyor" /></td>
<td>Surveyor</td>
</tr>
<tr>
<td><img src="image" alt="Temporary barrier" /></td>
<td>Temporary barrier</td>
</tr>
<tr>
<td><img src="image" alt="Temporary barrier with warning lights" /></td>
<td>Temporary barrier with warning lights</td>
</tr>
<tr>
<td><img src="image" alt="Traffic or Pedestrian signal" /></td>
<td>Traffic or Pedestrian signal</td>
</tr>
<tr>
<td><img src="image" alt="Type III Barricade" /></td>
<td>Truck mounted attenuator</td>
</tr>
<tr>
<td><img src="image" alt="Type III Barricade" /></td>
<td>Type III Barricade</td>
</tr>
<tr>
<td><img src="image" alt="Warning lights" /></td>
<td>Warning lights</td>
</tr>
<tr>
<td><img src="image" alt="Work space" /></td>
<td>Work space</td>
</tr>
<tr>
<td><img src="image" alt="Work vehicle" /></td>
<td>Work vehicle</td>
</tr>
</tbody>
</table>
Notes for Figure 6H-1—Typical Application 1
Work Beyond the Shoulder

Guidance:
1. If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.

Option:
2. The ROAD WORK AHEAD sign may be replaced with other appropriate signs such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.
3. The ROAD WORK AHEAD sign may be omitted where the work space is behind a barrier, more than 600 mm (24 in) behind the curb, or 4.6 m (15 ft) or more from the edge of any roadway.
4. For short-term, short-duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
6. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 1
Notes for Figure 6H-3—Typical Application 3

Work on Shoulders

Guidance:
1. A SHOULDER WORK sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.

Option:
2. The Workers symbol signs may be used instead of SHOULDER WORK signs.
3. The SHOULDER WORK AHEAD sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
4. For short-duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
6. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
7. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.
Figure 6H-3. Work on Shoulders (TA-3)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-4—Typical Application 4
Short-Duration or Mobile Operation on Shoulder

Guidance:
1. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 8 km (5 mi).
2. In those situations where the distance between the advance signs and the work is 3.2 km (2 mi) to 8 km (5 mi), a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.

Option:
3. The ROAD WORK NEXT XX km (MILES) sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 3.2 km (2 mi).
4. Warning signs may be omitted when the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights if the distance between work locations is 1.6 km (1 mile) or more, and if the work vehicle travels at vehicular traffic speeds between locations.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
6. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.
7. If an arrow panel is used for an operation on the shoulder, the caution mode shall be used.
Figure 6H-4. Short-Duration or Mobile Operation on Shoulder (TA-4)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 4
Notes for Figure 6H-6—Typical Application 6
Shoulder Work with Minor Encroachment

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.
2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.

Option:

3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.
5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
6. Temporary traffic barriers may be used along the work space.
7. The shadow vehicle may be omitted if a taper and channelizing devices are used.
8. A truck-mounted attenuator may be used on the shadow vehicle.
9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Resident traffic and day labor force's equipment to use road shoulder for passing barricades.

Use when shoulders are too narrow for passage of traffic.

GENERAL NOTES

Type III barricades to be width of pavement only.

Reflectiveized striping shall appear on both sides of barricades. Barricades shall be positioned so that stripes slope downward toward the side on which traffic is to pass.

Although not shown, advance warning signs with minimum dimensions of 36x36, 900x900 and black legends on orange reflectorized backgrounds shall be utilized where needed.

This case is for use on rural road where the local authority considers this protection to be appropriate for the specific job conditions.

TWO-LANE, TWO-WAY TRAFFIC, RURAL OPERATIONS EXCEEDING ONE DAYLIGHT PERIOD

All dimensions are in inches (millimeters) unless otherwise shown.

TRAFFIC CONTROL DEVICES - DAY LABOR CONSTRUCTION

STANDARD B.L.R. 17-4
GENERAL NOTES

Type III Barricades and 511-2-4833 signs shall be positioned as shown in "Road Closed to All Traffic" detail on Highway Standard 101010.

Two Type A Low Intensity Flashing Lights shall be used on each approach in advance of the work area during hours of darkness. One light shall be installed above the barricades and the other above the first advance warning sign.

All signs shall be post mounted if the closure time exceeds four days.

All warning signs shall have minimum dimensions of 36 x 36 (900 x 900) and have a black legend on an orange reflectorized background.

All work zone signs are required to meet, as a minimum, Type B reflectivity requirements of Table 1091-2 in Article 1091.02 of the Standard Specifications.

When fluorescent signs are used, orange flags are not required.

Longitudinal dimensions may be adjusted to fit field conditions.

When the distance between the barricade and the intersection is between 1500’ (450 m) and 2000’ (600 m), the advance sign shall be placed at the intersection, then the distance between the barricade and the intersection is over 2000’ (600 m), an additional sign shall be placed at the intersection. The additional sign shall give the distance to the barricade in miles or fractions of a mile.

All dimensions are in inches (millimeters) unless otherwise shown.

TYPICAL APPLICATION OF TRAFFIC CONTROL DEVICES FOR CONSTRUCTION ON RURAL LOCAL HIGHWAYS

STANDARD B.L.R. 21-8
CONDITION I
APPROACH TRAFFIC STOPPED

CONDITION II
APPROACH TRAFFIC DOES NOT STOP

GENERAL NOTES
Type III Barricades and R1-4-4030 signs shall be positioned as shown in the "Road Closed To All Traffic" detail on Highway Standard 70901, if the distance "D" exceeds 5000' (1500 m), an additional set of barricades and R1-4-4030 shall be placed at each end of the work area.

Two Type 4 Low Intensity Flashing Lights shall be used on each approach in advance of the work area. One light shall be installed above each barricade, if only one barricade is required, the other light shall be installed above the first advance warning sign.

All signs shall be posted on the closure line exceeds four days.

All warning signs shall have minimum dimensions of 36 x 36 (900 x 900) and have a black legend on an orange reflective background.

All work zone signs are required to meet, as a minimum, Type II reflectivity requirements of Table 109-2 in Article 109-2 of the Standard Specifications.

When fluorescent signs are used, orange flags are not required.

Longitudinal dimensions may be adjusted to field conditions.

All dimensions are in inches (millimeters) unless otherwise shown.

SYMBOLS
- Work area
- Type III Barricade
- Sign with 8x8 (450x450) min, orange flag attached

DATE
REVISIONS
11-08 Revised General Notes (and switch units to English Metric).
11-08 Revised General Notes
10-09

TYPICAL APPLICATION OF TRAFFIC CONTROL DEVICES FOR CONSTRUCTION ON RURAL LOCAL HIGHWAYS (TWO-LANE TWO WAY RURAL TRAFFIC ROAD CLOSED TO TRU TRAFFIC)

STANDARD BLR. 23-6
Notes for Figure 6H-10—Typical Application 10
Lane Closure on Two-Lane Road Using Flaggers

Option:
1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).
2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
4. The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Standard:
5. At night, flagger stations shall be illuminated, except in emergencies.

Guidance:
6. When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.
7. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
8. When a highway-rail grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.
9. When a highway-rail grade crossing exists within the activity area, drivers operating on the left side of the normal centerline should be provided with comparable warning devices as for drivers operating on the right side of the normal centerline.
10. Early coordination with the railroad company should occur before work starts.

Option:
11. A flagger or a uniformed law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.
Note: The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 10
Notes for Figure 6H-11—Typical Application 11
Lane Closure on Two-Lane Road with Low Traffic Volumes

Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6H-10 (using flaggers) when the following conditions exist:
   a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
   b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.

2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.
Figure 6H-11. Lane Closure on Two-Lane Road with Low Traffic Volumes

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 11
Notes for Figure 6H-12—Typical Application 12
Lane Closure on Two-Lane Road Using Traffic Control Signals

Standard:
1. TTC signals shall be installed and operated in accordance with the provisions of Part 4. TTC signals shall meet the physical display and operational requirements of conventional traffic control signals.
2. TTC signal timing shall be established by authorized officials. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.
3. When the TTC signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.
4. Stop lines shall be installed with TTC signals for intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the stop line shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.
5. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.

Guidance:
6. Where no-passing lines are not already in place, they should be added.
7. Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway, recognizing that the distances shown for sign spacings are minimums. Adjustments in the height of the signal heads should be made as needed to conform to the vertical alignment.

Option:
8. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.
9. Removable pavement markings may be used.

Support:
10. TTC signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.
11. The maximum length of activity area for one-way operation under TTC signal control is determined by the capacity required to handle the peak demand.
Figure 6H-12. Lane Closure on Two-Lane Road Using Traffic Control Signals (TA-12)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 12
Notes for Figure 6H-13—Typical Application 13
Temporary Road Closure

Support:
1. Conditions represented are a planned closure not exceeding 20 minutes during the daytime.

Standard:
2. A flagger or uniformed law enforcement officer shall be used for this application. The flagger, if used for this application, shall follow the procedures noted in Sections 6E.04 and 6E.05.

Guidance:
3. The uniformed law enforcement officer, if used for this application, should follow the procedures noted in Sections 6E.04 and 6E.05.

Option:
4. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
5. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.
Figure 6H-13. Temporary Road Closure (TA-13)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-15—Typical Application 15

Work in Center of Road with Low Traffic Volumes

Guidance:
1. The lanes on either side of the center work space should have a minimum width of 3 m (10 ft) as measured from the near edge of the channelizing devices to the edge of pavement or the outside edge of paved shoulder.
2. Workers in the roadway should wear high-visibility safety apparel as described in Section 6D.03.

Option:
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. If the closure continues overnight, warning lights may be used on the channelizing devices.
5. A lane width of 2.7 m (9 ft) may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
6. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
8. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.
Typical Application 15

3 m (10 ft) minimum to edge of pavement or outside edge of paved shoulder

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-17—Typical Application 17
Mobile Operations on Two-Lane Road

Standard:
1. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
2. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
3. If an arrow panel is used, it shall be used in the caution mode.

Guidance:
4. Where practical and when needed, the work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.
5. Whenever adequate stopping sight distance exists to the rear, the shadow vehicle should maintain the minimum distance from the work vehicle and proceed at the same speed. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.
6. The shadow vehicles should also be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign.

Option:
7. The distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.
8. Additional shadow vehicles to warn and reduce the speed of oncoming or opposing vehicular traffic may be used. Law enforcement vehicles may be used for this purpose.
9. A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.
10. If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.

Support:
11. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead.

Standard:
12. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-17. Mobile Operations on Two-Lane Road (TA-17)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 17
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Minimum distance between the sign and the work area is 700' (213 m). Maximum distance to be determined by the local authority but in no case to exceed the length of one-half day’s operation or 4 miles (6 km), whichever is less.

Symbols:
- Work area
- Sign with [flag] (450x450 mm), orange flag attached.

Typical applications:
- Mowing
- Spraying aggregate
- Weed spraying
- Surface maintenance
- Bituminous, resurfacing
- Crack repairing
- Shoulder repair
- Cleaning ditches

General Notes:
Maintenance operations shall be confined to one traffic lane, leaving the opposite lane open to traffic. In areas 500-1500 ft. of both traffic lanes shall be available for traffic movement between work areas at intervals not greater than 1000’ (300 m).

When operations are on the pavement and stationary or moving at a speed less than 4 mph (6 kph), a WORKHEAD sign, or other appropriate sign, shall be placed in each direction between the NO PARKING sign and the work area. The distance between this sign and the work area shall be a minimum of 400’ (120 m) but in no case to exceed the length of one-half day’s operation or 4 miles (6 km), whichever is less. The distance between the two signs shall be approximately 400’ (120 m).

All signs are to be removed at completion of the day’s operations.

Any unattended obstacles, excavation, or pavement drop-off greater than 3’ (0.9 m) in the work area shall be protected by Type 1 or Type 2 barricades with flashing lights.

Longitudinal dimensions may be adjusted slightly to fit field conditions.

All vehicles, equipment, men, and their activities are restricted at all times to one side of the pavement.

Flashing lights or rotating beacons are required for all maintenance vehicles while in operation.

Applicable operations illustrated in Standard 70350) may be used when operations do not exceed 15 minutes on the pavement or 60 minutes on the shoulder respectively.

All warning signs shall have minimum dimensions of 36x36 (900x900) and have black legend on an orange reflective background.

When fluorescent signs are used orange flags are not required.

This is for use on rural local roads where the local authority considers this protection to be appropriate for the specific job conditions.

All dimensions are in inches (millimeters) unless otherwise shown.

Traffic Control Devices—Day Labor Maintenance

Standard B.L.R. 16-5
Notes for Figure 6H-18—Typical Application 18
Lane Closure on Minor Street

Standard:
1. This TTC shall be used only for low-speed facilities having low traffic volumes.

Option:
2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

Standard:
3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure 6H-10.

Option:
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.
Figure 6H-18. Lane Closure on Minor Street (TA-18)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Work Vehicle (optional)
Truck-Mounted Attenuator (optional)
Buffer Space (optional)
30 m (100 ft) MAX.

Typical Application 18
Notes for Figure 6H-20—Typical Application 20
Detour for Closed Street

Guidance:
1. This plan should be used for streets without posted route numbers.
2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

Option:
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Flashing warning lights may be used on Type III Barricades.
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

Standard:
7. When used, the Street Name sign shall be placed above the Detour sign.

Support:
8. See Figure 6H-9 for the information for detouring a numbered highway.
Figure 6H-20. Detour for Closed Street (TA-20)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 20
**GENERAL NOTES**

This Standard is used where at anytime, day or night, any vehicle, equipment, workers or their activities encroach on the pavement requiring the closure of one or more traffic lanes in an urban area.

Calculate L as follows:

### FORMULAS

<table>
<thead>
<tr>
<th>Speed Limit</th>
<th>English</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph (60 km/h)</td>
<td>L = ( \frac{S^2}{W} )</td>
<td>L = ( \frac{S^2}{W} )</td>
</tr>
<tr>
<td>45 mph (70 km/h) or greater</td>
<td>L = ( \frac{S^2}{W} ) or ( L = \frac{S^2}{W} )</td>
<td>L = ( \frac{S^2}{W} ) or ( L = \frac{S^2}{W} )</td>
</tr>
</tbody>
</table>

Where:
- W = Width of offset in feet (meters),
- S = Normal posted speed (mph or km/h).

All dimensions are in inches (millimeters) unless otherwise shown.

---

**SYMBOLS**

- **Arrow board**
- **Cone, drum or barricade**
- **Sign on portable or permanent support**
- **Work area**
- **Barricade or drum with flashing light**
- **Type I barricade with flashing lights**
- **Flagger with traffic control sign.**

---

**URBAN LANE CLOSURE, MULTILANE, 2W WITH MOUNTABLE MEDIAN**

(Sheet 1 of 2)
Notes for Figure 6H-21—Typical Application 21
Lane Closure on Near Side of Intersection

Standard:
1. The merging taper shall direct vehicular traffic into either the right or left lane, but not both.

Guidance:
2. In this typical application, a left taper should be used so that right-turn movements will not impede through motor vehicle traffic. However, the reverse should be true for left-turn movements.
3. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

Option:
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A shadow vehicle with a truck-mounted attenuator may be used.
6. A work vehicle with high-intensity rotating, flashing, oscillating, or strobe lights may be used with the high-level warning device.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
8. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-21. Lane Closure on Near Side of Intersection (TA-21)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-22—Typical Application 22
Right Lane Closure on Far Side of Intersection

Guidance:
1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

Option:
2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right lane having significant right turning movements, then the right lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.
3. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.
Figure 6H-22. Right Lane Closure on Far Side of Intersection (TA-22)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-23—Typical Application 23
Left Lane Closure on Far Side of Intersection

Guidance:
1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

Option:
2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, then the left lane may be reopened as a turn bay for left turns only, as shown.

Support:
4. By first closing off the left lane and then reopening it as a turn bay, an island is created with channelizing devices that allows the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.
Figure 6H-23. Left Lane Closure on Far Side of Intersection (TA-23)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 23

30 m (100 ft)
Notes for Figure 6H-26—Typical Application 26
Closure in Center of Intersection

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.

Option:

2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles.
   Left turns may be prohibited as required by geometric conditions.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

8. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-26. Closure in Center of Intersection (TA-26)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 26
Notes for Figure 6H-27—Typical Application 27
Closure at Side of Intersection

Guidance:
1. The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.
2. Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.

Standard:
3. At night, flagger stations shall be illuminated, except in emergencies.

Option:
4. ONE LANE ROAD AHEAD signs may also be used to provide adequate advance warning.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
8. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Support:
9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

Option:
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
11. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-27. Closure at Side of Intersection (TA-27)

See Note 2 for flagger information.

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 27
Notes for Figure 6H-28—Typical Application 28  
Sidewalk Closures and Bypass Sidewalks

Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Guidance:

2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.

3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

Option:

4. Street lighting may be considered.

5. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.

6. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.

7. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.

8. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.
Figure 6H-28. Sidewalk Detour or Diversion (TA-28)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 28
Notes for Figure 6H-29—Typical Application 29
Crosswalk Closures and Pedestrian Detours

Standard:
1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. Curb parking shall be prohibited for at least 15 m (50 ft) in advance of the midblock crosswalk.

Guidance:
3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.
4. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

Option:
5. Street lighting may be considered.
6. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
7. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
8. Type C Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.
9. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.
Note: For long-term stationary work, the double yellow centerline and/or lane lines should be removed between the crosswalk lines.

See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-30—Typical Application 30
Interior Lane Closure on Multi-lane Street

Guidance:
1. This information applies to low-speed, low-volume urban streets. Where speed or volume is higher, additional signing such as LEFT LANE CLOSED XX m (FT) should be used between the signs shown.

Option:
2. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the work space needed for the operation.
3. Shadow vehicles with a truck-mounted attenuator may be used.

Guidance:
4. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
5. Early coordination with the railroad company should occur before work starts.
Figure 6H-30. Interior Lane Closure on Multi-lane Street (TA-30)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-32—Typical Application 32  
Half Road Closure on Multi-lane, High-Speed Highway

Standard:

1. Pavement markings no longer applicable shall be removed or obliterated as soon as practical. Except for intermediate-term and short-term situations, temporary markings shall be provided to clearly delineate the temporary travel path. For short-term and intermediate-term situations where it is not feasible to remove and restore pavement markings, channelization shall be made dominant by using a very close device spacing.

Guidance:

2. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
3. Where channelizing devices are used instead of pavement markings, the maximum spacing should be 0.1 S meters where S is the speed in km/h (0.5 S feet where S is the speed in mph).
4. If the tangent distance along the temporary diversion is more than 180 m (600 ft), a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.

Option:

5. Warning lights may be used to supplement channelizing devices at night.

Guidance:

6. When a highway-rail grade crossing exists within or upstream of the merging taper and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the merging taper precedes the highway-rail grade crossing.
7. When a highway-rail grade crossing exists within the activity area, provisions should be made to provide road users operating on the left side of the normal centerline with comparable warning devices as supplied for road users operating on the right side of the normal centerline.
8. When a highway-rail grade crossing exists within the activity area, early coordination with the railroad company should occur before work starts.

Option:

9. When a highway-rail grade crossing exists within the activity area, a flagger may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.
10. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.
Figure 6H-32. Half Road Closure on Multi-lane, High-Speed Highway (TA-32)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-33—Typical Application 33
Stationary Lane Closure on Divided Highway

Standard:
1. This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.
2. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.

Guidance:
3. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.

Option:
4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.

Support:
5. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.
**Figure 6H-33. Stationary Lane Closure on Divided Highway (TA-33)**

**Note:** See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

*Typical Application 33*
Notes for Figure 6H-35—Typical Application 35
Mobile Operation on Multi-lane Road

Standard:
1. Arrow panels shall, as a minimum, be Type B, with a size of 1500 x 750 mm (60 x 30 in).

Guidance:
2. Vehicles used for these operations should be made highly visible with appropriate equipment, such as: high-intensity rotating, flashing, oscillating, or strobe lights, flags, signs, or arrow panels.
3. Shadow Vehicle 1 should be equipped with an arrow panel and truck-mounted attenuator.
4. Shadow Vehicle 2 should be equipped with an arrow panel. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow panel.
5. Shadow Vehicle 2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
6. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
7. Work should normally be accomplished during off-peak hours.
8. When the work vehicle occupies an interior lane (a lane other than the far right or far left) of a directional roadway having a right shoulder 3 m (10 ft) or more in width, Shadow Vehicle 2 should drive the right shoulder with a sign indicating that work is taking place in the interior lane.

Option:
9. A truck-mounted attenuator may be used on Shadow Vehicle 2.
10. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow Vehicle 1 in the closed lane, Shadow Vehicle 2 straddling the edge line, and Shadow Vehicle 3 on the shoulder.
11. Where adequate shoulder width is not available, Shadow Vehicle 3 may drive partially in the lane.
**Figure 6H-35. Mobile Operation on Multi-lane Road (TA-35)**

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
ALL SPEEDS
TWO-LANE & MULTILANE
SHOULDER WORK WITH
MINOR ENCROACHMENT
60 MINUTES OR LESS
SIGHT DISTANCE OF 1000’ TO
APPROACHING TRAFFIC REQUIRED

WZ 03
DAY AND NIGHT

TAPER LENGTHS (FT.)

<table>
<thead>
<tr>
<th>SPEED</th>
<th>SHOULDER WIDTH (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>65</td>
<td>45</td>
</tr>
<tr>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

When workers encroach onto roadway, a protective vehicle is required (see page 14). All vehicles shall operate strobe lights.

THIS CASE IS ONLY ALLOWED DURING NON-PEAK TRAFFIC.
ALL SPEEDS
TWO-LANE AND MULTILANE
LESS THAN 60 MINUTES
SHOULDER WORK

* Taper varies (see Table)
  Cones on pavement edge
≤45 mph - 40' ctrs.
Cones on 20' centers
≥50 mph - 80' ctrs.
(min. of 3)

Optional

Shoulder

TABLE OF TAPER LENGTHS (FT.)

<table>
<thead>
<tr>
<th>SPEED</th>
<th>SHOULDER WIDTH (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>2</td>
</tr>
<tr>
<td>65</td>
<td>45</td>
</tr>
<tr>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>45</td>
<td>30</td>
</tr>
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<tr>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

100’ min. to workers
All vehicles operating strobe lights.

* Cones required when work is within 2’ of pavement.
INTERMITTENT/MOVING OPERATION
SHOULDER WORK

SHOULDER WORK

Flashing Arrow Board (CAUTION Mode)

SHOULDER

OR

SHOULDER

TMA is required when truck encroaches onto roadway.

200'-1500'

All vehicles operating strobe lights.
ALL SPEEDS
TWO-LANE AND MULTILANE
60 MINUTES OR MORE
SHOULDER WORK

For work more than 2 hours
an Arrow board is required.

<table>
<thead>
<tr>
<th>SPEED</th>
<th>SHOULDER WIDTH (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>2</td>
</tr>
<tr>
<td>65</td>
<td>45</td>
</tr>
<tr>
<td>55</td>
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</tr>
<tr>
<td>45</td>
<td>30</td>
</tr>
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<td>40</td>
<td>20</td>
</tr>
<tr>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

TABLE OF TAPER LENGTHS (FT.)

TABLE OF SIGN SPACING

If work area
is >15' from
pavement edge,
no signs are
required.

ROAD WORK AHEAD

These are minimum dimensions
to be increased if needed to
fit field conditions.

B See Table

<table>
<thead>
<tr>
<th>SPEED MPH</th>
<th>LENGTH A</th>
<th>LENGTH B</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>1,000'</td>
<td>1,600'</td>
</tr>
<tr>
<td>55-60</td>
<td>500'</td>
<td>500'</td>
</tr>
<tr>
<td>45-50</td>
<td>350'</td>
<td>350'</td>
</tr>
<tr>
<td>≤40</td>
<td>100'</td>
<td>100'</td>
</tr>
</tbody>
</table>
Arrow board in CAUTION mode, required when sight distance is not available.

* Cones on 20' ctrs.  
* Cones on pavement edge
  ≤45 mph - 40' ctrs.  
  ≥50 mph - 80' ctrs.  
  (min. of 3)

Optional
Arrow board in CAUTION mode optional

 See Table

WORKERS  Or  SHOULDER WORK

Signs required on both sides of multilane divided highway when median is > 10'.

100' min. to workers
All vehicles operating strobe lights.

* Cones required when working within 2 ft. of pavement.
ALL SPEEDS
2 LANE 2 WAY
OFF ROAD MOVING OPERATION
NO TIME LIMIT

See table

See note

ROAD WORK AHEAD

MOWING AHEAD

WORKERS

* May be used for maintenance mowing operations
ALL SPEEDS
MULTILANE
OFF ROAD MOVING OPERATION
NO TIME LIMIT

Signs in Median may be omitted when median is less than 10 ft. wide.

ROAD WORK AHEAD
MOWING AHEAD
WORKERS

* May be used for maintenance mowing operations
If work area is more than 15 ft. from pavement edge, no signs are required.

Note:
1. Minimum distance is A from table at the Start of the Operation. Maximum distance is not to exceed one half the length required for one normal day's operation (4 miles maximum).
2. No Advance Warning Signs are required in opposite direction if work is on outside shoulder only.
ALL SPEEDS
LESS THAN 60 MINUTES

Cones along centerline
≤45 mph - 40' ctrs.
≥50 mph - 80' ctrs.

100' min.

WORK AREA is between the centerline and 2' outside of the pavement edge.

2'

Notes:
Cone required after 30 minutes.

All vehicles operating strobe lights.

Adequate sight distance of 1000' required otherwise utilize CASE WZ-21.
ALL SPEEDS
NON-MOVING OPERATION
NO TIME LIMIT

Cones on centerline
≤45 mph - 40’ ctrs.
≥50 mph - 80’ ctrs.
(min. of 3)

Cones on 20’ centers

ROAD WORK AHEAD

ONE LANE ROAD AHEAD

FLAGGER

FLAGGER
Within 2 ft. of roadway

<table>
<thead>
<tr>
<th>TABLE OF SIGN SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED</td>
</tr>
<tr>
<td>MPH</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>45-50</td>
</tr>
<tr>
<td>≤40</td>
</tr>
</tbody>
</table>
ALL SPEEDS
MOVING OPERATION
NO TIME LIMIT

Flaggers used for moving operations are dependent on the travel speed. If the work operation moves too fast for flaggers, the flaggers may be omitted and the FLAGGER signs shall be replaced with WORKER signs. In lieu of flaggers, a protective vehicle with a TMA and an arrow board in CAUTION mode shall be used in advance of the work area.

If work operation exceeds 2 miles per ½ day, utilize detail WZ24.

All vehicles operating strobe lights.
See Flagger Handbook for flagger instructions and requirements

NOTE:
Minimum distance is 200 ft. at Start of Operation. Maximum distance is 2 miles but in no case to exceed one half the distance required for one normal day's operations, whichever is less.

<table>
<thead>
<tr>
<th>SPEED MPH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>500'</td>
</tr>
<tr>
<td>45-50</td>
<td>350'</td>
</tr>
<tr>
<td>≤40</td>
<td>100'</td>
</tr>
</tbody>
</table>
MULTILANE
Less than or equal to 55 mph
ONE LANE CLOSURE
No Time Limit

When protective vehicle is moved forward to protect workers, an arrow board shall be placed at the start of the taper.

Arrow Board in Arrow Mode

Protective vehicle with arrow board in ARROW mode, minimum of 100' to workers.

100'

1100'

1000'

500'

2600'

500'

See Taper Table

* Use existing or a reduced speed limit as may be needed, up to 10 m.p.h. less than posted.

ROAD WORK 1 MILE

For maintenance and utility projects

RIGHT LANE CLOSED 1/2 MILE
Add these signs when work is being performed in the left lane for an undivided highway.

The opposing inside lane should be closed when work is within 2' of the centerline.

All vehicles operating strobe lights.

When work is being performed in the left lane, corresponding left lane information shall be used.

Cones at 50' centers.

When drums or barricades are used, the 50' spacing may be doubled.

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Length (')</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>660</td>
</tr>
<tr>
<td>45</td>
<td>540</td>
</tr>
<tr>
<td>40</td>
<td>320</td>
</tr>
<tr>
<td>35</td>
<td>245</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
</tr>
</tbody>
</table>
INTERSTATE
ONE LANE CLOSURE
NO TIME LIMIT
ANY SPEED

The first 2 signs and message board are stationary.

1. The Road Work Ahead sign shall be located 3 to 5 miles in advance of the project limits.
2. The message and size of the Work Zone Public Information sign shall be as specified by the Bureau of Operations.
3. The message board shall be used to display status of lane within the project. The primary message shall be:
   “Right Lane Closed”/ “X Miles Ahead”
   “Left Lane Closed”/“X Miles Ahead”
   “All Lanes Open”

Arrows Board in Arrow Mode

Signs not required in median when median is less than 10’ wide.

1. ROAD WORK AHEAD
2. Work Zone Public Information Sign
3. 100'
4. 1500'
5. 1000'
6. 1000'
7. 1600'
8. 500'
9. 1100'

1. Three, Type II barricades, drums, or vertical barricades at 15 m (50’) centers.
2. Signs 1, 2, and 3 are optional unless the lane closure(s) last(s) overnight or traffic backups are anticipated.
3. If signs 1, 2, and 3 are not used, replace the RIGHT LANE CLOSED 1 MILE with ROAD WORK AHEAD sign.
Work Zone speed limit 45 signs shall be moved as necessary to maintain the required spacing between the signs and the workers in each separate work activity.

Protective vehicle with arrow board in ARROW mode.

When protective vehicle is moved forward to protect workers, an arrow board shall be placed at the start of the taper.

1000' to 2500' 2000'

100' Minimum

TMA - 100' minimum to workers.

Cone at 50' centers

1500' 1000' 500'

Direction indicator barricades at 50' centers.

All vehicles operating strobe lights.

Work Zone SPEED LIMIT 45

END WORK ZONE SPEED LIMIT

When work is being performed in the left lane, corresponding left lane information shall be used.
45 MPH OR LESS
CENTER LANE USED AS
THRU LANE
NO TIME LIMIT
UP TO 60 MINUTES, NO SIGNS REQUIRED
FOR MORE THAN 60 MINUTES, SIGNS REQUIRED

Cone lines on lane lines at 20’ centers
Cone lines on 20’ centers in taper areas
See Taper Table
100’

Protective vehicle with arrowboard in ARROW mode
ROAD WORK AHEAD
RIGHT LANE CLOSED AHEAD
Or

86
All vehicles operating strobe lights

**Taper Table Length**

<table>
<thead>
<tr>
<th>Speed</th>
<th>Length</th>
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<tbody>
<tr>
<td>45</td>
<td>270'</td>
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<td>170'</td>
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<tr>
<td>35</td>
<td>125'</td>
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<tr>
<td>30</td>
<td>90'</td>
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**Sign Spacing**

<table>
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<td>45</td>
<td>350'</td>
</tr>
<tr>
<td>≤40</td>
<td>100'</td>
</tr>
</tbody>
</table>
45 MPH OR LESS
CENTER LANE CLOSURE
NO TIME LIMIT
UP TO 60 MINUTES, NO SIGNS REQUIRED
FOR MORE THAN 60 MINUTES, SIGNS REQUIRED

Cone placement:
- Cones on lane lines at 20’ centers
- Cones on 20’ centers in taper area
- 3 Cones
- 100’ buffer

Signs:
- ROAD WORK AHEAD
- CENTER LANE CLOSED AHEAD
- WORKERS

Buffer varies, see Table A
If operational problems are evident and caused by left-turning vehicles, the R3-9b signs in the immediate area of the work-zone should be temporarily covered and/or adjustments made in the lengths of the work area, buffer areas and tapers. All dimensions shown may be increased.

<table>
<thead>
<tr>
<th>TABLE A</th>
<th>Sign Spacing</th>
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<tbody>
<tr>
<td>SPEED</td>
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