

Part 6G and H - Minnesota MUTCD 2005 with 2007-09 Revisions	Part 6G - Federal MUTCD 2009	Part 6G – MN MUTCD Rearranged Sections	Comments – Remarks
<p>6G – TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES</p> <p>6G.1 Introduction</p> <p>STANDARD The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a temporary traffic control zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.</p> <p>SUPPORT Each temporary traffic control zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. A temporary traffic control zone is the section of roadway between the first advance warning sign through the last traffic control device, where traffic returns to its normal path and conditions. The goal of the temporary traffic control zone is to provide for the safe and efficient movement of traffic around a location where the normal function of the roadway is suspended. The key factor in promoting temporary traffic control zone safety is proper judgment.</p> <p>The purpose of temporary traffic control is to balance the need for safe and effective work spaces with the need to warn, control, protect, and expedite vehicular and pedestrian traffic. To accomplish this, the respect of the driver must be earned by appropriate and prudent use of traffic control devices. Proper engineering judgment is the key factor in making the temporary traffic control zone both safe and efficient.</p> <p>GUIDANCE Advance planning is necessary for any successful temporary traffic control zone. Before setting up any zone, the appropriate layout and number of devices must be determined. Any major changes from the typical layouts should be documented. For major projects, emergency operation plans should be developed in the event of a total road closure.</p> <p>OPTION Important aspects of the planning stage include consideration of alternate routes and the use of public information.</p> <p>STANDARD It is essential to notify emergency services (i.e. police, fire, etc.) of any road closures and route changes.</p> <p>SUPPORT In this chapter, the factors which affect the selection of the typical temporary traffic control zone layouts are explained. Chapter 6H</p>	<p>CHAPTER 6G. TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES</p>	<p>CHAPTER 6G. TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES</p> <p>Section 6G.a Introduction</p> <p>SUPPORT The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a temporary traffic control zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.</p> <p>The purpose of temporary traffic control is to balance the need for safe and effective work spaces with the need to warn, control, protect, and expedite vehicular and pedestrian traffic. To accomplish this, the respect of the driver must be earned by appropriate and prudent use of traffic control devices. Proper engineering judgment is the key factor in making the temporary traffic control zone both safe and efficient.</p> <p>GUIDANCE Advance planning is necessary for any successful temporary traffic control zone. Before setting up any zone, the appropriate layout and number of devices must be determined. Any major changes from the typical layouts should be documented. For major projects, emergency operation plans should be developed in the event of a total road closure.</p> <p>OPTION Important aspects of the planning stage include consideration of alternate routes and the use of public information.</p> <p>STANDARD It is essential to notify emergency services (i.e. police, fire, etc.) of any road closures and route changes.</p> <p>SUPPORT In this chapter, the factors which affect the selection of the typical temporary traffic control zone layouts are explained. Chapter 6H details the layouts which are found in Chapter 6J, Traffic Control for Long Term Temporary Traffic Control Zones and in Chapter 6K Short Term Temporary Traffic Control Zones (the Field Manual).</p> <p>STANDARD For most projects, especially long term projects, it will be necessary to prepare a project specific Traffic Control Plan (TCP). A TCP may range from a reference to Chapter 6K (the Field Manual) to a detailed set of plans and specifications.</p> <p>GUIDANCE In developing any TCP the following items should be considered:</p> <ol style="list-style-type: none"> 1. Suitable detours <ul style="list-style-type: none"> - Weight, height and width restrictions - Capacity 	<p>MN LANGUAGE</p> <p>MN LANGUAGE</p>

details the layouts which are found in Chapter 6J, Traffic Control for Long Term Temporary Traffic Control Zones and in Chapter 6K Short Term Temporary Traffic Control Zones (the Field Manual).

6G.2 Traffic Control Plans

STANDARD

For most projects, especially long term projects, it will be necessary to prepare a project specific Traffic Control Plan (TCP). A TCP may range from a reference to Chapter 6K (the Field Manual) to a detailed set of plans and specifications.

GUIDANCE

In developing any TCP the following items should be considered:

1. Suitable detours
 - Weight, height and width restrictions
 - Capacity
 - Geometrics
 - Maintenance of the detour
2. Access and signage to businesses
3. Conflict with standard routes and accommodations for:
 - School buses
 - Public transit
 - Fire
 - Ambulance
 - Postal Service
4. Restriction of capacity during peak hours
5. Alternate routes and other construction and/or maintenance activities in the area that may affect alternate routes.
6. Restrictions on overweight, overheight and overwidth permits
7. Inplace signing, lighting and signal modifications
8. Trail crossings, pedestrians, bicyclists
9. Utility work
10. Special events, holidays, etc.
11. Local ordinances

6G.3 Typical Applications

SUPPORT

Typical layouts include a variety of temporary traffic control methods, but do not include a layout for every conceivable work situation.

GUIDANCE

Typical layouts should be altered, when necessary, to fit the conditions of a particular temporary traffic control zone. When modifications are made, factors such as traffic volume, speed, sight distance, type of work, etc. should be considered.

OPTION

The typical layouts illustrated in Chapter 6K (the Field Manual) generally represent typical highway agency activities. Other

Section 6G.01 Typical Applications

Support:

⁰¹ Each TTC zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, and cars), and road user 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.

⁰² Typical applications (TAs) of TTC zones are organized according to duration, location, type of work, and highway type. Table 6H-1 is an index of these typical applications. These typical applications include the use of various TTC methods, but do not include a layout for every conceivable work situation.

⁰³ Well-designed TTC plans for planned special events will likely be developed from a combination of treatments from several of the typical applications.

Guidance:

⁰⁴ For any planned special event that will have an impact on the traffic on any street or highway, a TTC plan should be developed in conjunction with and be approved by the agency or agencies that have jurisdiction over the affected roadways.

- Geometrics

- Maintenance of the detour

2. Access and signage to businesses

3. Conflict with standard routes and accommodations for:

- School buses

- Public transit

- Fire

- Ambulance

- Postal Service

4. Restriction of capacity during peak hours

5. Alternate routes and other construction and/or maintenance activities in the area that may affect alternate routes.

6. Restrictions on overweight, overheight and overwidth permits

7. Inplace signing, lighting and signal modifications

8. Trail crossings, pedestrians, bicyclists

9. Utility work

10. Special events, holidays, etc.

11. Local ordinances

Section 6G.01 Typical Applications

SUPPORT

Each temporary traffic control zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. A temporary traffic control zone is the section of roadway between the first advance warning sign through the last traffic control device, where traffic returns to its normal path and conditions. 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. **The key factor in promoting temporary traffic control zone safety is proper judgment.**

Typical layouts include a variety of temporary traffic control methods, but do not include a layout for every conceivable work situation.

⁰³ Well-designed TTC plans for planned special events will likely be developed from a combination of treatments from several of the typical applications.

Guidance:

⁰⁴ For any planned special event that will have an impact on the traffic on any street or highway, a TTC plan should be developed in conjunction with and be approved by the agency or agencies that have jurisdiction over the affected roadways.

devices may be added to supplement the devices shown in the typical layouts, while others may be deleted. Sign spacings and taper lengths may be increased to provide additional time or space for driver response. In some situations, however, such as an urban setting, too many devices can spread signing over too long a distance to be fully effective.

Other devices may be added to supplement the devices indicated in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

GUIDANCE

When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6B and by incorporating appropriate devices and practices from the following list:

A. Additional devices:

1. Signs
2. Arrow panels
3. More channelizing devices at closer spacing (see Section 6F.68 for information regarding detectable edging for pedestrians)
4. Temporary raised pavement markers
5. High-level warning devices
6. Portable changeable message signs
7. Temporary traffic control signals (including pedestrian signals and accessible pedestrian signals).
8. Temporary traffic barriers
9. Crash cushions
10. Screens
11. Rumble strips
12. More delineation

B. Upgrading of devices:

1. A full complement of standard pavement markings
2. Brighter and/or wider pavement markings
3. Larger and/or brighter signs
4. Channelizing devices with greater conspicuity
5. Temporary traffic barriers in place of channelizing devices

C. Improved geometrics at detours or crossovers

D. Increased distances:

1. Longer advance warning area
2. Longer tapers

E. Lighting:

1. Temporary roadway lighting
2. Steady-burn lights used with channelizing devices
3. Flashing lights for isolated hazards
4. Illuminated signs
5. Floodlights

Where pedestrian or bicycle usage is high, typical applications should also be modified by giving particular attention to the

05 Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.

Option:

06 Other devices may be added to supplement the devices shown in the typical applications, while others may be deleted. The sign spacings and taper lengths may be increased to provide additional time or space for driver response.

Support:

07 Decisions regarding the selection of the most appropriate typical application to use as a guide for a specific TTC zone require an understanding of each situation. Although there are many ways of categorizing TTC zone applications, the four factors mentioned earlier (work duration, work location, work type, and highway type) are used to characterize the typical applications illustrated in Chapter 6H.

Section 6G.02 Work Duration

Support:

01 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.

Standard:

02 The five categories of work duration and their time at a location shall be:

A. Long-term stationary is work that occupies a location more than 3 days.

B. Intermediate-term stationary is 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 is daytime work that occupies a location for more than 1 hour within a single daylight period.

D. Short duration is work that occupies a location up to 1 hour.

05 Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone. When modifications are made, factors such as traffic volume, speed, sight distance, type of work, etc. should be considered.

OPTION

The typical layouts illustrated in Chapter 6K (the Field Manual) generally represent typical highway agency activities. Other devices may be added to supplement the devices shown in the typical layouts, while others may be deleted. Sign spacings and taper lengths may be increased to provide additional time or space for driver response. In some situations, however, such as an urban setting, too many devices can spread signing over too long a distance to be fully effective.

06 Other devices may be added to supplement the devices shown in the typical applications, while others may be deleted. The sign spacings and taper lengths may be increased to provide additional time or space for driver response. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

SUPPORT

Selecting the most appropriate typical layout and modifications for a temporary traffic control zone requires knowledge and understanding of the zone. Although there are many ways of categorizing temporary traffic control zone layouts, roadway type, location of the work, volume, duration of work, and speed have been used to characterize the typical drawings illustrated in Chapter 6K (the Field Manual).

Section 6G.02 Work Duration

Support:

01 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.

STANDARD

The five categories of work duration and their time at a location are as follows:

A. Long-term temporary traffic control zone — any temporary traffic control zone that occupies a location more than 3 days.

B. Intermediate-term/night temporary traffic control zone — any temporary traffic control zone that occupies a location during hours of darkness or up to 3 days.

C. Short-term temporary traffic control zone - any temporary traffic control zone that occupies a location for less than twelve (12) hours.

D. Short duration temporary traffic control zone - any temporary traffic control zone that occupies a location

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provisions set forth in Chapter 6D, Section 6F.68, and other Sections of Part 6 related to accessibility and detectability provisions in temporary traffic control zones.

6G.4 Selecting the Typical Layout

SUPPORT

Selecting the most appropriate typical layout and modifications for a temporary traffic control zone requires knowledge and understanding of the zone. Although there are many ways of categorizing temporary traffic control zone layouts, roadway type, location of the work, volume, duration of work, and speed have been used to characterize the typical drawings illustrated in Chapter 6K (the Field Manual).

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A. Roadway Type

SUPPORT

The choice of traffic control needed for a temporary traffic control zone also depends upon the type of roadway where the work is located. Roadway type is a major factor in the use of temporary traffic control zone traffic control devices. Typical layouts of the following categories of roadway type are included in Chapter 6K (the Field Manual).

GUIDANCE

There are three major types of roadways:

- 1) Two-Way Two-Lane Roads - a roadway consisting of two opposing lanes of undivided traffic.
- 2) Multi-Lane Undivided roads - a roadway where two or more lanes of traffic travel in the same direction and opposing traffic lanes have no physical separation except pavement markings (where required).
- 3) Multi-Lane Divided roads - a roadway where two or more lanes of traffic travel in the same direction and opposing traffic lanes are separated by a median (ditch, barrier, curbing, etc.) and the median is generally wide enough to place TTC devices. Temporary traffic control for divided multi-lane roads may also be used for one-way roadways.

STANDARD

For each of these roadway types there are additional features that must be considered in the selection of the appropriate typical layout. Such features include intersections/interchanges, horizontal and vertical curvature and decision sight distance.

B. Location of Work

SUPPORT

Work may be performed anywhere within the right-of-way, from

E. Mobile is work that moves intermittently or continuously.

Support:

03 At long-term stationary TTC zones, there is ample time to install and realize benefits from the full range of TTC procedures and devices that are available for use. Generally, larger channelizing devices, temporary roadways, and temporary traffic barriers are used.

Standard:

04 Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary TTC zones.

Guidance:

05 Inappropriate markings in long-term stationary TTC zones should be removed and replaced with temporary markings.

Support:

06 In intermediate-term stationary TTC zones, it might not be feasible or practical to use procedures or devices that would be desirable for long-term stationary TTC zones, such as altered pavement markings,

(area) for less than one (1) hour.

E. Mobile temporary traffic control zone - any temporary traffic control zone that occupies a location (area) for less than fifteen (15) minutes.

Section 6G.02A Long-Term Temporary Traffic Control Zone

Support:

03 At long-term stationary TTC zones, there is ample time to install and realize benefits from the full range of TTC procedures and devices that are available for use. Generally, larger channelizing devices, temporary roadways, and temporary traffic barriers are used.

Larger channelizing devices have more retroreflective material and offer better nighttime visibility. The larger devices are also less likely to be displaced or tipped over—an important consideration during those periods when the work crew is not present.

Standard:

04 Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary TTC zones.

GUIDANCE

Temporary roadways and barriers may be provided, and inappropriate markings should be removed and replaced with temporary markings. Temporary signs should be post mounted and

STANDARD

Any conflicting signs shall be covered.

OPTION

A long-term temporary traffic control zone may range in duration from several days to several years.

GUIDANCE

Traffic control procedures and devices should be chosen to accommodate the varying seasonal, climactic and visibility situations that may arise during the length of the project.

Consideration should also be given to devices that are durable and easily maintained.

SUPPORT

Layouts for long-term temporary traffic control zones are not included in Chapter 6K (the Field Manual), but examples of long-term applications are shown in Chapter 6J. Normally, a long-term temporary traffic control zone will require a project specific Traffic Control Plan (TCP). Implementing a Traffic Control Plan requires advance planning and consultation with the local road authority and Traffic Engineering professionals. Advance notice and good public relations are helpful.

Section 6G.02B Intermediate-Term/Night Temporary Traffic Control Zone

SUPPORT

In intermediate-term/night temporary traffic control zones, it may

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outside the shoulder area to the center of an intersection. As a general rule, the closer the work is to traffic, the more traffic control devices are needed. Chapter 6H will describe in detail appropriate devices for each location.

STANDARD

The exact location or locations of the work must be known prior to selecting the layout.

When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place, shall supply information about highway conditions, and shall indicate how motor vehicle traffic can move through the temporary traffic control zone.

C. Volume

SUPPORT

Volume is another a factor in selecting the appropriate layout. A low volume roadway is defined as any street or highway where the Average Daily Traffic (ADT) is less than 400 vehicles per day. An intermediate volume roadway is defined as any street or highway where the ADT is less than 1500 vehicles per day. If in question, an ADT may be obtained from the local roadway authority.

GUIDANCE

However, it is important to remember that the ADT should not be the sole determining factor in the decision to use a low volume layout. Peak periods such as morning or evening rush hours or in rural areas, seasonal variations in traffic, should be considered.

SUPPORT

Another factor to consider is decision sight distance. In areas with limited visibility due to horizontal or vertical curvature, a low volume layout may not be appropriate.

GUIDANCE

If there is any doubt as to the ADT or decision sight distance, the low volume layout should not be used.

D. Duration of Work

SUPPORT

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

STANDARD

Work duration is the major factor in determining the number and types of devices used in temporary traffic control zones. The five categories of work duration and their time at a location are as follows:

- Long-term temporary traffic control zone — any temporary traffic control zone that occupies a location more than 3 days.
- Intermediate-term/night temporary traffic control zone

temporary traffic barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time.

Standard:

⁰⁷ Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary TTC zones.

Support:

⁰⁸ Most maintenance and utility operations are short-term stationary work.

not be feasible or practical to use procedures or devices that would be desirable for long-term temporary traffic control zones, such as altered pavement markings, barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time. In other instances, there might be insufficient pay-back time to economically justify more elaborate temporary traffic control measures.

Night work presents special problems and requires extraordinary precautions. Night temporary traffic control zones may be in place for only a few hours. During this time, traffic volumes may be lighter than during daylight hours. However, additional devices such as warning lights and larger more reflective devices are necessary because drivers are more likely to be impaired and inattentive.

Standard:

⁰⁷ Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary TTC zones.

GUIDANCE

Driver impairment may be due to age, drugs, age, alcohol, or fatigue.

In addition to floodlighting the flagger stations and the work space, the work vehicles should also be made more visible.

Typical characteristics of intermediate-term/night temporary traffic control zones are:

- Signs mounted on temporary supports.
- Minimal covering of in-place signs.
- Additional devices are used to override in-place signs.
- Conflicting pavement markings are normally not removed except for multiple lane shifts.

STANDARD

If multiple lanes are being shifted, then the in-place lane markings shall be removed and temporary markings installed.

Section 6G.02C Short-Term Temporary Traffic Control Zones

SUPPORT

Most maintenance and utility operations fall into the category of short-term temporary traffic control zones. The work crew is present to maintain and monitor the temporary traffic control zone. Signs are mounted on portable stands and pavement markings are generally not removed.

Within Chapter 6K (the Field Manual), several temporary traffic control zone layouts when used for a short-term duration have devices which may be either omitted or perhaps substituted with a lower level device depending upon whether the work space will be either attended or occupied. A work space is considered to be attended when the TTC devices are reviewed for knock-downs or other needed adjustments on a hourly basis. A work space is

<p>— any temporary traffic control zone that occupies a location during hours of darkness or up to 3 days.</p> <ul style="list-style-type: none"> • Short-term temporary traffic control zone - any temporary traffic control zone that occupies a location for less than twelve (12) hours. • Short duration temporary traffic control zone - any temporary traffic control zone that occupies a location (area) for less than one (1) hour. • Mobile temporary traffic control zone - any temporary traffic control zone that occupies a location (area) for less than fifteen (15) minutes. <p>1. Long-Term Temporary Traffic Control Zone</p> <p>SUPPORT</p> <p>At long-term temporary traffic control zones, there is ample time to install and realize benefits from the full range of temporary traffic control procedures and devices that are available for use. Generally, larger channelizing devices are used, as they have more retroreflective material and offer better nighttime visibility. The larger devices are also less likely to be displaced or tipped over— an important consideration during those periods when the work crew is not present.</p> <p>STANDARD</p> <p>Since long-term operations extend into nighttime, retroreflective devices shall be used in long-term stationary temporary traffic control zones.</p> <p>GUIDANCE</p> <p>Temporary roadways and barriers may be provided, and inappropriate markings should be removed and replaced with temporary markings. Temporary signs should be post mounted and</p> <p>STANDARD</p> <p>Any conflicting signs shall be covered.</p> <p>OPTION</p> <p>A long-term temporary traffic control zone may range in duration from several days to several years.</p> <p>GUIDANCE</p> <p>Traffic control procedures and devices should be chosen to accommodate the varying seasonal, climactic and visibility situations that may arise during the length of the project. Consideration should also be given to devices that are durable and easily maintained.</p> <p>SUPPORT</p> <p>Layouts for long-term temporary traffic control zones are not included in Chapter 6K (the Field Manual), but examples of long-term applications are shown in Chapter 6J. Normally, a long-term temporary traffic control zone will require a project specific Traffic Control Plan (TCP). Implementing a Traffic Control Plan requires advance planning and consultation with the local road authority</p>	<p>09 As compared to stationary operations, mobile and short-duration operations are activities that might involve different treatments. Devices having greater mobility might be necessary such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the TTC zone is important.</p> <p><i>Guidance:</i></p> <p>10 <i>Safety in short-duration or mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.</i></p> <p><i>Option:</i></p> <p>11 Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of signs and channelizing devices for short-duration or mobile operations. These vehicles may be augmented with signs or arrow boards.</p> <p><i>Support:</i></p> <p>12 During short-duration work, it often takes longer to set up and remove the TTC zone than to perform the work. Workers face hazards in setting up and taking down the TTC zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.</p> <p><i>Option:</i></p> <p>13 Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles.</p> <p><i>Support:</i></p> <p>14 Mobile operations often involve frequent short stops for activities such as litter cleanup, pothole patching, or utility operations, and are similar to short-duration operations.</p>	<p>considered to be occupied when workers are present within the work space and TTC devices should continuously be reviewed by workers and adjustments made as needed.</p> <p>Section 6G.02D Short Duration Temporary Traffic Control Zones</p> <p>SUPPORT</p> <p>Quick repair, installation or inspection activities fall into the category of short duration temporary traffic control zones. The work crew will perform a quick operation and leave the area and generally have little or no effect on the traffic.</p> <p>During short duration work, it often takes longer to set up and remove the traffic control than to perform the work. Workers face hazards in setting up and taking down the temporary traffic control zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.</p> <p>OPTION</p> <p>Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as rotating lights or strobe lights on work vehicles.</p> <p>Temporary Road Closures</p> <p>GUIDANCE</p> <p>Work that may require a complete closure for a short period of time (15 minutes or less) should be scheduled for non-peak hours. A portable changeable message sign should be considered to warn motorists approaching the closure. Care must be taken to ensure that advance warning signs extend beyond any possible queue. If the closure is done during nighttime hours, uniformed officers should be used for flagging.</p> <p>Section 6G.02E Mobile Temporary Traffic Control Zones</p> <p>SUPPORT</p> <p>Mobile operations are work activities that move along the road. Mobile operations often involve frequent short stops, each as</p>	<p>MN LANGUAGE but COMPLAINT</p>
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and Traffic Engineering professionals. Advance notice and good public relations are helpful.

2. Intermediate-Term/Night Temporary Traffic Control Zone

SUPPORT

In intermediate-term/night temporary traffic control zones, it may not be feasible or practical to use procedures or devices that would be desirable for long-term temporary traffic control zones, such as altered pavement markings, barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time. In other instances, there might be insufficient pay-back time to economically justify more elaborate temporary traffic control measures.

Night work presents special problems and requires extraordinary precautions. Night temporary traffic control zones may be in place for only a few hours. During this time, traffic volumes may be lighter than during daylight hours. However, additional devices such as warning lights and larger more reflective devices are necessary because drivers are more likely to be impaired and inattentive.

STANDARD

Since intermediate-term operations extend into nighttime, retroreflective devices shall be used in intermediate-term stationary temporary traffic control zones.

GUIDANCE

Driver impairment may be due to age, drugs, age, alcohol, or fatigue.

In addition to floodlighting the flagger stations and the work space, the work vehicles should also be made more visible.

Typical characteristics of intermediate-term/night temporary traffic control zones are:

- Signs mounted on temporary supports.
- Minimal covering of in-place signs.
- Additional devices are used to override in-place signs.
- Conflicting pavement markings are normally not removed except for multiple lane shifts.

STANDARD

If multiple lanes are being shifted, then the in-place lane markings shall be removed and temporary markings installed.

3. Short-Term Temporary Traffic Control Zones

SUPPORT

Most maintenance and utility operations fall into the category of short-term temporary traffic control zones. The work crew is present to maintain and monitor the temporary traffic control zone. Signs are mounted on portable stands and pavement markings are generally not removed.

Within Chapter 6K (the Field Manual), several temporary traffic control zone layouts when used for a short-term duration have

Guidance:
 15 Warning signs and high-intensity rotating, flashing, oscillating, or strobe lights should be used on the vehicles that are participating in the mobile work.

Option:
 16 Flags and/or channelizing devices may additionally be used and moved periodically to keep them near the mobile work area.
 17 Flaggers may be used for mobile operations that often involve frequent short stops.

Support:
 18 Mobile operations also include work activities where workers and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.
Guidance:
 19 When mobile operations are being performed, a shadow vehicle equipped with an arrow board or a sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high.

much as 15 minutes long, for activities such as pothole patching, crack sealing or utility operations and are similar to short duration operations. Mobile operations also include work activities in which workers and equipment move along the road without stopping, usually at slow speeds.

As compared to stationary operations, mobile operations are activities that might involve different treatments. Devices having greater mobility might be necessary, such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the temporary traffic control zone is important.

Maintaining safe work and road user conditions is a paramount goal in carrying out mobile operations.

During mobile work, it often takes longer to set up and remove the traffic control than to perform the work. Workers face hazards in setting up and taking down the temporary traffic control zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.

GUIDANCE

If a mobile operation does not move at least the decision sight distance (See Table 6E-1) every 15 minutes it should be considered a stationary temporary traffic control zone and the appropriate stationary layout used. If sight distance is limited or volumes high, a stationary layout should also be considered.

Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours and parking may be prohibited.

OPTION

Considering these factors, simplified control procedures may be warranted for mobile work. A reduction in the number of devices may be offset by the use of other more dominant devices, as detailed for mobile operations in Chapter 6K (the Field Manual), and may include rotating lights or strobe lights on work vehicles and vehicles augmented with signs or arrow panels.

Flaggers may be used for mobile operations that often involve frequent short stops.

STANDARD

Mobile operations on a high speed travel lane of a multi-lane divided highway shall use arrow boards.

GUIDANCE

When the mobile operation is continually moving along the road, the traffic should be directed to pass safely. A shadow vehicle or

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devices which may be either omitted or perhaps substituted with a lower level device depending upon whether the work space will be either attended or occupied. A work space is considered to be attended when the TTC devices are reviewed for knock-downs or other needed adjustments on a hourly basis. A work space is considered to be occupied when workers are present within the work space and TTC devices should continuously be reviewed by workers and adjustments made as needed.

4. Short Duration Temporary Traffic Control Zones

SUPPORT

Quick repair, installation or inspection activities fall into the category of short duration temporary traffic control zones. The work crew will perform a quick operation and leave the area and generally have little or no effect on the traffic.

During short duration work, it often takes longer to set up and remove the traffic control than to perform the work. Workers face hazards in setting up and taking down the temporary traffic control zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.

OPTION

Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as rotating lights or strobe lights on work vehicles.

5. Mobile Temporary Traffic Control Zones

SUPPORT

Mobile operations are work activities that move along the road. Mobile operations often involve frequent short stops, each as much as 15 minutes long, for activities such as pothole patching, crack sealing or utility operations and are similar to short duration operations. Mobile operations also include work activities in which workers and equipment move along the road without stopping, usually at slow speeds.

As compared to stationary operations, mobile operations are activities that might involve different treatments. Devices having greater mobility might be necessary, such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the temporary traffic control zone is important.

Maintaining safe work and road user conditions is a paramount goal in carrying out mobile operations.

During mobile work, it often takes longer to set up and remove the traffic control than to perform the work. Workers face hazards in setting up and taking down the temporary traffic control zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.

GUIDANCE

Where feasible, warning signs should be placed along the roadway and moved periodically as work progresses.

20 Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours.

21 If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow boards should be used.

Standard:

22 Mobile operations shall have appropriate devices on the equipment (that is, high-intensity rotating, flashing, oscillating, or strobe lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.

Option:

23 For mobile operations that move at speeds of less than 3 mph, mobile signs or stationary signing that is periodically retrieved and repositioned in the advance warning area may be used.

Section 6G.03 Location of Work

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 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 (including bicyclists and pedestrians), the greater the number of TTC devices that are needed. Procedures are described later in this Chapter for establishing TTC zones in the following locations:

- A. Outside the shoulder,
- B. On the shoulder with no encroachment,
- C. On the shoulder with minor encroachment,
- D. Within the median, and
- E. Within the traveled way.

Standard:

03 **When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place and shall supply information about highway conditions. TTC devices shall indicate how vehicular traffic can move through the TTC zone.**

Section 6G.04 Modifications To Fulfill Special Needs

protection vehicle equipped as a sign truck, with an appropriately used arrow board, should follow the work vehicle as detailed in the layouts.

Work and shadow vehicles should be equipped with such devices such as flags, rotating/strobe vehicle lights, truck-mounted attenuators, and appropriate signs. These devices may be required individually or in various combinations, or all of them, as determined necessary.

Standard:

22 Mobile operations shall have appropriate devices on the equipment (that is, high-intensity rotating, flashing, oscillating, or strobe lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.

OPTION

For mobile operations that move at speeds less than 5 km/h (3 mph), mobile signs or portable stationary signing that is periodically retrieved and repositioned in the advance warning area to keep them near the work space may be used.

Section 6G.03 Location of Work

SUPPORT

Chapter 6D and Sections 6F.?? and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 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 (including bicyclists and pedestrians), the greater the number of TTC devices that are needed. Procedures are described later in this Chapter for establishing TTC zones in the following locations:

- A. Outside the shoulder,
- B. On the shoulder with no encroachment,
- C. On the shoulder with minor encroachment,
- D. Within the median, and
- E. Within the traveled way.

STANDARD

The exact location or locations of the work shall be known prior to selecting the layout.

03 **When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place and shall supply information about highway conditions. TTC devices shall indicate how vehicular traffic can move through the TTC zone.**

Section 6G.04 Modifications To Fulfill Special Needs

If a mobile operation does not move at least the decision sight distance (See Table 6E-1) every 15 minutes it should be considered a stationary temporary traffic control zone and the appropriate stationary layout used. If sight distance is limited or volumes high, a stationary layout should also be considered.

Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours and parking may be prohibited.

OPTION

Considering these factors, simplified control procedures may be warranted for mobile work. A reduction in the number of devices may be offset by the use of other more dominant devices, as detailed for mobile operations in Chapter 6K (the Field Manual), and may include rotating lights or strobe lights on work vehicles and vehicles augmented with signs or arrow panels.

Flaggers may be used for mobile operations that often involve frequent short stops.

For mobile operations that move at speeds less than 5 km/h (3 mph), mobile signs or portable stationary signing that is periodically retrieved and repositioned in the advance warning area to keep them near the work space may be used.

STANDARD

Mobile operations on a high speed travel lane of a multi-lane divided highway shall use arrow panels.

GUIDANCE

When the mobile operation is continually moving along the road, the traffic should be directed to pass safely. A shadow or backup vehicle equipped as a sign truck, with an appropriately used arrow panel, should follow the work vehicle as detailed in the layouts.

Work and shadow vehicles should be equipped with such devices such as flags, rotating/strobe vehicle lights, truck-mounted attenuators, and appropriate signs. These devices may be required individually or in various combinations, or all of them, as determined necessary.

STANDARD

Mobile operations that move at speeds greater than 10 mph, such as pavement marking operations, shall have appropriate devices on the equipment (that is, rotating lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.

E. Speed

SUPPORT

Speed is an important factor in determining the appropriate layout. The speed used in deciding whether a roadway is a high speed or low speed roadway is the posted speed limit prior to work starting.

STANDARD

A high speed roadway is defined as any street or highway where the speed limit is 45 miles per hour or greater. A low speed

Support:

01 The typical applications in Chapter 6H illustrate commonly encountered situations in which TTC devices are employed.

Option:

02 Other devices may be added to supplement the devices provided in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

Guidance:

03 When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6B and by incorporating appropriate devices and practices from the following list:

A. Additional devices:

1. Signs
2. Arrow boards
3. More channelizing devices at closer spacing (see Section 6F.74 for information regarding detectable edging for pedestrians)
4. Temporary raised pavement markers
5. High-level warning devices
6. Portable changeable message signs
7. Temporary traffic control signals (including pedestrian signals and accessible pedestrian signals)
8. Temporary traffic barriers
9. Crash cushions
10. Screens
11. Rumble strips
12. More delineation

B. Upgrading of devices:

1. A full complement of standard pavement markings
2. Brighter and/or wider pavement markings
3. Larger and/or brighter signs
4. Channelizing devices with greater conspicuity
5. Temporary traffic barriers in place of channelizing devices

C. Improved geometrics at detours or crossovers

D. Increased distances:

1. Longer advance warning area
2. Longer tapers

E. Lighting:

1. Temporary roadway lighting
2. Steady-burn lights used with channelizing devices
3. Flashing lights for isolated hazards
4. Illuminated signs
5. Floodlights

F. Pedestrian routes and temporary facilities

G. Bicycle diversions and temporary facilities

Support:

01 The typical applications in Chapter 6K illustrate commonly encountered situations in which TTC devices are employed.

Option:

02 Other devices may be added to supplement the devices provided in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

Guidance:

03 When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6B and by incorporating appropriate devices and practices from the following list:

A. Additional devices:

1. Signs
2. Arrow boards
3. More channelizing devices at closer spacing (see Section 6F.?? for information regarding detectable edging for pedestrians)
4. Temporary raised pavement markers
5. High-level warning devices
6. Portable changeable message signs
7. Temporary traffic control signals (including pedestrian signals and accessible pedestrian signals)
8. Temporary traffic barriers
9. Crash cushions
10. Screens
11. Rumble strips
12. More delineation

B. Upgrading of devices:

1. A full complement of standard pavement markings
2. Brighter and/or wider pavement markings
3. Larger and/or brighter signs
4. Channelizing devices with greater conspicuity
5. Temporary traffic barriers in place of channelizing devices

C. Improved geometrics at detours or crossovers

D. Increased distances:

1. Longer advance warning area
2. Longer tapers

E. Lighting:

1. Temporary roadway lighting
2. Steady-burn lights used with channelizing devices
3. Flashing lights for isolated hazards
4. Illuminated signs
5. Floodlights

F. Pedestrian routes and temporary facilities

G. Bicycle diversions and temporary facilities

OPTION

roadway is any street or highway where the posted speed limit is 40 miles per hour or less.

OPTION

As with traffic volumes, if some unusual conditions exist, such as actual speeds being much higher than the posted speed, a different layout may be appropriate. A high speed layout may be used or the distances between advance warning signs may be increased to compensate for the higher speeds.

6G.5 Work Affecting Pedestrian and Bicycle Facilities

SUPPORT

It is not uncommon, particularly in urban areas, that road work and the associated temporary traffic control will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in temporary traffic control zones.

In addition to specific provisions identified in Sections 6G.6, 6G.7, 6G.8, 6G.10, 6G.11, 6G.12, and 6G.13, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

GUIDANCE

Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapters 6D and 6G, Section 6F.68, and in other Sections of Part 6 related to accessibility and detectability provisions in temporary traffic control zones.

Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.

Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

Except for short duration and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK sign should be placed in advance of the activity area. When work is performed on a paved shoulder 2.4 m (8 ft) or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not narrow any existing pedestrian passages to less than 1200 mm (48 in).

Pedestrian detours should be avoided since pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Whenever possible, work should be done in a manner that does not create a need to detour pedestrians from existing routes or crossings.

STANDARD

Where pedestrian routes are closed, alternate pedestrian routes shall be provided.

Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities

Support:

01 It is not uncommon, particularly in urban areas, that road work and the associated TTC will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in TTC zones.

02 In addition to specific provisions identified in Sections 6G.06 through 6G.14, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

Guidance:

03 Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6D, this Chapter, Section 6F.74, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

04 Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.

05 Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

06 Except for short duration and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK (W21-5) sign should be placed in advance of the activity area. When work is performed on a paved shoulder 8 feet or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not narrow any existing pedestrian passages to less than 48 inches.

07 Pedestrian detours should be avoided since pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Whenever possible, work should be done in a manner that does not create a need to detour pedestrians from existing routes or crossings.

Standard:

08 Where pedestrian routes are closed, alternate pedestrian routes shall be provided.

09 When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Other devices may be added to supplement the devices indicated in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities

SUPPORT

It is not uncommon, particularly in urban areas, that road work and the associated temporary traffic control will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in temporary traffic control zones.

In addition to specific provisions identified in Sections 6G.6 through 6G.15, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

Guidance:

03 Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6D, this Chapter, Section 6F.??, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

04 Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.

05 Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

06 Except for short duration and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK (W21-5) sign should be placed in advance of the activity area. When work is performed on a paved shoulder 8 feet or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not narrow any existing pedestrian passages to less than 48 inches.

07 Pedestrian detours should be avoided since pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Whenever possible, work should be done in a manner that does not create a need to detour pedestrians from existing routes or crossings.

Standard:

08 Where pedestrian routes are closed, alternate pedestrian routes shall be provided.

09 When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

When existing pedestrian facilities are disrupted, closed, or relocated in a temporary traffic control zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

6G.6 Temporary Traffic Control During Nighttime Hours SUPPORT

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Conducting highway construction and maintenance activities during night hours could provide an advantage when traditional daytime traffic control strategies cannot achieve an acceptable balance between worker and public safety, traffic and community impact, and constructability. The two basic advantages of working at night are reduced traffic congestion and less involvement with business activities. However, the two basic conditions that must normally be met for night work to offer any advantage are reduced traffic volumes and easy set up and removal of the traffic control patterns on a nightly basis.

Shifting work activities to night hours, when traffic volumes are lower and normal business is less active, might offer an advantage in some cases, as long as the necessary work can be completed and the work site restored to essentially normal operating conditions to carry the higher traffic volume during non-construction hours. Although working at night might offer advantages, it also includes safety issues. Reduced visibility inherent in night work impacts the performance of both drivers and workers. Because traffic volumes are lower and congestion is minimized, speeds are often higher at night necessitating greater visibility at a time when visibility is reduced. Finally, the incidence of impaired (alcohol or drugs), fatigued, or drowsy drivers might be higher at night.

Working at night also involves other factors, including construction productivity and quality, social impacts, economics, and environmental issues. A decision to perform construction or maintenance activities at night normally involves some consideration of the advantages to be gained compared to the safety and other issues that might be impacted.

GUIDANCE

Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6G.4) to provide added visibility and driver guidance, and increased protection for workers.

In addition to the enhancements listed in Section 6G.4, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.

OPTION

Where reduced traffic volumes at night make it feasible, the entire

Section 6G.06 Work Outside of the Shoulder

Support:

01 When work is being performed off the roadway (beyond the shoulders, but within the right-of-way), little or no TTC might be needed. TTC generally is not needed where work is confined to an area 15 feet or more from the edge of the traveled way. However, TTC is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the worksite via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing). For work beyond the shoulder, see Figure 6H-1.

Guidance:

02 *Where the situations described in Paragraph 1 exist, a single warning sign, such as ROAD WORK AHEAD (W20-1), should be used. If the equipment travels on the roadway, the equipment should be equipped with appropriate flags, high-intensity rotating, flashing, oscillating, or strobe lights, and/or a SLOW MOVING VEHICLE (W21-4) sign.*

Option:

03 If work vehicles are on the shoulder, a SHOULDER WORK (W21-5) sign may be used. For mowing operations, the sign MOWING AHEAD (W21-8) may be used.

04 Where the activity is spread out over a distance of more than 2 miles, the SHOULDER WORK (W21-5) sign may be repeated every 1 mile.

05 A supplementary plaque with the message NEXT XX MILES (W7-3aP) may be used.

Guidance:

06 *A general warning sign like ROAD MACHINERY AHEAD (W21-3) should be used if workers and equipment must occasionally move onto the shoulder.*

Section 6G.06 Work Outside of the Shoulder

SUPPORT

When work is being performed off the roadway (beyond shoulders yet within the right-of-way), little or no temporary traffic control may be needed. If there is no effect upon traffic, no devices are needed. Temporary traffic control generally is not needed where work is confined to an area 15 ft or more from the edge of the traveled way. However, temporary traffic control is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the work site via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing). For work beyond the shoulder, see Figure 6K-2.

GUIDANCE

Where the above situations exist, a single warning sign, such as ROAD WORK AHEAD, should be used. If the equipment travels on the roadway, the equipment should be equipped with appropriate flags, high-intensity rotating, flashing, oscillating, or strobe lights, and/or a SLOW MOVING VEHICLE (W21-4) sign.

An advance warning sign should be used when any of the following conditions occur:

- 1. Work will be performed on the shoulder at certain stages of the activity.**
- 2. Equipment may be moved along or across the highway.**
- 3. Motorists may be distracted by the work activity.**

OPTION

A typical sign for this situation may be ROAD WORK AHEAD.

If work vehicles are on the shoulder, a SHOULDER WORK sign may be used. For mowing operations, the sign MOWING AHEAD may be used.

GUIDANCE

Where the activity is spread out over a distance of more than 2 mi, the SHOULDER WORK sign should be repeated every 1 mi.

OPTION

A supplementary plaque with the message NEXT XX MILES may be used.

GUIDANCE

A general warning sign, like Workers sign (W21-1a), should be used if workers and equipment must occasionally move closer to the traveled way.

If the equipment travels on or crosses the roadway, it should be equipped with appropriate flags, flashing lights, and/or a SLOW MOVING VEHICLE symbol. If vehicles are using the shoulder, a ROAD WORK AHEAD or SHOULDER WORK sign is appropriate.

Additional MN Guidance

MN Guidance

MN Guidance

roadway may be closed by detouring traffic to alternate facilities, thus removing the traffic risk from the activity area.

GUIDANCE

Because typical street and highway lighting is rarely adequate to provide sufficient levels of illumination for work tasks, temporary lighting should be provided where workers are active to supply sufficient illumination to reasonably safely perform the work tasks. Temporary lighting for night work should be designed such that glare does not interfere with driver visibility, or create visibility problems for truck drivers, equipment operators, flaggers, or other workers.

Consideration should also be given to stationing uniformed law enforcement officers and lighted patrol cars at night work locations where there is a concern that high speeds or impaired drivers might result in undue risks for workers or other drivers.

STANDARD

Except in emergencies, temporary lighting shall be provided at all flagger stations.

SUPPORT

Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 50 lux (5 foot candles) can be adequate for general activities. An average horizontal luminance of 108 lux (10 foot candles) can be adequate for activities around equipment. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 216 lux (20 foot candles).

6G.7 Control of Traffic Through Traffic Incident Management Areas **MOVED TO END OF COLUMN**

CHAPTER 6H - TYPICAL APPLICATIONS

6H.1 Typical Applications

STANDARD

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a temporary traffic control zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

SUPPORT

Chapter 6G contains a discussion of the factors which affect the selection of a typical temporary traffic control layout. Chapter 6H details the layouts for a variety of situations commonly encountered and shown in Chapter 6J, Long Term Temporary Traffic Control Zones, and Chapter 6K Short Term Temporary Traffic Control Zone Layouts (the Field Manual). While not every situation is addressed, the information illustrated can generally be adapted to a broad

Section 6G.07 Work on the Shoulder with No Encroachment

Support:

01 The provisions of this Section apply to short-term through long-term stationary operations.

Standard:

02 When paved shoulders having a width of 8 feet 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 motor vehicle traffic to remain within the traveled way.

Guidance:

03 When paved shoulders having a width of 8 feet or more are closed on freeways and expressways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign, such as ROAD WORK AHEAD (W20-1), should be used, followed by a RIGHT or LEFT SHOULDER CLOSED (W21-5a) sign. Where the downstream end of the shoulder closure extends beyond the distance that can be perceived by road users, a supplementary plaque bearing the message NEXT XX FEET (W16-4P) or MILES (W7-3aP) should be placed below the SHOULDER CLOSED (W21-5a) sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

04 When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the road system because road users expect to be able to use it in emergencies. Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified length of the approaching TTC zone. The sign(s) should read SHOULDER CLOSED (W21-5a) with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of 1/3 L using the formulas in Tables 6C-3 and 6C-4.

05 When the shoulder is not occupied but work has adversely affected its condition, the LOW SHOULDER (W8-9) or SOFT SHOULDER (W8-4) sign should be used, as appropriate.

06 Where the condition extends over a distance in excess of 1 mile,

Section 6G.07 Work on the Shoulder with No Encroachment

SUPPORT

The provisions of this Section apply to short-term through long-term stationary operations.

GUIDANCE

Parking lanes should be treated the same as shoulders. They should be posted for any restrictions at least 24 hours prior to commencing work.

STANDARD

If the parking lane is normally open to vehicle travel during the time of day the closure will be in effect, the parking lane shall be considered a traveled lane.

STANDARD

When a highway shoulder is occupied, warning is needed to advise the driver and protect the workers. A single warning sign SHOULDER WORK or ROAD WORK AHEAD shall be used.

02 When paved shoulders having a width of 8 feet 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 motor vehicle traffic to remain within the traveled way.

GUIDANCE

When paved shoulders having a width of 8 feet or more are closed on expressways and freeways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign (such as ROAD WORK AHEAD) should be used, followed by a RIGHT or LEFT SHOULDER CLOSED sign. Where the end of the shoulder closure extends beyond the distance which can be perceived by road users, a supplementary plaque bearing the message NEXT X FEET or X MILES should be placed below the SHOULDER CLOSED sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the road system because road users expect to be able to use it in emergencies. Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified length of the approaching temporary traffic control zone. The sign(s) should read SHOULDER CLOSED with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of 1/3 L using the formulas in Table 6C-??.

When the shoulder is not occupied but work has adversely affected its condition, other warning signs and devices are appropriate. The LOW SHOULDER, NO SHOULDER, HIGH SHOULDER or SOFT SHOULDER sign should be used. Refer to Figures 6K-3, 4, and 5 in the Field Manual for longitudinal drop offs

MN Guidance

MN Standard

MN Standard

Refers to MN Drop off Guidance

range of conditions. In many instances, an appropriate temporary traffic control plan is achieved by combining features from various typical layouts. For example, work at an intersection might present a near-side work zone for one street and a far-side work zone for the other street. These treatments are found in two different layouts, and a third layout shows how to handle pedestrian crosswalk closures.

Procedures for establishing temporary traffic control zones vary with such conditions as road configuration, location of the work, work activity, duration of work, **traffic speed**, traffic volume, and **pedestrians**. Examples presented in this Chapter are guides showing how to apply principles and standards. **All distances shown on the layouts are approximate. Engineering judgment is required in applying these guidelines to actual situations and adjusting to field conditions.** In general, the procedures illustrated represent the minimum needs for the situation depicted.

OPTION

Other devices may be added to supplement the devices and the device spacing may be adjusted to provide additional reaction time or **protection**. However, the same important basic considerations of uniformity and standardization of general principles apply for all roadways.

STANDARD

Each temporary traffic control zone shall be reviewed in the field to evaluate its effectiveness.

GUIDANCE

All work zones should be tested by driving through the zone after all devices are in place.

6H.2 Work Performed Outside the Shoulder

SUPPORT

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

When work is being performed off the roadway (beyond shoulders yet within the right-of-way), little or no temporary traffic control may be needed. If there is no effect upon traffic, no devices are needed.

Temporary traffic control generally is not needed where work is confined to an area 4.5 m (15 ft) or more from the edge of the traveled way. However, temporary traffic control is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the work site via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing). For work beyond the shoulder, see Figure 6H-1.

GUIDANCE

Where the above situations exist, a single warning sign, such as ROAD WORK AHEAD, should be used. If the equipment travels on

the sign should be repeated at 1-mile intervals.

Option:

07 In addition, a supplementary plaque bearing the message NEXT XX MILES (W7-3aP) may be used. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

Standard:

08 **When used for shoulder work, arrow boards shall operate only in the caution mode.**

Support:

09 A typical application for stationary work operations on shoulders is shown in Figure 6H-3. Short duration or mobile work on shoulders is shown in Figure 6H-4. Work on freeway shoulders is shown in Figure 6H-5.

Section 6G.08 Work on the Shoulder with Minor Encroachment

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

02 *When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 10 feet, the lane should be closed.*

03 *Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate.*

Option:

04 A lane width of 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when vehicular traffic does not include longer and wider heavy commercial vehicles.

Support:

05 Figure 6H-6 illustrates a method for handling vehicular traffic where the stationary or short duration work space encroaches slightly

and Sections 6F-41?? through 6F-42??. In areas where the speed limit is greater than 30 mph and the condition extends over a distance in excess of one mile, the sign should be repeated at one mile intervals. In areas where the speed limit is 30 mph or less, the sign should be repeated at 1/4 mile increments.

OPTION

In addition, a supplementary plaque bearing the message NEXT X MILES may be placed below the first such warning sign. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

GUIDANCE

Signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

Standard:

08 **When used for shoulder work, arrow boards shall operate only in the caution mode.**

OPTION

If work is directly adjacent to the travel lane, workers need to be protected. In some instances, this may require the use of portable barriers.

Section 6G.08 Work on the Shoulder with Minor Encroachment

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

02 *When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 10 feet, the lane should be closed.*

03 *Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate.*

GUIDANCE

Traffic should not be directed onto a lane that is only partially paved.

OPTION

A lane width of 9 ft may be used for short-term stationary work on intermediate volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.

MN Guidance

MN Guidance

the roadway, the equipment should be equipped with appropriate flags, rotating/strobe lights, and/or a SLOW MOVING VEHICLE symbol.

An advance warning sign should be used when any of the following conditions occur:

1. Work will be performed on the shoulder at certain stages of the activity.
2. Equipment may be moved along or across the highway.
3. Motorists may be distracted by the work activity.

OPTION

A typical sign for this situation may be ROAD WORK AHEAD.

If work vehicles are on the shoulder, a SHOULDER WORK sign may be used. For mowing operations, the sign MOWING AHEAD may be used.

GUIDANCE

Where the activity is spread out over a distance of more than 3.2 km (2 mi), the SHOULDER WORK sign should be repeated every 1.6 km (1 mi).

OPTION

A supplementary plaque with the message NEXT XX MILES may be used.

GUIDANCE

A general warning sign, like Workers sign (W21-1a), should be used if workers and equipment must occasionally move closer to the traveled way.

If the equipment travels on or crosses the roadway, it should be equipped with appropriate flags, flashing lights, and/or a SLOW MOVING VEHICLE symbol. If vehicles are using the shoulder, a ROAD WORK AHEAD or SHOULDER WORK sign is appropriate.

OPTION

If the work is in a narrow median of a divided highway, traffic control for both directions of travel may be necessary.

GUIDANCE

If work in the median of a divided highway is within 4.5 m (15 ft) from the edge of the traveled way for either direction of travel, temporary traffic control should be used through the use of advance warning signs and channelizing devices.

If the work is long term, the use of portable barriers should be considered.

6H.3 Work Performed on Shoulders

SUPPORT

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

The provisions of this Section apply to short-term through long-term stationary operations.

STANDARD

When a highway shoulder is occupied, warning is needed to advise

into the traveled way.

Section 6G.09 Work Within the Median

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Guidance:

02 If work in the median of a divided highway is within 15 feet from the edge of the traveled way for either direction of travel, TTC should be used through the use of advance warning signs and channelizing devices.

Section 6G.10 Work Within the Traveled Way of a Two-Lane Highway

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Detour signs are used to direct road users onto another roadway. At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring or diverting road users on two-lane highways are shown in Figures 6H-7, 6H-8, and 6H-9. Figure 6H-7 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

Guidance:

03 When a detour is long, Detour (M4-8, M4-9) signs should be installed to remind and reassure road users periodically that they are still successfully following the detour.

04 When an entire roadway is closed, as illustrated in Figure 6H-8, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 10 miles from the intersection. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED AHEAD, LOCAL TRAFFIC ONLY (R11-3a) sign should be used. The portion of the road open to local road users should have adequate signing, marking, and delineation.

05 Detours should be signed so that road users will be able to traverse the entire detour route and back to the original roadway as shown in Figure 6H-9.

Section 6G.09 Work Within the Median

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

OPTION

If the work is in a narrow median of a divided highway, traffic control for both directions of travel may be necessary.

Guidance:

02 If work in the median of a divided highway is within 15 feet from the edge of the traveled way for either direction of travel, TTC should be used through the use of advance warning signs and channelizing devices.

If the work is long term, the use of portable barriers should be considered.

Section 6G.09.5 Detours

SUPPORT

Detour signing is usually designed by the traffic engineer with authority over the closed roadway because it is considered a traffic routing problem. Detour signs are used to direct traffic onto another roadway. At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring or diverting road users on two-lane highways are shown in Layouts 6J-16, 6J-17, and 6J-18. Layout 6J-15 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

GUIDANCE

When the detour is long, Detour (M4-8, M4-9) signs should be installed periodically and at major intersections to remind and reassure drivers that they are still on a detour.

When a roadway is closed at some point beyond the detour, traffic should be advised as to what location the road is open. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED AHEAD, LOCAL TRAFFIC ONLY sign should be used. The portion of the road open to local road users should have adequate signing, marking, protection, and delineation.

Detours should be signed so that traffic will be able to get through the entire detour area and back to the original roadway.

When an entire roadway is closed, as illustrated in Layout 6J-19, a

THIS SECTION IN THE FED MUTCD DOES NOT MAKE SENSE IN THIS LOCATION AND ACTUALLY USES THE DESCRIPTION OF A DETOUR

the driver and protect the workers. A single warning sign SHOULDER WORK or ROAD WORK AHEAD shall be used. 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 motor vehicle traffic to remain within the traveled way.

GUIDANCE

Motorists should be given advance warning that a shoulder is closed. Drivers expect to be able to use the shoulder as a refuge in emergencies. The work space on the shoulder should be closed off with channelizing devices with a taper one third the length of a merging taper as established in Section 6C-3.

When a highway shoulder is occupied, a SHOULDER WORK sign, except for short duration and mobile operations, should be placed in advance of the activity area. When work is performed on a paved shoulder 2.4 m (8 ft) or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper.

OPTION

If work is directly adjacent to the travel lane, workers need to be protected. In some instances, this may require the use of portable barriers.

STANDARD

A minimum clear lane width of 3 m (10 ft) shall be maintained at all times. The lane shall be all paved or all gravel.

GUIDANCE

When work takes up part of a lane, motor vehicle traffic volumes, vehicle mix (buses, trucks, and cars), speed, and capacity, should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 3 m (10 ft), the lane should be closed.

Truck off-tracking should be considered when determining whether the minimum lane width of 3 m (10 ft) is adequate.

OPTION

A lane width of 2.7 m (9 ft) may be used for short-term stationary work on intermediate volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.

GUIDANCE

Traffic should not be directed onto a lane that is only partially paved.

When the shoulder is not occupied but work has adversely affected its condition, other warning signs and devices are appropriate. The LOW SHOULDER, NO SHOULDER, HIGH SHOULDER or SOFT SHOULDER sign should be used. Refer to Figure VI-15 in Section 6K (the Field Manual) for longitudinal drop offs and Sections 6F-41 through 6F-42. In areas where the speed limit is greater than 30 mph and the condition extends over a distance in

Support:

06 Techniques for controlling vehicular traffic under one-lane, two-way conditions are described in Section 6C.10.

Option:

07 Flaggers may be used as shown in Figure 6H-10.

08 STOP/YIELD sign control may be used on roads with low traffic volumes as shown in Figure 6H-11.

09 A temporary traffic control signal may be used as shown in Figure 6H-12.

THERE IS NO RURAL HIGHWAY SECTION

Section 6G.11 Work Within the Traveled Way of an Urban

detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 16 km (10 mi) from the intersection.

Section 6G.10 Work Within the Traveled Way of a Two-Lane Highway

SUPPORT

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Techniques for one lane, two-way traffic control are described in Section 6C-5.

STANDARD

When one lane of a two lane road is closed, the remaining lane shall accommodate both lanes of travel. A minimum lane width of 3 m (10 ft) shall be maintained at all times (see Section 6H-3).

OPTION

On intermediate volume, residential streets, traffic may be self regulating.

Where conditions permit, parking may be prohibited and traffic shifted into the parking lanes.

Flaggers may be used as shown in Layout 6K-19.

STOP/YIELD sign control may be used on intermediate volume roads as shown in Layout 6J-9. SEE LAYOUT 6K-19 needs to be fixed

A temporary traffic control signal may be used as shown in Layout 6J-10.

Section 6G.10.5 Work Within the Traveled Way of an Rural Highway

OPTION

For short term temporary traffic control zones that cover a relatively long segment of roadway (up to 3 miles) but do not meet the requirements for a mobile temporary traffic control zone, flagger signs may be installed at one mile increments.

STANDARD

A supplementary plaque indicating NEXT X MILES shall be used.

GUIDANCE

Crossroads should be adequately signed for any driver entering the temporary traffic control zone from the crossroad. For work in intersections, see Section 6H-4.

STANDARD

The driver expects to enter a turn lane at or near the posted speed limit. Therefore it is necessary to provide adequate advance warning of work in the turn lane.

Section 6G.11 Work Within the Traveled Way of an Urban

THIS IS THE INFORMATION FROM MNMUTCD REGARDING TLTW ROADWAYS

excess of 1600 m (one mile), the sign should be repeated at one mile intervals. In areas where the speed limit is 30 mph or less, the sign should be repeated at 400 m (1/4 mile) increments.

When paved shoulders having a width of 2.4 m (8 ft) or more are closed on expressways and freeways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign (such as ROAD WORK AHEAD) should be used, followed by a RIGHT or LEFT SHOULDER CLOSED sign. Where the end of the shoulder closure extends beyond the distance which can be perceived by road users, a supplementary plaque bearing the message NEXT X FEET or X MILES should be placed below the SHOULDER CLOSED sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the road system because road users expect to be able to use it in emergencies.

Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified length of the approaching temporary traffic control zone. The sign(s) should read SHOULDER CLOSED with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of 0.33 L using the formulas in Table 6C-2.

OPTION

In addition, a supplementary plaque bearing the message NEXT X MILES may be placed below the first such warning sign. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

GUIDANCE

Signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

STANDARD

Flashing arrowboards shall be used only in the caution mode.

6H.4 Work Performed in Urban Areas

SUPPORT

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

OPTION

Urban temporary traffic control zones may be divided into segments.

STANDARD

Decisions shall be made as to how to control vehicular traffic, whether parking should be prohibited, how many lanes are required, or whether any turns should be prohibited at intersections, and how to maintain access to business, industrial, and residential areas.

Street

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 In urban TTC zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns need to be prohibited at intersections, and how to maintain access to business, industrial, and residential areas.

03 Pedestrian traffic needs separate attention. Chapter 6D contains information regarding pedestrian movements near TTC zones.

Standard:

04 If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).

05 Where transit stops are affected or relocated because of work activity, both pedestrian and vehicular access to the affected or relocated transit stops shall be provided.

Guidance:

06 If a designated bicycle route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto the path used by pedestrians.

07 Worksites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.

Support:

08 Utility work takes place both within and outside the roadway to construct and maintain services such as power, gas, light, water, or telecommunications. Operations often involve intersections, since that is where many of the network junctions occur. The work force is usually small, only a few vehicles are involved, and the number and types of TTC devices placed in the TTC zone is usually minimal.

Standard:

09 All TTC devices shall be retroreflective or illuminated if utility work is performed during nighttime hours.

Guidance:

Street

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 In urban TTC zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns need to be prohibited at intersections, and how to maintain access to business, industrial, and residential areas.

03 Pedestrian traffic needs separate attention. Chapter 6D contains information regarding pedestrian movements near TTC zones.

Standard:

04 If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).

05 Where transit stops are affected or relocated because of work activity, both pedestrian and vehicular access to the affected or relocated transit stops shall be provided.

Guidance:

06 If a designated bicycle route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto the path used by pedestrians.

07 Worksites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.

Support:

08 Utility work takes place both within and outside the roadway to construct and maintain services such as power, gas, light, water, or telecommunications. Operations often involve intersections, since that is where many of the network junctions occur. The work force is usually small, only a few vehicles are involved, and the number and types of TTC devices placed in the TTC zone is usually minimal.

Standard:

09 All TTC devices shall be retroreflective or illuminated if utility work is performed during nighttime hours.

SUPPORT

Temporary traffic control zones in urban areas present many problems. Frequent intersections and driveways, parking, congestion, visual clutter and lack of space to install signs make the devices more difficult to install.

OPTION

Engineering judgment is required to modify the typical layouts for specific situations. These modifications usually include variations in the spacing of devices to provide adequate sight distance for the driver. Modifications may also include the use of high level warning devices in urban areas, in place of or in addition to the work vehicle or Type III barricade.

Guidance:

If the temporary traffic control zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the temporary traffic control zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.

If the temporary traffic control zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).

Where transit stops are affected or relocated because of work activity, access to temporary transit stops shall be provided.

GUIDANCE

If a designated bicycle route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto the path used by pedestrians.

Even if the road is closed to vehicles, pedestrian access and walkways should be provided, if necessary.

Work sites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.

SUPPORT

Utility work takes place both within and outside the roadway to construct and maintain services such as power, gas, light, water, or telecommunications. Operations often involve intersections, since that is where many of the network junctions occur. The work force is usually small, only a few vehicles are involved, and the number and types of temporary traffic control devices placed in the temporary traffic control zone is usually minimal.

STANDARD

All temporary traffic control devices shall be retroreflective if utility work is performed during nighttime hours.

SUPPORT

Temporary traffic control zones in urban areas present many problems. Frequent intersections and driveways, parking, congestion, visual clutter and lack of space to install signs make the devices more difficult to install.

OPTION

Engineering judgment is required to modify the typical layouts for specific situations. These modifications usually include variations in the spacing of devices to provide adequate sight distance for the driver. Modifications may also include the use of high level warning devices in urban areas, in place of or in addition to the work vehicle or Type III barricade.

GUIDANCE

As discussed under moving and mobile projects, the reduced number of devices in utility work zones should be offset by the use of high-visibility devices, such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles or high-level warning devices.

10 As discussed under short-duration projects, however, the reduced number of devices in utility work zones should be offset by the use of high-visibility devices, such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles or high-level warning devices.

Support:

11 Figures 6H-6, 6H-10, 6H-15, 6H-18, 6H-21, 6H-22, 6H-23, 6H-26, and 6H-33 are examples of typical applications for utility operations. Other typical applications might apply as well.

Section 6G.12 Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Work on multi-lane (two or more lanes of moving motor vehicle traffic in one direction) highways is divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures, and closures on five-lane roadways.

Standard:

03 When a lane is closed on a multi-lane road for other than a mobile operation, a transition area containing a merging taper shall be used.

Guidance:

04 When justified by an engineering study, temporary traffic barriers (see Section 6F.70) should be used to prevent incursions of errant vehicles into hazardous areas or work space.

Support:

05 Figure 6H-34 illustrates a lane closure in which temporary traffic barriers are used.

Option:

06 When the right lane is closed, TTC similar to that shown in Figure 6H-33 may be used for undivided or divided four-lane roads.

Guidance:

07 If morning and evening peak hour vehicular traffic volumes in the two directions are uneven and the greater volume is on the side where the work is being done in the right-hand lane, consideration should be given to closing the inside lane for opposing vehicular traffic and making the lane available to the side with heavier vehicular traffic, as shown in Figure 6H-31.

08 If the larger vehicular traffic volume changes to the opposite direction at a different time of the day, the TTC should be changed to allow two lanes for opposing vehicular traffic by moving the devices from the opposing lane to the center line. When it is necessary to create a temporary center line that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

Option:

10 As discussed under short-duration projects, however, the reduced number of devices in utility work zones should be offset by the use of high-visibility devices, such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles or high-level warning devices.

Section 6G.12 Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway

SUPPORT

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Work on multi-lane (two or more lanes of moving motor vehicle traffic in one direction) highways is divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures, and closures on five-lane roadways.

Standard:

03 When a lane is closed on a multi-lane road for other than a mobile operation, a transition area containing a merging taper shall be used.

Guidance:

04 When justified by an engineering study, temporary traffic barriers should be used to prevent incursions of errant vehicles into hazardous areas or work space. (see Section 6F.xx)

Guidance:

07 If morning and evening peak hour vehicular traffic volumes in the two directions are uneven and the greater volume is on the side where the work is being done in the right-hand lane, consideration should be given to closing the inside lane for opposing vehicular traffic and making the lane available to the side with heavier vehicular traffic.

08 If the larger vehicular traffic volume changes to the opposite direction at a different time of the day, the TTC should be changed to allow two lanes for opposing vehicular traffic by moving the devices from the opposing lane to the center line. When it is necessary to create a temporary center line that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

OPTION

If the work activity can be contained entirely within the left (or inside) lane, it may be appropriate to close only that lane on low

A. Two-lane, two-way, low speed

STANDARD

When one lane of a two lane road is closed, the remaining lane shall accommodate both lanes of travel. A minimum lane width of 3 m (10 ft) shall be maintained at all times (see Section 6H-3).

OPTION

Techniques for one lane, two-way traffic control are described in Section 6C-5. On intermediate volume, residential streets, traffic may be self regulating. Where conditions permit, parking may be prohibited and traffic shifted into the parking lanes.

B. Multi-lane undivided

OPTION

If the work activity can be contained entirely within the left (or inside) lane, it may be appropriate to close only that lane on low speed streets or highways.

When closing a left lane on a multi-lane undivided road, as motor vehicle traffic flow permits, the two interior lanes may be closed, as shown in Layouts 6K-34 and 6K-35, to provide drivers and workers additional lateral clearance and to provide access to the work space.

STANDARD

When only the left lane is closed on undivided roads, channelizing devices shall be placed along the centerline as well as along the adjacent lane.

GUIDANCE

Channelizing devices should be placed along the centerline and outside of the work space to give advance warning to the opposing traffic.

When an interior lane is closed, an adjacent lane should also be considered for closure to provide additional space for vehicles and materials and to facilitate the movement of equipment within the work space.

When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Motor vehicle traffic should be moved over one lane at a time. As shown in Layout 6K-54, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Table 6C-2.

STANDARD

When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.

OPTION

When half the road is closed on an undivided highway, both directions of motor vehicle traffic may be accommodated as shown in Layout 6K-20. When both interior lanes are closed, temporary traffic controls may be used as indicated in Layout 6K-

09 When closing a left lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Figure 6H-30, to provide drivers and workers additional lateral clearance and to provide access to the work space.

Standard:

10 When only the left lane is closed on undivided roads, channelizing devices shall be placed along the center line as well as along the adjacent lane.

Guidance:

11 When an interior lane is closed, an adjacent lane should also be considered for closure to provide additional space for vehicles and materials and to facilitate the movement of equipment within the work space.

12 When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Vehicular traffic should be moved over one lane at a time. As shown in Figure 6H-37, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Tables 6C-3 and 6C-4.

Option:

13 If operating speeds are 40 mph or less and the space approaching the work area does not permit moving traffic over one lane at a time, a single continuous taper may be used.

Standard:

14 When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.

Option:

15 When half the road is closed on an undivided highway, both directions of vehicular traffic may be accommodated as shown in Figure 6H-32. When both interior lanes are closed, temporary traffic controls may be used as provided in Figure 6H-30. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.16).

Support:

16 TTC for lane closures on five-lane roads is similar to other multi-

speed streets or highways.

When closing a left lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Layouts 6K-?? and 6K-??, to provide drivers and workers additional lateral clearance and to provide access to the work space.

Standard:

10 When only the left lane is closed on undivided roads, channelizing devices shall be placed along the center line as well as along the adjacent lane.

GUIDANCE

Channelizing devices should be placed along the centerline and outside of the work space to give advance warning to the opposing traffic.

When an interior lane is closed, an adjacent lane should also be considered for closure to provide additional space for vehicles and materials and to facilitate the movement of equipment within the work space.

When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Vehicular traffic should be moved over one lane at a time. As shown in Layout 6K-54?, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Table 6C-2.

Option:

13 If operating speeds are 40 mph or less and the space approaching the work area does not permit moving traffic over one lane at a time, a single continuous taper may be used.

Standard:

14 When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.

OPTION

When half the road is closed on an undivided highway, both directions of motor vehicle traffic may be accommodated as shown in Layout 6K-20?. When both interior lanes are closed, temporary traffic controls may be used as indicated in Layout 6K-19?. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.16).

OPTION

An alternative is to close the two center lanes to give motorists and workers additional protection and to provide easier access to the work space. Overall safety needs, evaluated on the basis of existing traffic volumes and speeds in each direction, is the main factor for determining alternatives.

SUPPORT

Temporary traffic control for lane closures on five-lane roads is

19. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.15).

SUPPORT

Temporary traffic control for lane closures on five-lane roads is similar to other multi-lane undivided roads. Layout 6K-23 can be adapted for use on five-lane roads. Layout 6K-1 can be used on a five-lane road for short duration and mobile operations.

OPTION

An alternative is to close the two center lanes to give motorists and workers additional protection and to provide easier access to the work space. Overall safety needs, evaluated on the basis of existing traffic volumes and speeds in each direction, is the main factor for determining alternatives.

C. Multi-lane Divided or One Way Streets

SUPPORT

Work on multi-lane (two or more lanes of moving motor vehicle traffic in one direction) highways is divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures, and closures on five-lane roadways.

OPTION

On multi-lane divided roads, crossovers may be constructed, lanes in the opposite direction closed and traffic diverted onto the opposing road.

GUIDANCE

In these situations and on one way streets, traffic should be moved over one lane at a time and the tapers should be separated by a distance of twice the merging taper.

When an interior lane is closed for use as a work space, consideration should also be given to closing an adjacent lane. This procedure provides additional space for vehicles and materials and facilitates the movement of equipment within the work space.

STANDARD

Where speeds are greater than 30 mph, center lane closures shall not be used except for moving operations. For higher speed areas, if work is necessary in the center lane, either the right two lanes or the left two lanes shall be closed.

In high speed extended lane closures, Type III barricades shall be installed at 300 m (1,000 ft) spacing in the closed lanes to ensure that the driver is aware that the lane is closed.

OPTION

Three drums may be used in place of the Type III barricades.

When the right lane is closed, temporary traffic control similar to that shown in Layout 6K-30 may be used for undivided or divided four-lane roads.

GUIDANCE

If morning and evening peak hourly motor vehicle traffic volumes in the two directions are uneven and the greater volume is on the side where the work is being done in the right lane, consideration should be given to closing the inside lane for opposing motor

lane undivided roads. Figure 6H-32 can be adapted for use on five-lane roads. Figure 6H-35 can be used on a five-lane road for short duration and mobile operations.

Section 6G.13 Work Within the Traveled Way at an Intersection

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 The typical applications for intersections are classified according to the location of the work space with respect to the intersection area (as defined by the extension of the curb or edge lines). The three classifications are near side, far side, and in-the-intersection. Work spaces often extend into more than one portion of the intersection. For example, work in one quadrant often creates a near-side work space on one street and a far-side work space on the cross street. In such instances, an appropriate TTC plan is obtained by combining features shown in two or more of the intersection and pedestrian typical applications.

03 TTC zones in the vicinity of intersections might block movements and interfere with normal road user flows. Such conflicts frequently occur at more complex signalized intersections having such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, signal detectors for actuated control, and accessible pedestrian signals and detectors.

Guidance:

04 The effect of the work upon signal operation should be considered, and temporary corrective actions should be taken, if necessary, such as revising signal phasing and/or timing to provide adequate capacity, maintaining or adjusting signal detectors, and relocating signal heads to provide adequate visibility as described in Part 4.

Standard:

05 When work will occur near an intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.

Guidance:

similar to other multi-lane undivided roads. Layout 6K-23? can be adapted for use on five-lane roads. Layout 6K-1? can be used on a five-lane road for short duration and mobile operations.

GUIDANCE

For roadways having either center two-way left turn lanes or exclusive left turn lanes, a transition area should be provided for vehicles entering or exiting the turn lanes.

Section 6G.13 Work Within the Traveled Way at an Intersection

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 The typical layouts for intersections are classified according to the location of the work space with respect to the intersection area (as defined by the extension of the curb or edge lines). The three classifications are near side, far side, and in-the-intersection. Work spaces often extend into more than one portion of the intersection. For example, work in one quadrant often creates a near-side work space on one street and a far-side work space on the cross street. In such instances, an appropriate TTC plan is obtained by combining features shown in two or more of the intersection and pedestrian typical applications.

03 TTC zones in the vicinity of intersections might block movements and interfere with normal road user flows. Such conflicts frequently occur at more complex signalized intersections having such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, signal detectors for actuated control, and accessible pedestrian signals and detectors.

Guidance:

04 The effect of the work upon signal operation should be considered, and temporary corrective actions should be taken, if necessary, such as revising signal phasing and/or timing to provide adequate capacity, maintaining or adjusting signal detectors, and relocating signal heads to provide adequate visibility as described in Part 4.

Prior to working in a signalized intersection, the traffic engineering staff having jurisdiction should be contacted for signal timing modifications.

Standard:

05 When work will occur near an intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.

GUIDANCE

For work at an intersection, advance warning signs, devices, and markings should be used as appropriate on all roadway approaches to the intersection as appropriate.

When work will occur near non-signalized intersections where operational and capacity problems are anticipated, the highway agency having jurisdiction should be contacted.

vehicle traffic and making the lane available to the side with heavier motor vehicle traffic. If the larger motor vehicle traffic volume changes to the opposite direction at a different time of the day, the temporary traffic control should be changed to allow two lanes for opposing motor vehicle traffic by moving the devices from the opposing lane back to the centerline. When it is necessary to create a temporary centerline that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

STANDARD

When a lane is closed on a multi-lane road for other than a mobile operation, a transition area containing a merging taper shall be used.

GUIDANCE

When justified by an engineering study, temporary traffic barriers should be used to prevent incursions of errant vehicles into hazardous areas or work space.

STANDARD

When temporary traffic barriers are placed immediately adjacent to the traveled way, they shall be equipped with appropriate channelizing devices, delineation, and/or other temporary traffic control devices. For lane closures, the merging taper shall use channelizing devices and the temporary traffic barrier shall be placed beyond the transition area.

SUPPORT

It must be recognized that although temporary traffic barriers are shown in several of the typical applications of Chapter 6H, they are not considered to be temporary traffic control devices in themselves.

Figure 6F-6 illustrates placement and end treatments for temporary traffic barriers.

There are four 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 motor vehicle traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects.

D. Intersections

SUPPORT

Chapter 6D and Sections 6F.68 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

STANDARD

The typical layouts for intersections are classified according to the location of the work space with respect to the intersection area (as

06 For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 40 mph, additional warning signs should be used in the advance warning area.

07 Pedestrian crossings near TTC sites should be separated from the worksite by appropriate barriers that maintain the accessibility and detectability for pedestrians with disabilities.

Support:

08 Near-side work spaces, as depicted in Figure 6H-21, are simply handled as a midblock lane closure. A problem that might occur with near-side lane closure is a reduction in capacity, which during certain hours of operation could result in congestion and backups.

Option:

09 When near-side work spaces are used, an exclusive turn lane may be used for through vehicular traffic.

10 Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as Keep Left) may be placed within the transition area.

Support:

11 Far-side work spaces, as depicted in Figures 6H-22 through 6H-25, involve additional treatment because road users typically enter the activity area by straight-through and left- or right-turning movements.

Guidance:

12 When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection.

Option:

13 If there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to an exclusive turn lane.

Support:

14 Figures 6H-26 and 6H-27 provide guidance on applicable procedures for work performed within the intersection.

Option:

15 If the work is within the intersection, any of the following strategies may be used:

- A. A small work space so that road users can move around it, as shown in Figure 6H-26;

06 For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 40 mph, additional warning signs should be used in the advance warning area.

07 Pedestrian crossings near TTC sites should be separated from the worksite by appropriate barriers that maintain the accessibility and detectability for pedestrians with disabilities.

1. Work Space on the Near Side of Intersections

SUPPORT

Near side work spaces are simply handled as a midblock lane closure. When a lane is closed on the approach side of an intersection, standard lane closure and taper techniques apply. A problem that may occur with a near-side lane closure is a reduction in capacity, which during certain hours of operation, could result in congestion and backups.

OPTION

When near-side work spaces are used, A exclusive turn lane may be converted for use as a through traffic lane.

Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as a Keep Left sign) may be placed within the transition area.

2. Work Space on the Far Side of Intersections

SUPPORT

Far-side work spaces involve require additional treatment because road users typically enter the activity area by straight-through and left or right turning movements.

Guidance:

12 When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection. Merging movements within the intersection should be avoided. Whenever possible, a taper should be provided in the closed lane for turning vehicles.

Option:

13 If there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to an exclusive turn lane.

3. Work Space Within the Intersection

SUPPORT

Layout 6K-42 provides guidance on applicable procedures for work performed within the intersection.

OPTION

15 If the work is within the intersection, any of the following strategies may be used:

- a. A small work space so that road users can move around it..

defined by the extension of curb or edge lines.) Thus, there are three classifications—near side, far side and in the intersection.

SUPPORT

Traffic control zones in the vicinity of intersections may block movements and interfere with normal road user flows. Such conflicts frequently occur at complex signalized intersections having such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, and signal detectors for actuated control, and accessible pedestrian signals and detectors.

GUIDANCE

The effect of the work upon signal operation should be considered, such as signal phasing for adequate capacity, for maintaining or adjusting detectors in the pavement, and ensuring the appropriate visibility of signal heads. Prior to working in a signalized intersection, the traffic engineering staff having jurisdiction should be contacted for signal timing modifications.

STANDARD

When work will occur near signalized intersections intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.

SUPPORT

It should be recognized that some work spaces may extend into more than one portion of the intersection. For example, work in one quadrant may create a near side work space on one street and a far side work space on the cross street.

GUIDANCE

In such instances, the traffic control zone should incorporate features shown in two or more of the intersection and pedestrian typical layouts. For work at an intersection, advance warning signs, devices, and markings should be used as appropriate on all roadway approaches to the intersection as appropriate.

When work will occur near non-signalized intersections where operational and capacity problems are anticipated, the highway agency having jurisdiction should be contacted.

For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 40 mph, additional warning signs should be used in the advance warning area.

Pedestrian crossings near temporary traffic control sites should be separated from the worksite by appropriate barriers that maintain the accessibility and detectability for pedestrians with disabilities.

1. Work Space on the Near Side of Intersections

SUPPORT

B. Flaggers or uniformed law enforcement officers to direct road users, as shown in Figure 6H-27;

C. Work in stages so the work space is kept to a minimum; and

D. Road closures or upstream diversions to reduce road user volumes.

Guidance:

¹⁶ Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users.

Section 6G.14 Work Within the Traveled Way of a Freeway or Expressway

Support:

⁰¹ Problems of TTC might occur under the special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways. Although the general principles outlined in the previous Sections of this Manual are applicable to all types of highways, high-speed, access controlled highways need special attention in order to accommodate vehicular traffic while also protecting road users and workers.

The road user volumes, road vehicle mix (buses, trucks, cars, and bicycles, if permitted), and speed of vehicles on these facilities require that careful TTC procedures be implemented, for example, to induce critical merging maneuvers well in advance of work spaces and in a manner that creates minimum turbulence and delay in the vehicular traffic stream. These situations often require more conspicuous devices than specified for normal rural highway or urban street use. However, the same important basic considerations of uniformity and standardization of general principles apply for all roadways.

⁰² Work under high-speed, high-volume vehicular traffic on a

b. Flaggers or uniformed law enforcement officers to direct road users.

c. Work in stages so the work space is kept to a minimum.

d. Road closures or upstream diversions to reduce road user volumes.

Guidance:

¹⁶ Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users.

Section 6G.14 Work Within the Traveled Way of a Freeway or Expressway

SUPPORT

Due to the physical characteristics of these facilities, unique problems such as limited access are encountered. Work under high-speed, high-volume motor vehicle traffic on a controlled access highway is complicated by the roadway design and operational features.

The presence of median dividers that establish separate roadways for directional traffic may also prohibit the closure of that roadway or the diverting of traffic to other lanes. Lack of access to and from adjacent roadways prohibits rerouting of traffic away from the activity area in many cases.

A major consideration in the establishment of traffic control is the vehicular speed differential which exists and the limited time available for drivers to react safely to unusual conditions while still providing a work space that protects workers.

Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

Problems of TTC might occur under the special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways. Although the general principles outlined in the previous Sections of this Manual are applicable to all types of highways, high-speed, access controlled highways need special attention in order to accommodate vehicular traffic while also protecting road users and workers.

The road user volumes, road vehicle mix (buses, trucks, cars, and bicycles, if permitted), and speed of vehicles on these facilities require that careful TTC procedures be implemented, for example, to induce critical merging maneuvers well in advance of work spaces and in a manner that creates minimum turbulence and delay in the vehicular traffic stream. These situations often require more conspicuous devices than specified for normal rural highway or urban street use. However, the same important basic considerations of uniformity and standardization of general principles apply for all roadways.

⁰² Work under high-speed, high-volume vehicular traffic on a

Near side work spaces are simply handled as a midblock lane closure. When a lane is closed on the approach side of an intersection, standard lane closure and taper techniques apply. The one significant problem that may occur with a near-side lane closure is a reduction in capacity, which during certain hours of operation, could result in congestion and backups.

OPTION

When near-side work spaces are used, an exclusive turn lane may be converted for use as a through traffic lane.

Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as a Keep Left sign) may be placed within the transition area.

2. Work Space on the Far Side of Intersections

GUIDANCE

When a lane must be closed on the far side of an intersection, that lane should be closed on the near side approach, or converted to an exclusive turn lane to preclude merging movements within the intersection.

Merging movements within the intersection should be avoided.

Whenever possible, a taper should be provided in the closed lane for turning vehicles.

OPTION

If, however, there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to an exclusive turn lane.

SUPPORT

Farside work spaces require additional treatment because motorists typically may enter the activity area by straight-through and left or right turning movements.

3. Work Space Within the Intersection

SUPPORT

Layout 6K-42 provides guidance on applicable procedures for work performed within the intersection.

OPTION

If the work is within the intersection, several options exist as follows:

- a. A small work space so that road users can move around it..
- b. Flaggers or uniformed law enforcement officers to direct road users.
- c. Work in stages so the work space is kept to a minimum.
- d. Road closures or upstream diversions to reduce road user volumes.

OPTION

Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users

controlled access highway is complicated by the roadway design and operational features. The presence of a median that establishes separate roadways for directional vehicular traffic flow might prohibit the closing of one of the roadways or the diverting of vehicular traffic to the other roadway. Lack of access to and from adjacent roadways prohibits rerouting of vehicular traffic away from the work space in many cases. Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

03 TTC for a typical lane closure on a divided highway is shown in Figure 6H-33. Temporary traffic controls for short duration and mobile operations on freeways are shown in Figure 6H-35. A typical application for shifting vehicular traffic lanes around a work space is shown in Figure 6H-36. TTC for multiple and interior lane closures on a freeway is shown in Figures 6H-37 and 6H-38.

Guidance:

04 The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Figure 6H-37. When the capacity of the other lanes is needed, the method shown in Figure 6H-38 should be used.

Section 6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Support:

01 Two-lane, two-way operation on one roadway of a normally divided highway is a typical procedure that requires special consideration in the planning, design, and work phases, because unique operational problems (for example, increasing the risk of head-on crashes) can arise with the two-lane, two-way operation.

Standard:

02 When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing vehicular traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate), channelizing devices, or a temporary raised island throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

Support:

03 Figure 6H-39 shows the procedure for two-lane, two-way operation. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work are shown in Figures 6H-40 and 6H-41.

controlled access highway is complicated by the roadway design and operational features. The presence of a median that establishes separate roadways for directional vehicular traffic flow might prohibit the closing of one of the roadways or the diverting of vehicular traffic to the other roadway. Lack of access to and from adjacent roadways prohibits rerouting of vehicular traffic away from the work space in many cases. Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

03 TTC for a typical lane closure on a divided highway is shown in Layout 6K-51?. Temporary traffic controls for short duration and mobile operations on freeways are shown in Layout 6K-45?. A typical application for shifting vehicular traffic lanes around a work space is shown in Layout 6K-13?. TTC for multiple and interior lane closures on a freeway is shown in Layouts 6K-?? and 6K-??.

Guidance:

04 The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Layout 6K-?? When the capacity of the other lanes is needed, the method shown in Layout 6K-?? should be used.

Section 6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Support:

01 Two-lane, two-way operation on one roadway of a normally divided highway is a typical procedure that requires special consideration in the planning, design, and work phases, because unique operational problems (for example, increasing the risk of head-on crashes) can arise with the two-lane, two-way operation.

Standard:

02 When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing vehicular traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate), channelizing devices, or a temporary raised island throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

SUPPORT

The procedure for two-lane, two-way operation is shown in Layouts 6J-3, 6J-4, and 6J-5?. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work are shown in Layouts 6J-6 and 6J-7?.

GUIDANCE

The following items should be considered during the decision-making process:

- Suitable detours
- Characteristics of the traffic
- Maintaining traffic on the shoulder
- Construction of temporary lanes in the median

MN GUIDANCE

E. Parking Lanes

GUIDANCE

Parking lanes should be treated the same as shoulders. They should be posted for any restrictions at least 24 hours prior to commencing work.

STANDARD

If the parking lane is normally open to vehicle travel during the time of day the closure will be in effect, the parking lane shall be considered a traveled lane.

F. Three and Five-Lane Roadways with Center Turn Lanes

GUIDANCE

For roadways having either center two-way left turn lanes or exclusive left turn lanes, a transition area should be provided for vehicles entering or exiting the turn lanes.

6H.5 Work Performed in Rural Areas

SUPPORT

Traffic control for rural areas is similar to traffic control for urban areas. However, with higher speeds more devices are necessary to allow the driver adequate time for proper response. The spacing and size of these devices are also increased.

GUIDANCE

Sight distance should be considered in any temporary traffic control zone.

OPTION

The vertical and horizontal alignment on rural roads often causes limited sight distance. It may be necessary to increase device spacing in order to give the driver adequate time for proper response.

A. Two-lane, two-way roadway, high speed

SUPPORT

Techniques for one lane, two-way traffic control are described in Section 6C-5.

OPTION

For short term temporary traffic control zones that cover a relatively long segment of roadway (up to 4.8 km [3 miles]) but do not meet the requirements for a mobile temporary traffic control zone, flagger signs may be installed at 1.6 kilometer (one mile) increments.

Flaggers may be used as shown in Layout 6K-19.

STOP/YIELD sign control may be used on intermediate volume roads as shown in Layout 6J-9.

A temporary traffic control signal may be used as shown in Layout 6J-10.

STANDARD

A supplementary plaque indicating NEXT X MILES shall be used.

Section 6G.16 Crossovers

Guidance:

⁰¹ The following are considered good guiding principles for the design of crossovers:

- A. Tapers for lane drops should be separated from the crossovers,

- Construction of emergency pullouts in the two-lane, two-way section
- Closing only one directional lane
- Hazards to temporary traffic control zone personnel
- Shortest contract time
- Most efficient construction practice and least cost
- Width or height restrictions
- Condition of the pavement and the shoulders in the proposed TLTWO section.

STANDARD

The traffic control plan shall include provisions for separation of opposing traffic whenever two-way traffic must be maintained on one roadway of a normally divided highway. When traffic must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated either with portable barriers, or with channelizing devices throughout the length of the two-way operation.

OPTION

Striping, raised pavement markers, and signing, either alone or in combination, are used to complement separation devices. Alone or in combination, they do not meet the requirements for traffic separation.

STANDARD

When the directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices within the temporary two-lane, two-way operations section, and at intersections shall be covered, removed, or obliterated.

SUPPORT

In a TLTWO, diverting traffic to the opposing left lane exposes the traffic to unprotected hazards. These hazards may include unprotected bridge piers, bridge rail, and guard rail ends.

STANDARD

Prior to diverting traffic, these hazards shall be protected and marked.

The TLTWO shall be used only after careful consideration of other available methods of traffic control.

OPTION

It may be necessary to laterally shift one or more lanes of traffic.

STANDARD

If more than one lane is being shifted, even for a short term operation, it will be necessary to remove in-place pavement markings and install temporary markings.

Section 6G.16 Crossovers

GUIDANCE

The following are good guiding principles for the design of crossovers:

- Tapers for lane drops should be separated from the

MN STANDARDS

B. Intersections

GUIDANCE

Although intersections may be widely spaced, the crossroads should be adequately signed for any driver entering the temporary traffic control zone from the crossroad. For work in intersections, see Section 6H-4.

C. Turn lanes

STANDARD

The driver expects to enter a turn lane at or near the posted speed limit. Therefore it is necessary to provide adequate advance warning of work in the turn lane.

6H.6 Work Performed on Expressways/Freeways

SUPPORT

Problems of temporary traffic control might occur under the special conditions encountered where traffic must be moved through or around temporary traffic control zones on high-speed, high-volume roadways. Although the general principles outlined in the previous sections of the manual are applicable to all types of highways, high-speed, access-controlled highways need special attention in order to reasonably safely and efficiently accommodate vehicular traffic while also protecting work forces. On expressways and freeways, drivers expectations change. The presence of a worker or an obstacle on the roadway is a totally unexpected event.

Traffic control on these facilities requires a balance between worker and driver safety. The road user volume, road vehicle mix (buses, trucks, cars, and bicycles if permitted), and speed of vehicles on these facilities requires that careful traffic control procedures be implemented, for example, to induce critical merging maneuvers well in advance of activity areas and in a manner that creates minimum turbulence and delay in the vehicular traffic stream. These situations may require more conspicuous devices than specified for normal rural or urban street use. However, the same important basic considerations of uniformity and standardization of general principles apply for all roadways.

Due to the high volumes of traffic on expressways and freeways, especially in urban areas, it is difficult to schedule work during non-peak times. Many operations are being limited to night time hours when traffic volumes are the lowest. See Section 6H-4(c) for multi-lane divided closures.

Temporary traffic control for a typical lane closure on a divided highway is shown in Layout 6K-51. Temporary traffic controls for short duration and mobile operations on freeways are shown in Layout 6K-45. A typical application for shifting motor vehicle traffic lanes around a work space is shown in Layout 6J-13. Temporary

as shown in Figure 6H-39.

B. Crossovers should be designed for speeds no lower than 10 mph below the posted speed, the off-peak 85th-percentile speed prior to the work starting, or the anticipated operating speed of the roadway, unless unusual site conditions require that a lower design speed be used.

C. A good array of channelizing devices, delineators, and full-length, properly placed pavement markings should be used to provide drivers with a clearly defined travel path.

D. The design of the crossover should accommodate all vehicular traffic, including trucks and buses.

Support:

02 Temporary traffic barriers and the excessive use of TTC devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

Section 6G.17 Interchanges

Guidance:

01 Access to interchange ramps on limited-access highways should be maintained even if the work space is in the lane adjacent to the ramps. Access to exit ramps should be clearly marked and delineated with channelizing devices. For long-term projects, conflicting pavement markings should be removed and new ones placed. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before ramp closings.

Option:

02 If access is not possible, ramps may be closed by using signs and Type 3 Barricades. As the work space changes, the access area may be changed, as shown in Figure 6H-42. A TTC zone in the exit ramp may be handled as shown in Figure 6H-43.

03 When a work space interferes with an entrance ramp, a lane may need to be closed on the freeway (see Figure 6H-44). A TTC zone in the entrance ramp may require shifting ramp vehicular traffic (see Figure 6H-44).

crossovers.

- Crossovers should be designed for speeds not less than 10 miles per hour below the posted speed prior to work starting. If unusual site conditions require that a lower design speed be used, the signing shall reflect an appropriate advisory speed.
- A good array of channelizing devices, delineators, and full-length, properly placed pavement markings should provide drivers with a clearly defined travel path.
- The design of the crossover should accommodate all roadway traffic including trucks and buses.
- A clear area should be provided adjacent to the crossover.

GUIDANCE

A diversion (bypass) should be designed the same as a crossover.

OPTION

A diversion may carry either one direction or both directions of traffic. It may also be combined with a STOP/STOP condition for use at short segments such as a culvert on a two-lane, two-way road.

Support:

02 Temporary traffic barriers and the excessive use of TTC devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

Section 6G.17 Interchanges

Guidance:

01 Access to interchange ramps on limited-access highways should be maintained even if the work space is in the lane adjacent to the ramps. Access to exit ramps should be clearly marked and delineated with channelizing devices. For long-term projects, conflicting pavement markings should be removed and new ones placed. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before ramp closings.

Option:

02 If access is not possible, ramps may be closed by using signs and Type 3 Barricades. As the work space changes, the access area may be changed, as shown in Layout 6K-57?. A TTC zone in the exit ramp may be handled as shown in Layout 6K-60?.

When a work space interferes with an entrance ramp, a lane may need to be closed on the highway. Work in the entrance ramp may require shifting ramp vehicular traffic. Temporary traffic control for both operations is shown in Layouts 6K-58 and 6K-59.

GUIDANCE

Egress to exit ramps should be clearly marked and outlined with channelizing devices.

Advance warning sign spacing is dependent upon the length of the

MN GUIDANCE

MN GUIDANCE

MN GUIDANCE

traffic control for multiple and interior lane closures on a freeway is shown in Layout 6K-54.

GUIDANCE

The method for closing an interior lane when the open lanes have the capacity to carry motor vehicle traffic should be as shown in Layout 6K-54.

A. Problem Areas

SUPPORT

Due to the physical characteristics of these facilities, unique problems such as limited access are encountered. Work under high-speed, high-volume motor vehicle traffic on a controlled access highway is complicated by the roadway design and operational features.

The presence of median dividers that establish separate roadways for directional traffic may also prohibit the closure of that roadway or the diverting of traffic to other lanes. Lack of access to and from adjacent roadways prohibits rerouting of traffic away from the activity area in many cases.

A major consideration in the establishment of traffic control is the vehicular speed differential which exists and the limited time available for drivers to react safely to unusual conditions while still providing a work space that protects workers.

Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

B. Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

SUPPORT

Two-lane, two-way operations (TLTWO) on one roadway of a normally divided highway is a typical application that requires special consideration in the planning, design, and construction phases. Unique operational problems (for example, increasing the risk of serious head-on collisions) can arise with the TLTWO. Before including a TLTWO in the traffic control plan for a project, careful consideration should be given to its appropriateness.

STANDARD

When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing motor vehicle traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate) or with channelizing devices throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

SUPPORT

The procedure for two-lane, two-way operation is shown in Layouts 6J-3, 6J-4, and 6J-5. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work

Section 6G.18 Work in the Vicinity of a Grade Crossing Standard:

01 When grade crossings exist either within or in the vicinity of a TTC zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

Support:

02 Figure 6H-46 shows work in the vicinity of a grade crossing.

03 Section 8A.08 contains additional information regarding temporary traffic control zones in the vicinity of grade crossings.

Guidance:

04 Early coordination with the railroad company or light rail transit agency should occur before work starts.

Section 6G.19 Temporary Traffic Control During Nighttime Hours

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Conducting highway construction and maintenance activities during night hours could provide an advantage when traditional daytime traffic control strategies cannot achieve an acceptable balance between worker and public safety, traffic and community impact, and constructability. The two basic advantages of working at night are reduced traffic congestion and less involvement with business activities. However, the two basic conditions that must normally be met for night work to offer any advantage are reduced traffic volumes and easy set up and removal of the traffic control patterns on a nightly basis.

03 Shifting work activities to night hours, when traffic volumes are lower and normal business is less active, might offer an advantage in some cases, as long as the necessary work can be completed and the worksite restored to essentially normal operating conditions to carry the higher traffic volume during non-construction hours.

04 Although working at night might offer advantages, it also includes safety issues. Reduced visibility inherent in night work impacts the performance of both drivers and workers. Because traffic volumes are lower and congestion is minimized, speeds are often higher at night necessitating greater visibility at a time when visibility is reduced. Finally, the incidence of impaired (alcohol or drugs), fatigued, or drowsy drivers might be higher at night.

ramp and the exact location of signs is determined in the field. Spacing of the signs should be as long as practicable. A minimum lane width of 12 ft on exit ramps should be maintained.

Section 6G.18 Work in the Vicinity of a Grade Crossing Standard:

01 When grade crossings exist either within or in the vicinity of a TTC zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

SUPPORT

Work in the vicinity of a highway-rail grade crossing is shown in Layout 6J-14.

Guidance:

04 Early coordination with the railroad company or light rail transit agency should occur before work starts.

Section 6G.19 Temporary Traffic Control During Nighttime Hours

Support:

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Conducting highway construction and maintenance activities during night hours could provide an advantage when traditional daytime traffic control strategies cannot achieve an acceptable balance between worker and public safety, traffic and community impact, and constructability. The two basic advantages of working at night are reduced traffic congestion and less involvement with business activities. However, the two basic conditions that must normally be met for night work to offer any advantage are reduced traffic volumes and easy set up and removal of the traffic control patterns on a nightly basis.

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are shown in Layouts 6J-6 and 6J-7.

GUIDANCE

The following items should be considered during the decision-making process:

- Suitable detours
- Characteristics of the traffic
- Maintaining traffic on the shoulder
- Construction of temporary lanes in the median
- Construction of emergency pullouts in the two-lane, two-way section
- Closing only one directional lane
- Hazards to temporary traffic control zone personnel
- Shortest contract time
- Most efficient construction practice and least cost
- Width or height restrictions
- Condition of the pavement and the shoulders in the proposed TL TWO section.

STANDARD

The traffic control plan shall include provisions for separation of opposing traffic whenever two-way traffic must be maintained on one roadway of a normally divided highway. When traffic must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated either with portable barriers, or with channelizing devices throughout the length of the two-way operation.

OPTION

Striping, raised pavement markers, and signing, either alone or in combination, are used to complement separation devices. Alone or in combination, they do not meet the requirements for traffic separation.

STANDARD

When the directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices within the temporary two-lane, two-way operations section, and at intersections shall be covered, removed, or obliterated.

SUPPORT

In a TL TWO, diverting traffic to the opposing left lane exposes the traffic to unprotected hazards. These hazards may include unprotected bridge piers, bridge rail, and guard rail ends.

STANDARD

Prior to diverting traffic, these hazards shall be protected and marked.

The TL TWO shall be used only after careful consideration of other available methods of traffic control.

C. Crossovers

GUIDANCE

The following are good guiding principles for the design of

05 Working at night also involves other factors, including construction productivity and quality, social impacts, economics, and environmental issues. A decision to perform construction or maintenance activities at night normally involves some consideration of the advantages to be gained compared to the safety and other issues that might be impacted.

Guidance:

06 Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6G.04) to provide added visibility and driver guidance, and increased protection for workers.

07 In addition to the enhancements listed in Section 6G.04, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.

Option:

08 Where reduced traffic volumes at night make it feasible, the entire roadway may be closed by detouring traffic to alternate facilities, thus removing the traffic risk from the activity area.

Guidance:

09 Consideration should be given to stationing uniformed law enforcement officers and lighted patrol cars at night work locations where there is a concern that high speeds or impaired drivers might result in undue risks for workers or other drivers.

Standard:

10 Except in emergencies, temporary lighting shall be provided at all flagger stations.

Support:

11 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. An average horizontal luminance of 10 foot candles can be adequate for activities around equipment. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot candles.

=====

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Guidance:

06 Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6G.04) to provide added visibility and driver guidance, and increased protection for workers.

07 In addition to the enhancements listed in Section 6G.04, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.

Option:

08 Where reduced traffic volumes at night make it feasible, the entire roadway may be closed by detouring traffic to alternate facilities, thus removing the traffic risk from the activity area.

GUIDANCE

Because typical street and highway lighting is rarely adequate to provide sufficient levels of illumination for work tasks, temporary lighting should be provided where workers are active to supply sufficient illumination to reasonably safely perform the work tasks. Temporary lighting for night work should be designed such that glare does not interfere with driver visibility, or create visibility problems for truck drivers, equipment operators, flaggers, or other workers.

09 Consideration should be given to stationing uniformed law enforcement officers and lighted patrol cars at night work locations where there is a concern that high speeds or impaired drivers might result in undue risks for workers or other drivers.

Standard:

10 Except in emergencies, temporary lighting shall be provided at all flagger stations.

Support:

11 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. An average horizontal luminance of 10 foot candles can be adequate for activities around equipment. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot candles.

Section 6G.20 Installation, Maintenance and Inspection of TTC

GUIDANCE

Prior to installing any traffic control device, it should be inspected for condition, reflectorization and standard shape, size, color and

MN SECTION ADDED

crossovers:

- Tapers for lane drops should be separated from the crossovers.
- Crossovers should be designed for speeds not less than 10 miles per hour below the posted speed prior to work starting. If unusual site conditions require that a lower design speed be used, the signing shall reflect an appropriate advisory speed.
- A full array of channelizing devices, delineators, and full-length, properly placed pavement markings are important in providing drivers with a clearly defined travel path.
- The design of the crossover should accommodate all roadway traffic including trucks and buses.
- A clear area should be provided adjacent to the crossover.

SUPPORT

Temporary traffic barriers and the excessive use of temporary traffic control devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

D. Lane Shifts

OPTION

It may be necessary to laterally shift one or more lanes of traffic.

STANDARD

If more than one lane is being shifted, even for a short term operation, it will be necessary to remove in-place pavement markings and install temporary markings.

E. Interchanges

GUIDANCE

Access to interchange ramps on limited access highways should be maintained even if the work space is in the lane adjacent to the ramps. For long-term projects, conflicting pavement markings should be removed and new ones placed.

OPTION

If access is not possible, ramps may be closed by using appropriate guide signing and Type III barricades. As the work space changes, the access area may be changed, as shown in Layout 6K-57. A temporary traffic control zone in the exit ramp may be handled as shown in Layout 6K-60.

GUIDANCE

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

Egress to exit ramps should be clearly marked and outlined with channelizing devices.

OPTION

message. If the device is not standard or in good condition, it should be replaced immediately. See Section 6K (the Field Manual) for Quality Standards.

Existing signs that do not apply or conflict with temporary traffic control should be removed or covered. If the sign is removed it should be carefully stored for re-installation when the temporary traffic control zone is removed.

SUPPORT

When covering a sign, care should be taken not to damage the sign face. When placing another hard material over the sign face, plastic spacers need to be inserted to avoid scratching the sign face. Translucent materials and materials that may become damaged by the weather are not acceptable coverings.

Temporary traffic control zone signs that are installed prior to the start of work also need to be covered, rotated or folded to avoid giving the driver an erroneous message.

STANDARD

When work is not in progress and the hazard no longer exists, devices shall be covered or removed.

Traffic control devices shall be installed in the order that drivers will see them, starting with the sign or device that is furthest from the work space.

OPTION

If traffic in both directions will be affected, such as work in the center lanes, the devices can be placed in both directions at the same time.

GUIDANCE

When one direction of traffic will be directed into the opposing lanes of traffic, all traffic controls for the opposing traffic should be installed first.

The devices should be removed as soon as the work is completed and they are no longer needed. Devices should be removed in the opposite order from which they were installed. Devices closest to the work space should be removed first.

SUPPORT

After the temporary traffic control zone is in place, it is helpful to inspect the zone by driving through the zone. Driver's actions and reactions should be noted and if any problems are encountered, they should be quickly corrected.

GUIDANCE

Any major modifications to the Traffic Control Plan or standard layouts and the reasons for the modifications should be documented.

SUPPORT

During the life of a temporary traffic control zone, maintenance is needed. On short term operations, vehicles may knock over cones which then need to be placed upright. For intermediate term and long term operations, accidents, weather, dirt and vandalism may affect the traffic control devices.

When a work space interferes with an entrance ramp, a lane may need to be closed on the highway. Work in the entrance ramp may require shifting ramp traffic. Temporary traffic control for both operations is shown in Layouts 6K-58 and 6K-59.

GUIDANCE

Advance warning sign spacing is dependent upon the length of the ramp and the exact location of signs is determined in the field. Spacing of the signs should be as long as practicable. A minimum lane width of 3.6 m (12 ft) on exit ramps should be maintained.

6H.7 Movable Barriers

SUPPORT

Figure 6J-29 shows a temporary reversible lane using movable barriers.

OPTION

If the work activity permits, a movable barrier may be used and relocated to the shoulder during non-work periods or peak period motor vehicle traffic conditions.

6H.8 Work in the Vicinity of Highway-Rail Grade Crossings

STANDARD

When highway-rail grade crossings exist either within or in the vicinity of a temporary traffic control zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be stopped on the railroad tracks with no means of escape.

If the queuing of vehicles across the tracks cannot be avoided, a law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

SUPPORT

Work in the vicinity of a highway-rail grade crossing is shown in Layout 6J-14.

GUIDANCE

Early coordination with the railroad company should occur before work starts.

6H.9 Road Closures

A. Temporary

GUIDANCE

Work that may require a complete closure for a short period of time (15 minutes or less) should be scheduled for non-peak hours. A portable changeable message sign should be considered to warn motorists approaching the closure. Care must be taken to ensure that advance warning signs extend beyond any possible queue. If the closure is done during nighttime hours, uniformed officers should be used for flagging.

B. Detours

GUIDANCE

A regular plan for inspection and maintenance should be implemented to ensure that all devices remain functional and in good repair throughout the life of the temporary traffic control zone. If problems are encountered, they should be corrected immediately and documented.

GUIDANCE

Any hazard (i.e. pothole, washout, damaged guardrail) should be repaired as soon as possible. However, when the hazard cannot be immediately repaired, or is not directly in the traveled way, it should be marked. Hazards should be marked with a reflectorized drum(s) or Type I or Type II barricade(s) with a Type A, low intensity flashing warning light attached.

SUPPORT

Other problems may be noted during routine inspections which may indicate a problem with the driver's perception of the zone. Skid marks, broken glass and devices continually knocked over may indicate a lack of advance warning or other problem with the temporary traffic control.

GUIDANCE

The zone should be reviewed during day and night to determine the problem and take appropriate corrective action.

SUPPORT

The frequency of inspection and maintenance will vary depending on the project size, duration, volume of traffic and complexity of the zone. Good communication and clear lines of responsibility will assist in resolving problems promptly.

SUPPORT

Detour signing is usually designed by the traffic engineer with authority over the closed roadway because it is considered a traffic routing problem. Detour signs are used to direct traffic onto another roadway.

At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring or diverting road users on two-lane highways are shown in Layouts 6J-16, 6J-17, and 6J-18. Layout 6J-15 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

GUIDANCE

When the detour is long, Detour (M4-8, M4-9) signs should be installed periodically and at major intersections to remind and reassure drivers that they are still on a detour.

When a roadway is closed at some point beyond the detour, traffic should be advised as to what location the road is open. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED AHEAD, LOCAL TRAFFIC ONLY sign should be used.

The portion of the road open to local road users should have adequate signing, marking, protection, and delineation.

Detours should be signed so that traffic will be able to get through the entire detour area and back to the original roadway.

When an entire roadway is closed, as illustrated in Layout 6J-19, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 16 km (10 mi) from the intersection.

C. Diversions (Bypasses)

GUIDANCE

A diversion should be designed the same as a crossover (see Section 6H-6c).

OPTION

A diversion may carry either one direction or both directions of traffic. It may also be combined with a STOP/STOP condition for use at short segments such as a culvert on a two-lane, two-way road.

6H.10—Miscellaneous

SUPPORT

Most activities including roadway construction/maintenance, electrical services and pavement marking operations can be accomplished with the multi-purpose typical layouts shown in Section 6K (the Field Manual). However, there are several types of activities which require traffic control set ups unique to that particular operation. Activities may include surveys and blasting zones.

A. Surveys

SUPPORT

Survey activities may involve work entirely off the roadway, in the roadway or moving along the roadway at a walking pace. Workers often must have their backs to traffic and may be a distraction to motorists. Often times it is necessary to leave equipment in the roadway. Special layouts have been developed for survey operations in low volume, good visibility locations (see Section 6K—the Field Manual).

GUIDANCE

These layouts should not be used for any other type of work. If any doubt exists about whether the roadway is low volume or the sight distance is limited, a lane closure in accordance with Section 6K (the Field Manual) should be used.

B. Blasting Zones

GUIDANCE

Whenever blasting occurs within 300 m (1,000 ft) of a roadway, signs for a blasting zone should be installed. Signs for blasting operations are discussed in Sections 6F 38 through 6F 40 and a typical layout is shown in the Miscellaneous Section of Section 6K (the Field Manual).

C. Hazards

GUIDANCE

Any hazard (i.e. pothole, washout, damaged guardrail) should be repaired as soon as possible. However, when the hazard cannot be immediately repaired, or is not directly in the traveled way, it should be marked. Hazards should be marked with a reflectorized drum(s) or Type I or Type II barricade(s) with a Type A, low intensity flashing warning light attached.

6H.11 Enhancement of Diagrams

SUPPORT

To improve safety, typical designs may be modified to a more elaborate treatment, as indicated by the following:

GUIDANCE

When conditions are more complex, typical applications should be modified by incorporating appropriate devices and practices from the following list:

1. Additional devices:

- Additional signs
- Flashing arrowboards
- More channelizing devices at closer spacing
- Temporary raised pavement markers
- High-level warning devices
- Portable changeable message signs

- Portable traffic signals
 - Portable barriers
 - Impact attenuators Crash cushions
 - Glare screens
 - Rumble strips
 - More delineation
2. Upgrading of devices:
- A full complement of standard pavement markings in areas of high hazard
 - Brighter and/or wider pavement markings
 - Larger and/or brighter signs
 - Channelizing devices with greater conspicuity
 - Temporary traffic barriers in place of channelizing devices
3. Improved geometrics at diversions or crossovers, giving particular attention to the provisions set forth in Section 6B
4. Increased distances:
- Longer advance warning area
 - Longer tapers
5. Lighting:
- Temporary roadway lighting
 - Steady-burn lights used with channelizing devices
 - Flashing lights for isolated hazards
 - Illuminated signs
 - Floodlights

Where pedestrian or bicycle usage is high, typical applications should also be modified by giving particular attention to the provisions set forth in Chapter 6D, Section 6F.68, and other Sections of Part 6 related to accessibility and detectability provisions in temporary traffic control zones.

SUPPORT

The typical applications in Chapter 6H illustrate commonly encountered situations in which temporary traffic control devices are employed.

OPTION

Other devices may be added to supplement the devices indicated in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

SUPPORT

Uniformity of devices and their application is always of paramount importance. As noted earlier, temporary traffic barriers are not temporary traffic control 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

temporary traffic control devices.

STANDARD

Temporary traffic barriers serving as temporary traffic control devices shall conform to requirements for such devices as set forth throughout Part 6.

6H-12 Installation, Maintenance and Inspection

GUIDANCE

Prior to installing any traffic control device, it should be inspected for condition, reflectorization and standard shape, size, color and message. If the device is not standard or in good condition, it should be replaced immediately. See Section 6K (the Field Manual) for Quality Standards.

Existing signs that do not apply or conflict with temporary traffic control should be removed or covered. If the sign is removed it should be carefully stored for re-installation when the temporary traffic control zone is removed.

SUPPORT

When covering a sign, care should be taken not to damage the sign face. When placing another hard material over the sign face, plastic spacers need to be inserted to avoid scratching the sign face. Translucent materials and materials that may become damaged by the weather are not acceptable coverings.

Temporary traffic control zone signs that are installed prior to the start of work also need to be covered, rotated or folded to avoid giving the driver an erroneous message.

STANDARD

When work is not in progress and the hazard no longer exists, devices shall be covered or removed.

Traffic control devices shall be installed in the order that drivers will see them, starting with the sign or device that is furthest from the work space.

OPTION

If traffic in both directions will be affected, such as work in the center lanes, the devices can be placed in both directions at the same time.

GUIDANCE

When one direction of traffic will be directed into the opposing lanes of traffic, all traffic controls for the opposing traffic should be installed first.

The devices should be removed as soon as the work is completed and they are no longer needed. Devices should be removed in the opposite order from which they were installed. Devices closest to the work space should be removed first.

SUPPORT

After the temporary traffic control zone is in place, it is helpful to inspect the zone by driving through the zone. Driver's actions and reactions should be noted and if any problems are encountered, they should be quickly corrected.

GUIDANCE

Any major modifications to the Traffic Control Plan or standard layouts and the reasons for the modifications should be documented.

SUPPORT

During the life of a temporary traffic control zone, maintenance is needed. On short term operations, vehicles may knock over cones which then need to be placed upright. For intermediate term and long term operations, accidents, weather, dirt and vandalism may affect the traffic control devices.

GUIDANCE

A regular plan for inspection and maintenance should be implemented to ensure that all devices remain functional and in good repair throughout the life of the temporary traffic control zone. If problems are encountered, they should be corrected immediately and documented.

SUPPORT

Other problems may be noted during routine inspections which may indicate a problem with the driver's perception of the zone. Skid marks, broken glass and devices continually knocked over may indicate a lack of advance warning or other problem with the temporary traffic control.

GUIDANCE

The zone should be reviewed during day and night to determine the problem and take appropriate corrective action.

SUPPORT

The frequency of inspection and maintenance will vary depending on the project size, duration, volume of traffic and complexity of the zone. Good communication and clear lines of responsibility will assist in resolving problems promptly.