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600 GENERAL

600-1 Introduction

The information provided in this Part of the TEM is intended to supplement ODOT Part 6 by presenting ODOT policies, standards, guidelines, practices and procedures concerning the design and application of various types of temporary traffic control. Examples of situations which require temporary traffic control include highway construction and maintenance work, utility work, special events (e.g., tournaments and festivals) and incidents (e.g., traffic accidents and chemical spills).

In addition to typical methods for maintaining traffic through temporary traffic control zones, this Part also provides suggestions for when detours may be used and guidelines for the preparation of plans. It does not address every conceivable condition. Each situation is unique; therefore, the temporary traffic control used should take into consideration the individual characteristics of the particular situation.

One function of this Part is to serve as a guide for the designer in developing strategies to maintain traffic during construction activity, and in preparing a set of maintenance of traffic plans for incorporation into a set of highway construction plans. Tables 697-1a through 697-1f present a review of the pros and cons of various temporary traffic control options.

Information on policies, guidelines and standards related to temporary traffic control devices and their use are located in the early Chapters of this Part. For example, Chapter 602 addresses the various elements of a temporary traffic control zone, Chapter 604 addresses flagger control, Chapter 605 discusses the individual devices, and typical applications are addressed in Chapter 607. Information specifically related to design, construction and maintenance functions is located in the later Chapters (Chapters 640 through 660).

600-2 Construction Projects

Chapter 150 addresses the general application of ODOT standards, specifications and Standard Construction Drawings (SCDs) to construction projects, while this Part provides additional detail information.

Coordination with other projects is necessary in order to minimize the inconvenience to road users (see Section 640-17). This may require communication among several government jurisdictions, various offices within ODOT and several contractors.

Projects should be scheduled to avoid routing a detour (Section 602-6) through another construction site. See Section 640-16 for information regarding work on detours and alternate routes. Sections 640-17 and 640-18.2.5 address signing for adjacent projects.

600-3 Force Account (ODOT Operations) Work

Districts performing force account work must comply with the requirements in the ODOT and this Manual. It is recommended that the Districts also follow the provisions in applicable SCDs and Construction and Materials Specifications (CMS) sections. However, it should be recognized that information in the SCDs and CMS does not necessarily provide the only method to achieve a given objective.
600-4 Public Communication

Communicating the details of highway improvement projects is desirable and necessary. The traveling public, businesses, schools and communities are all impacted by a construction project. In general, road users find it difficult to accept the disruption of travel caused by work activities; therefore, maintaining good public relations is very important, especially on major projects.

Public meetings, news releases and media alerts, among other communication tools, should be used to communicate to the public and to maintain good public relations. Involvement of the news media and local authorities in publicizing the existence of, and the reasons for, work activities can be of great assistance in keeping the public well informed.

600-5 High vs. Low-Volume Highways

*Part 5* addresses traffic controls for the category of roads known as Low-Volume Roads (LVR). Generally, ODOT-maintained highways do not fall within the LVR category defined in *Part 5*.

However, traffic volume is a useful criteria when addressing levels of traffic control appropriate in various situations. Therefore, the terms “low-volume” and “high-volume” are often used. For purposes of this Part, unless defined otherwise for a specific situation, “high-volume” describes a highway with an ADT greater than 4,000, and a “low-volume” street or highway has an ADT of 4,000 or less.

600-6 Incident Management Areas

OMUTCD Chapter 6I and *Chapter 608* specifically address additional information about control of traffic through traffic incident management areas.
601-1 General

The control of road users through a temporary traffic control zone is an essential part of highway construction, utility work, maintenance operations and incident management. However, the safety of those road users and workers in temporary traffic control zones shall also be an integral and high-priority element of every project from planning through design and construction. Maintenance and utility work should also be planned and conducted with the safety of drivers, bicyclists, pedestrians and workers considered at all times.

The objective of temporary traffic control in general is to provide for the safe and expeditious movement of traffic through work zones and incident areas by doing the following:

1. Alerting the road user;
2. Telling the road user what to do;
3. Guiding the road user through or around the site; and
4. Protecting the worker.

OMUTCD Section 6B.01 outlines various principles and procedures that experience has shown tend to enhance the safety of road users and workers in work zones and incident areas.

601-2 Work Zones on Interstates and Other Freeways

As much as safely possible, methods for traffic control should produce the least possible effect on traffic operations by minimizing the frequency or time of hindrance to normal traffic flow.

In an attempt to minimize delay to road users on Interstate and other freeway projects, ODOT has developed Policy 516-003(P), Traffic Management in Work Zones Interstate and Other Freeways (see Section 1511). This policy establishes standards for acceptable traffic queuing. Predicted queue lengths resulting from decreased capacity of the highway at a work site on Interstate and other freeways shall not exceed the standards set by this policy.

On the basis of this policy, Permitted Lane Closure Schedules (PLCSs) have been established for each District. OTE has consolidated this information into a statewide system of maps/schedules available from the OTE website at http://plcm.dot.state.oh.us. The maps and related scheduling information shall be reviewed periodically by the Districts and updated as needed. Use of the PLCSs in the design process is described in Section 630-4.

The concepts presented in Policy 516-003(P) should also be considered for application on non-freeway projects.
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602-1 General

This Chapter addresses various basic elements of temporary traffic control, e.g., Temporary Traffic Control Plans (also known as Maintenance of Traffic Plans), definitions of the components of a traffic control zone, tapers and one-lane, two-way traffic control.

602-2 Temporary Traffic Control Plans

A Temporary Traffic Control (or Maintenance of Traffic) Plan describes temporary traffic control measures to be used for facilitating the road users through a work zone. These plans play a vital role in providing a continuity of safe and efficient traffic flow when a work zone, incident or other event, temporarily disrupts the normal flow of traffic. See Section 640-1 for further information.

Depending on what’s needed, these plans may range in scope from very detailed to simply a reference to a manual figure, a typical drawing or a sketch in the contract document.

602-3 Temporary Traffic Control Zones

As noted in Section 1501-3, a temporary traffic control zone is an area of a highway where road user conditions are changed because of a work zone or incident by the use of temporary traffic control devices, flaggers, law enforcement officers or other authorized personnel.

A work zone is an area of a highway with construction, maintenance or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first Warning Sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last temporary traffic control device.

A traffic incident management area is an area of a highway where temporary traffic controls are imposed by authorized officials in response to an emergency road user occurrence, a natural disaster, hazardous material spill, or other unplanned incident.

602-4 Components of Temporary Traffic Control Zones

602-4.1 General

The temporary traffic control zone established for a particular work activity or incident begins with the first advance warning device and ends at the point beyond the work area where traffic is no longer affected. As noted in OMOVING Section 6C.03, most zones include the following elements: advance warning area, transition area, activity area and termination area. These four areas are described in OMOVING Sections 6C.04 through 6C.07 and Figure 6C-1. Some of this information is repeated here in Sections 602-4.2 through 602-4.5, and Figure 698-1.

602-4.2 Advance Warning Area

An advance warning area is the section of highway where road users are informed about the upcoming work zone or incident area. The advance warning area may vary from a single sign or flashing amber light on a vehicle to a series of signs starting a mile or more in advance of the transition area.

The advance warning area should be long enough to give road users adequate time to respond to conditions. For most situations, the length of the advance warning area should be:
6.  One-half to 1 mile for freeways or expressways.

7.  One-quarter mile for rural highways.

8.  At least one block for urban streets.

Advance warning may be eliminated when the activity area is sufficiently removed from the road users' path so that it does not interfere with the normal flow.

602-4.3  Transition Area

When a lane or shoulder closure is used, or when traffic is shifted, a transition area shall be used to channel traffic from the normal travel lanes into the path required to move around the work area. The transition area should be obvious to road users, with the correct path clearly marked.

Transition areas usually involve strategic use of tapers (see Section 602-5), which because of their importance are discussed separately.

In mobile operations, the transition area moves with the work space.

602-4.4  Activity Area

602-4.4.1  General

The activity area is the section of the highway where the work activity takes place. It is comprised of the work space, the traffic space and the buffer space.

When work occurs on a high-volume, highly congested facility, an incident management vehicle storage space may be provided so that emergency vehicles (for example, tow trucks) can respond quickly to road user incidents. If used, this storage area should not extend into any portion of the buffer space.

602-4.4.2  Work Space

The work space is that portion of the highway closed and set aside for workers, equipment and material, and a shadow vehicle if one is used upstream. They are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.

Work spaces may remain in fixed locations or may move as work progresses.

There may be several work spaces within the project limits (even separated by several miles); however, each work space should be adequately signed to inform road users and reduce confusion.

602-4.4.3  Traffic Space

The traffic space is that portion of the highway in which road users are routed through the activity area.

602-4.4.4  Buffer Space

As shown in OMUTCD Figures 6C-1 and 6C-2 and Figure 698-1, the buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle. The activity area may contain one or more lateral or longitudinal buffer spaces.
The buffer space should be free of work activity, equipment, material, work or shadow vehicles, workers, and the workers' personal vehicles.

A longitudinal buffer space may be placed in advance of a work space. It may also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in O MUTCD Figure 6C-2.

Typically, the buffer space is formed as a traffic island and defined by channelizing devices. When a formidable device, such as a shadow vehicle or an arrow board, is placed in such an island, only the area in front of (upstream of) the device functions as a buffer.

A longer buffer space should be used when high speed highways or high truck volumes are involved, or when the work area is located around a curve, over a hillcrest or on a downgrade.

The lateral buffer space may be used to separate the traffic space from the work space, or from such areas as excavations or pavement-edge drop-offs. A lateral buffer space also may be used between two travel lanes, especially those carrying opposing flows. The width of a lateral buffer space should be determined by engineering judgment.

602-4.5 Termination Area

The termination area shall be used to return road users to their normal path. The termination area shall extend from the downstream end of the work space to the END ROAD WORK signs, if posted.

602-5 Tapers

602-5.1 General

Tapers are an important element of a temporary traffic control zone. They may be used in both the transition and termination areas. As noted in O MUTCD Section 6C.08, whenever tapers are to be used in close proximity to interchange ramps, crossroads, curves, or other influencing factors, it may be desirable to adjust the length of the tapers.

Tapers are created by using a series of channelizing devices and/or pavement markings placed to move the traffic out of or back to its normal path. Types of tapers are shown in O MUTCD Figure 6C-2.

The criteria for determining taper length (L) is shown in O MUTCD Table 6C-3 and should be the minimum used. The minimum desirable taper lengths apply to roadway conditions of relatively flat grades and straight alignment. Longer tapers are not necessarily better than shorter tapers (particularly in urban areas characterized by short block lengths, driveways, etc.). Extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The real test of taper length involves observation of driver performance after traffic control plans are put into effect.

The maximum space between devices in a taper should approximate the distance in feet of the speed in miles per hour (i.e., a 55 miles per hour speed road should normally have devices spaced about 55 feet apart). It is desirable to provide spacing which is less than the maximum allowable. The spacing is shown in SCDs MT-95.30, 95.31 and 95.32.
602-5.2 Merging Taper

A merging taper requires the longest distances because drivers are required to merge with an adjacent lane of traffic at the prevailing speed. The taper should be long enough to enable merging drivers to adjust their speeds and merge into a single lane before the end of the transition. An example of a merging taper is shown in OMUTCD Figure 6C-2.

602-5.3 Shifting Taper

A shifting taper is used when merging is not required, but a lateral shift is needed. The length L should be used for shift taper lengths when the speed is 50 miles per hour or greater. The length one-half L may be used for shift tapers when the speed is less than 50 miles per hour, except on freeways, expressways, and multi-lane divided or undivided highways, where L should be used for all shift tapers, regardless of speed. Where more space is available, it may be beneficial to use longer taper lengths. Guidance for changes in alignment may also be accomplished by using horizontal curves designed for normal highway speeds. An example of a shifting taper is shown in OMUTCD Figure 6C-2.

602-5.4 Shoulder Taper

A shoulder taper may be beneficial on high-speed roadways with improved shoulders that may be mistaken for driving lanes (when work is occurring in the shoulder area). If used, shoulder tapers approaching the activity area should have a length of about one-third L. If a shoulder is used as a travel lane either through practice or during a temporary traffic activity, a normal merging or shifting taper should be used. An example of a shoulder taper is presented in OMUTCD Figure 6C-2.

602-5.5 Downstream (Ending) Taper

The downstream (ending) taper may be useful in termination areas to provide a visual cue to the driver that access is available to the original lane or path that was closed. When used, a downstream taper should have a minimum length of about 100 feet per lane, with devices spaced about 20 feet apart. An example of a downstream taper is shown in OMUTCD Figure 6C-2.

602-5.6 One-Lane, Two-Way Taper

The one-lane, two-way traffic taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction. Traffic should be controlled by a flagger or a temporary traffic signal (if sight distance is limited), or a STOP or YIELD sign. A short taper having a maximum length of 100 feet, with channelizing devices at approximately 20-foot) spacings, should be used to guide traffic into the one-way section. OMUTCD Figures 6C-3, 6H-10 and 6H-46 illustrate one-lane, two-way traffic control situations using flaggers.

602-5.7 Lane Width Transition

Often it is necessary to decrease the lane width in a work zone. The length of the lane width transition is calculated using the same criteria used in calculating a shifting taper (see Section 602-5.3).

602-5.8 Multiple Tapers

Occasionally it is necessary to close more than a single lane of pavement in order to perform the necessary work on the highway. This may be accomplished by closing or shifting multiple travel lanes, or by a combination of both. Any of these conditions creates a need for more than a single taper. Multiple tapers shall be separated by tangent sections. For example, if
the number of open lanes in one direction of a multi-lane highway is to be reduced by two, then it will be necessary to provide two merge tapers, separated by a tangent section of length 2L as shown in OMUTCD Figure 6H-37 (where L is the minimum permitted taper length of the associated tapers as indicated in OMUTCD Table 6C-3). If there is a reduction of one lane and a shift of the remaining open lanes, then one merge taper and one shift taper shall be provided. The merge taper and the shift taper shall be separated by a tangent section of length one-half L as shown in OMUTCD Figure 6H-32.

602-6  Detours, Alternate Routes and Diversions

A detour is a temporary rerouting of road users onto an existing highway in order to prohibit through traffic within the work zone. As noted in OMUTCD Section 6G.10, detours should be clearly signed over their entire length so that road users can easily use existing highways to return to the original highway. Normally, detours on the state highway system are provided by the District. See OMUTCD Section 6F.50 for related signing, as well as Sections 605-7 and 605-8. OMUTCD Figures 6H-8, 6H-9, 6H-19 and 6H-20 provide examples of detours.

An alternate route is similar to a detour except that the work zone remains open to through traffic. The road user is able to choose between following the route through the work zone, or following the signed alternate route.

A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work space, e.g., median crossovers, runarounds or lane shifts. OMUTCD Figure 6H-7 is an example of a diversion.

Consideration should be given to other projects in the area, traffic patterns, traffic volumes, types of vehicles, local activities and special events when planning detour installations or diversions. This would require that adequate attention be given to proper scheduling of projects in order to avoid simultaneous construction or maintenance activity on parallel highways. Proper scheduling may require coordination between Districts or even within various offices in a single District (see Section 640.16).

Two Standard Operating Procedures (SOPs) maintained by the Office of Maintenance Administration (on their intranet Reference Materials webpage) should be consulted when detours are required:

1. OPS-103, Detours is to be used to determine whether work on an existing highway, be it by contract or by ODOT force account, will require the closing of the highway with provision for detours, temporary roads and temporary runarounds, or whether traffic will be maintained through all or portions of the construction project, and to establish reporting procedures.

2. OPS-104, Maintenance & Repair of Local Roads and Streets Used as: Official Detours, Designated Local Detour Routes, or Haul Roads, establishes the method for designating a local detour. A local detour is a route, other than the official detour, that is anticipated to be most used by traffic bypassing the closed portion of the highway. Only one local detour shall be designated for each official detour. These documents also discuss the need to coordinate with the local officials and financing procedures.

602-7  One-Lane, Two-Way Traffic Control

602-7.1  General

As noted in OMUTCD Section 6C.10, where traffic in both directions must, for a limited distance, use a single lane, “provision should be made for alternate one-way movement through the constricted section.” Some means of coordinating movements at each end shall be used to avoid head-on conflicts and to minimize delays. Control points at each end should be chosen to permit easy passing of opposing lines of vehicles. At a “spot” obstruction,
however, such as an isolated pavement patch on roadways with lower speeds and adequate sight distance, the movement may be self-regulating. Alternate one-way traffic control may be accomplished as appropriate by flagger control (OMUTCD Section 6C.11), a flag-carrying or official car (OMUTCD Section 6C.12), a pilot car (OMUTCD Section 6C.13), traffic signals (OMUTCD Section 6C.14), or by using stop or yield control. This Section provides additional information regarding flagger control, the use of traffic signal and the use of STOP or YIELD signs (see OMUTCD Section 6E.01 for flagger qualifications).

602-7.2 Flagger Method

This method of one-lane, two-way traffic control is described in general in OMUTCD 6C.11.

When a single flagger is used, the flagger should be stationed on the shoulder opposite the obstruction or work space, or in a position where good visibility and traffic control can be maintained at all times. When good visibility and traffic control cannot be maintained by one flagger station, traffic may be controlled by a flagger at each end of the section. One of the flaggers should be designated as the coordinator. Flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals. The use of radios may also be desirable even though visual contact is possible.

602-7.3 Temporary Traffic Signal Method

As noted, traffic signals may be used to control vehicular traffic movements in temporary traffic control zones. They should be considered for half-width bridge reconstruction on low- to moderate-volume highways. When used, traffic signals shall be installed at each approach to the one-lane section, and drivers shall be apprised of their presence by means of the Signal Ahead sign preceded by appropriate Construction Warning Signs (see OMUTCD Figure 6H-12).

602-7.4 Stop or Yield Control Method

STOP or YIELD signs may be used to control traffic on low-volume roads at a one-lane, two-way work zone when drivers are able to see the other end of the one-lane, two-way operation and have sufficient visibility of approaching vehicles. If the STOP or YIELD sign is installed for only one direction, then the STOP or YIELD sign should face road users who are driving on the side of the roadway that is closed for the work activity area. The approach to the side that is not closed must be visible (for a distance equal to the safe-passing sight distance for that approach) to the driver who must yield or stop (see OMUTCD Figure 6H-11).

602-8 Work Vehicles

The general term “work vehicle” refers to any of the vehicles used in performance of the work (i.e., those used to do the work, haul material, equipment or workers and to provide traffic control). The term is also used to refer specifically to one of the two types of vehicles generally used in temporary traffic control, i.e., “work vehicles” and “shadow vehicles.”

When differentiating between the types of vehicles in the zone, “work vehicle” refers to those vehicles used to do the work or haul material, equipment, or workers.

A “shadow vehicle” is used for traffic control. It may be used within the traffic control zone to provide advance warning for traffic, or to guide traffic into the proper lane by the use of signs or a flashing arrow board. The shadow truck should be positioned a sufficient distance in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment.
During working hours, the shadow vehicle shall display a yellow high-intensity rotating, flashing, oscillating, or strobe light. For additional protection, the shadow vehicle may be equipped with a truck-mounted attenuator (TMA) (see Section 605-15.3).

A shadow vehicle may also be placed, unoccupied, within the traffic control zone immediately in advance of the work space in a stationary operation. When a shadow vehicle is used in this way, a separate space should be provided for it. This space should be long enough to accommodate the vehicle itself, plus an open space in front of the vehicle to provide for the “roll ahead” which may occur following impact. This area is usually delineated by channelizing devices.

CMS 614.03 contains information about delineation requirements for work vehicles (also see Supplemental Specification 800). Also, the document described in Section 695-4, Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles, provides illustrations of acceptable delineation for supply vehicles.
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603 PEDESTRIAN AND WORKER SAFETY

603-1 General

In addition to creating vehicular restrictions, work zones and incident areas may also cause conflicts for pedestrian traffic and workers. Pedestrians and workers are exposed to hazardous conditions from both the work activity and the traffic. This Chapter addresses the need to provide for pedestrian and worker safety in temporary traffic control zones. Also see OMUTCD Chapter 6D.

603-2 Pedestrian Considerations

Where pedestrian traffic is present, pedestrian safety and needs must be addressed. See OMUTCD Sections 6D.01 and 6D.02.

There are three threshold considerations in planning for pedestrian safety in temporary traffic control zones on highways and streets:

1. Pedestrians should not be led into conflicts with work vehicles, equipment, or operations.

2. Pedestrians should not be led into conflicts with vehicles moving through or around the work zone or incident area.

3. Pedestrians should be provided with a safe, convenient travel path that replicates as nearly as possible the most desirable characteristics of sidewalks or footpaths.

In accommodating the needs of pedestrians, it should always be remembered that the range of pedestrians that can be expected is very wide, including the blind, the hearing impaired, and those with walking handicaps. All pedestrians need protection from potential injury and a smooth, clearly delineated travel path.

Therefore, every effort should be made to separate pedestrian movement from both work site activity and vehicular traffic. Whenever possible, signing should be used to direct pedestrians to safe street crossings in advance of an encounter with a temporary traffic control zone. Signs should be placed at intersections so that pedestrians, particularly in high-traffic-volume urban and suburban areas, are not confronted with mid-block activity areas that will induce them to skirt the temporary traffic control zone or make a mid-block crossing. It must be recognized that pedestrians will only infrequently retrace their steps to make a safe crossing. Consequently, ample advance notification of sidewalk closures is critically important. Refer to OMUTCD Figures 6H-28 and 6H-29 for typical traffic control device usage and techniques for pedestrian movement through work areas. Traffic control for a pedestrian detour is also presented in SCD MT-110.10.

Cuts into work areas across pedestrian walkways should be kept to a minimum, because they often create unacceptable changes in grade and rough or muddy terrain. Pedestrians cannot be expected to traverse these areas willingly. They will tend to avoid the cuts by attempting non-intersection crossings.

The engineer in charge of traffic control for temporary traffic control zones should provide both a sense of security and safety for pedestrians walking past work sites and consistent, unambiguous channelization to maintain foot traffic along the desired travel paths. The activity area should be regularly inspected so that effective pedestrian temporary traffic control is maintained.

603-3 Worker Considerations

Equally as important as the safety of road users traveling through the work zone or incident area is the safety of workers (see OMUTCD Section 6D.03). Temporary traffic control zones present...
temporary and constantly changing conditions that are unexpected by the road user. This creates an even higher degree of vulnerability for the personnel on or near the roadway.

Maintaining the temporary traffic control zones with road user flow inhibited as little as possible, and using temporary traffic control devices that get the road user’s attention and provide positive direction are of particular importance.

The following are key elements of traffic control management that should be considered in any procedure for assuring worker safety:

1. Training - All workers should be trained in how to work next to vehicular traffic in a way that minimizes their vulnerability. Workers having specific temporary traffic control responsibilities should be trained in temporary traffic control techniques, device usage and placement.

2. Worker Safety Apparel - All workers exposed to the risks of moving roadway traffic or construction equipment should wear highly-visible safety apparel (see MUTCD Sections 6D.03 and 6E.02).

3. Temporary Traffic Barriers - Temporary traffic barriers should be placed along the work space depending on such factors as lateral clearance of workers from adjacent traffic, speed of traffic, duration of operations, time of day and volume of traffic.

4. Speed Reduction - Reducing the speed of vehicular traffic, mainly through regulatory speed zoning (see Section 640-18), funneling, lane reduction, or the use of law enforcement officials or flaggers should be considered.

5. Shadow Vehicle - In the case of mobile and constantly moving operations, such as pothole patching and striping operations, a shadow vehicle, equipped with appropriate lights, Warning Signs and/or a rear-mounted impact attenuator may be used to protect the workers from impacts by errant vehicles.

6. Road Closure - If alternate routes are available to handle road users, the road may be closed temporarily. This may facilitate quicker project completion and thus further reduce worker vulnerability.

7. Law Enforcement Use - In highly vulnerable work situations, particularly those of relatively short duration, law enforcement units may be stationed to heighten the awareness of passing vehicular traffic and to improve safety through the temporary traffic control zone.

8. Lighting - For nighttime work, consider lighting the temporary traffic control zone and approaches.

9. Special Devices - Judicious use of special warning and control devices may be helpful for certain difficult work area situations. These include rumble strips, changeable message signs, hazard identification beacons, flags and warning lights. Intrusion warning devices may be used to alert workers to the approach of errant vehicles. However, misuse or overuse of special devices or techniques may lessen their effectiveness.

10. Public Information - Improved driver performance may be realized through a well-prepared and complete public relations effort that covers the nature of the work, etc. (see Section 600-4).
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604 FLAGGER CONTROL

604-1 General

This Chapter provides information supplementing that presented in OMUTCD Chapter 6E regarding the use of flaggers to provide temporary traffic control.

604-2 Qualifications for Flaggers

Because flaggers are responsible for public safety and make the greatest number of public contacts of all highway workers, they should be able to satisfactorily demonstrate the abilities described in OMUTCD Section 6E.01.

604-3 High-Visibility Safety Apparel

OMUTCD Section 6E.02 addresses the requirements for high-visibility safety apparel for flaggers. The same high-visibility safety apparel is recommended for law enforcement officers (LEOs) when they provide traffic control.

604-4 Hand-Signaling Devices

OMUTCD Section 6E.03 addresses the basic requirements for hand-signaling devices used to control road users through temporary traffic control zones. As noted in that Section, the STOP/SLOW sign paddle is the primary hand-signaling device.

In addition to the requirement for flag use described in OMUTCD Section 6E.03, flag use should be limited to emergency situations; however, they may also be appropriate at some intersections and at low-speed and/or low-volume locations which can best be controlled by a single flagger.

604-5 Automated Flagger Assistance Devices (AFADs)

604-5.1 General

Automated Flagger Assistance Devices (AFADs) enable a flagger(s) to be positioned out of the lane of traffic and are used to control road users through temporary traffic control (TTC) zones. These devices are designed to be remotely operated either by a single flagger at one end to the TTC zone or a central location or by separate flaggers near each device’s location.

For requirements on AFADs, refer to OMUTCD Section 6E.04 and Supplemental Specifications 830 and 930.

There are two types of AFADs:

1. An AFAD (Subsection 605-5.2) that uses a remotely controlled STOP/SLOW sign on either a trailer or a movable cart system to alternately control right-of-way.

2. An AFAD (Subsection 605-5.3) that uses remotely controlled red and yellow lenses and a gate arm to alternately control right-of-way.

AFADs should not be used for long-term stationary work. They might be appropriate under certain conditions for daytime work activities where they are set up and then removed each
day or for some nighttime work activities. Typical applications include TTC activities such as, but not limited to:

1. Bridge maintenance;
2. Haul road crossings; and
3. Pavement patching.

AFADs used on Ohio’s highways must be on ODOT’s pre-qualified list. Refer to Supplement 1030 for the qualification procedure.

604-5.2 STOP/SLOW Automated Flagger Assistance Devices (AFADs)

A STOP/SLOW AFAD shall include a STOP/SLOW sign that alternately displays the STOP face and the SLOW face of a STOP/SLOW paddle without the need for a flagger in the immediate vicinity of the AFAD or on the roadway.

For information on the requirements and use of a STOP/SLOW AFAD, refer to OMUTCD Section 6E.05 and Supplemental Specification 930.02.

604-5.3 Red/Yellow Lens Automated Flagger Assistance Devices (AFADs)

If used, a Red/Yellow AFAD shall alternately display a steadily illuminated CIRCULAR RED lens and a flashing CIRCULAR YELLOW lens to control traffic without the need for a flagger in the immediate vicinity of the AFAD or on the roadway.

For information on the requirements and use of a Red/Yellow Lens AFAD, refer to OMUTCD Section 6E.06 and Supplemental Specification 930.03.

604-6 Hand-Signaling Procedures

STOP/SLOW sign paddle and flag use are illustrated in OMUTCD Figure 6E-3. The signaling procedures used with the paddle or the flag shall be as described in OMUTCD Section 6E.07.

ATSSA publishes a pocket-sized Flagger Handbook which may be used for easy reference on flagging procedures (Section 695-3).

604-7 Flagger Stations

Except as noted below for a single flagger at a “spot” location, flagger stations shall be located far enough ahead of the work space, so that approaching traffic has sufficient distance to stop before entering the work space (see OMUTCD Section 6E.08). OMUTCD Table 6E-1, which provides information regarding the stopping sight distance as a function of speed, may be used in determining the location of a flagger station. These distances may be increased for downgrades and other conditions that affect stopping distance.

As noted in OMUTCD Section 6E.08, the flagger should stand either on the shoulder adjacent to the traffic being controlled or in the barricaded lane. A flagger should only stand in the lane being used by moving road users after the road users have stopped. The flagger should be clearly visible to the first approaching road user at all times. The flagger should also be visible to other road users. The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns, whistles, etc.) of approaching danger by out-of-control vehicles. The flagger should stand alone, never permitting a group of workers to congregate around the flagger station.

At “spot” lane closures where adequate sight distance is available for the safe handling of traffic, the use of one flagger may be sufficient (see OMUTCD Figure 6H-18 and accompanying notes).
At such a "spot" obstruction, a position may have to be taken on the shoulder opposite the barricaded section to operate effectively.

Except in emergency situations, flagger stations shall be preceded by an advance Warning Sign(s). Under certain geometric and traffic situations, more than one flagger station may be required for each direction of traffic. Also, except in emergency situations, flagger stations shall be illuminated at night.
605 TEMPORARY TRAFFIC CONTROL ZONE DEVICES

605-1 General

The design and application of temporary traffic control devices used in temporary traffic control zones should consider the needs of all road users. All traffic control devices used on street and highway construction, maintenance, utility, or incident management operations shall conform to the applicable provisions of the OMUTCD.

OMUTCD Chapter 6F addresses the design and application of traffic control devices for use in temporary traffic control zones. Additional information on the standards and guidelines for the design and use of these devices is included in this Part of the TEM.

The traffic control devices discussed herein include signs, pavement markings, raised pavement markers, channelizing devices, lighting devices, beacons, warning lights, traffic signals, and other devices used to regulate, warn or guide traffic.

Chapter 607 provides additional information on the use of these devices in typical applications, Chapter 640 provides additional design and plan preparation information, Chapter 650 addresses construction issues, Chapter 660 addresses maintenance issues, and Chapter 670 addresses various other considerations.

Crashworthiness and crash testing information on temporary traffic control devices are found in AASHTO’s Roadside Design Guide (RDG) (see Section 193-12). Additional materials and hardware information, including NCHRP 350 information, is addressed in Chapter 620.

As noted in OMUTCD Section 6F.02, where the color orange is required, fluorescent red-orange or fluorescent yellow-orange colors may also be used. The fluorescent version of orange provides higher conspicuousness than standard orange, especially during twilight.

605-2 General Characteristics of Signs

605-2.1 General

Temporary traffic control zone signs convey both general and specific messages by means of words or symbols and have the same three categories as all road user signs: regulatory, warning and guide described in OMUTCD Part 2.

Commonly used work zone signs are discussed in detail in OMUTCD Chapter 6F and in Sections 605-2 through 605-10. Illustrations of temporary traffic control signs that are discussed in this Manual, but not shown in the OMUTCD are provided in Figures 698-3a and 698-3b.

The OMUTCD and this Part of the TEM also provide examples of common applications of these signs. ODOT standards for application of work zone signing on construction projects are provided in the SCDs and this Manual, and material requirements are addressed in Chapter 620 and CMS 614. Also see Part 2 of this Manual for further signing information.

When standard orange flags or flashing warning lights are used in conjunction with signs, they shall not block the sign face.

605-2.2 Design

The colors for Regulatory Signs shall follow the standards in OMUTCD Chapter 2B. Warning Signs in temporary traffic control zones shall have a black legend on an orange background, except for the Railroad Advance Warning Sign (OMUTCD Section 8B.04), and except for signs in OMUTCD Chapter 2C that are permitted to have yellow or fluorescent yellow-green.
600 TEMPORARY TRAFFIC CONTROL

backgrounds, and those in OMUTCD Chapter 6I permitted to have fluorescent pink backgrounds (also see Section 605-5.2). Colors for Guide Signs shall follow the standards in OMUTCD Chapter 2D, except for Guide Signs noted in Sections 605-7 and 605-8.

As noted in OMUTCD Section 6F.02, existing yellow or fluorescent yellow-green Warning Signs already in place within temporary traffic control zones may remain in use when applicable. Color for other signs shall generally follow the standard for all highway signs.

605-2.3 Placement

Signs should be placed on the right side of the roadway unless otherwise specified in the OMUTCD or this Manual. On multi-lane divided highways, signs should be dual-mounted unless it is not physically possible to do so. OMUTCD Section 6F.03 and Figure 6F-1 provide guidelines for height and lateral clearance of temporary post-mounted signs. SCD MT-105.10 also addresses temporary sign supports. For increased visibility, a 7 foot mounting height may be used in rural areas.

As noted in OMUTCD Section 6F.03, signs mounted on portable supports may be placed within the roadway itself. Signs may also be mounted on or above barricades. Signs mounted on barricades and barricade/sign combinations shall be crashworthy.

Neither portable nor permanent sign supports should be located on sidewalks, bicycle lanes, or areas designated for pedestrian or bicycle traffic.

Methods of mounting signs other than on posts are illustrated in OMUTCD Figure 6F-2. Except as noted below for mobile operations, signs mounted on portable supports should not be used for a period of more than three days. Signs mounted on Type III barricades should not cover more than fifty percent of the top two rails or thirty-three percent of the total area of the three rails.

For information regarding signing for work zone speed zones see Section 640-18.2.

For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, or a trailer stationed in advance of the temporary traffic control zone or moving along with it. The work vehicle, the shadow vehicle, or the trailer may have an impact attenuator.

See Section 221-4 for information about erecting signs on or near utility poles.

605-2.4 Sheeting for Temporary Traffic Control Signs and Hand-Signaling Devices

For flatsheet signs and hand-signaling devices, Type G, H or J retroreflective sheeting shall be provided for the background and for the retroreflective legends. As an exception, any hand-signaling devices in ODOT maintenance inventory with Type F sheeting may remain in use until they have reached the end of their service life. New Type F hand-signaling devices shall not be permitted.

605-3 Regulatory Signs

605-3.1 General

Regulatory Signs in temporary traffic control zones are addressed in OMUTCD Chapter 6F. Section 605-3 will be used to provide additional information about Regulatory Signs discussed in the OMUTCD if needed. Information about Regulatory Signs used in temporary traffic control zones that are not currently addressed in the OMUTCD are discussed in Section 605-4.

If a temporary traffic control zone requires regulatory measures different from those existing, the existing permanent regulatory devices shall be removed or covered and superseded by
the appropriate temporary Regulatory Signs. **OMUTCD Sections 2B.13 and 2B.16** and **Chapter 1203** should be consulted before temporary traffic control zone regulatory speed limits are established.

### 605-3.2 ROAD CLOSED Sign (R11-2)

This sign is addressed in **OMUTCD Section 6F.08**. The words BRIDGE OUT (or BRIDGE CLOSED) may be substituted for ROAD (STREET) CLOSED where applicable.

The sign should be erected at or near the center of the roadway on or above a Type III barricade that closes the roadway. The sign shall not be used where traffic is maintained, or where the actual closing is some distance beyond this sign.

### 605-3.3 Weight Limit Signs (R12-1, R12-H1, R12-2, R12-H2, R12-4, R12-H4, R12-5, R12-H5)

These signs are addressed in **OMUTCD Sections 2B.59 and 6F.10**. When weight restrictions are imposed, a marked detour shall be provided for vehicles weighing more than the posted limit. A supplemental distance plaque (R16-H13) shall be provided with the appropriate weight limit sign at the point where the detour is provided.

### 605-4 Special Regulatory Signs

#### 605-4.1 General

**Section 605-4** is intended to address signs developed for use on ODOT-maintained highways that are not currently addressed in the **OMUTCD**. There may be a need for various Regulatory Signs that are not in the **OMUTCD**. They may eventually be incorporated into the **OMUTCD**; however, if their use is limited they may not be incorporated into that manual. Special Regulatory Signs should conform to the general requirements of color, shape and alphabet size and series. The sign message should be brief, legible and clear.

#### 605-4.2 Work Zone Speed Limit Sign (R2-1)

Speed limit reduction through temporary traffic control zones shall be provided as per **Sections 640-18.2 and 1203-2.9**. Where the speed limit reduction is applied, signing shall be as indicated in **Section 642-24 (Plan Note 642-24)**.

#### 605-4.3 Work Zone Increased Penalties Sign (R11-H5a)

**ORC Division 5501.27(A)(1)** requires that the **Director of Transportation** “adopt rules governing the posting of signs advising motorists that increased penalties apply for certain traffic violations on streets or highways in a construction zone.”

**ORC Division 5501.27(A)(2)** requires that the Director also adopt “rules governing the posting of signs to be used pursuant to **Section 2903.081 of the Ohio Revised Code (ORC)** giving notice to motorists of the prohibitions set forth in **ORC Sections 2903.06 and 2903.08** regarding the death of or injury to any person in a construction zone as a proximate result of a reckless operation offense or speeding offense.”

**ORC Section 4511.98**, states that “The director of transportation, board of county commissioners, or board of township trustees shall cause signs to be erected advising motorists that increased penalties apply for certain traffic violations occurring on streets or highways in a construction zone. The increased penalties shall be effective only when signs are erected in accordance with the guidelines and design specifications established by the director under **ORC Section 5501.27**; and when a violation occurs during hours of actual work within the construction zone.”
Chapter 5501:2-10 of the Ohio Administrative Code (OAC) documents the guidelines established by the Director pursuant to ORC Section 5501.27. For convenience, those guidelines are also presented in this Section. Administrative Code Section 5501:2-10-02 requires that each agency adopt procedures pertaining to requiring a contractor, work crew, or utility to erect, maintain, and remove signs, in conformance with these guidelines.

Work Zone Increased Penalty signs (R11-H5a) shall be used in construction zones on multi-lane divided highways where the work is expected to last thirty days or more, if the planned work length is at least 0.50 miles and if the construction zone is stationary. The signs may also be erected in any other construction zone at the discretion of the Director.

The signs may be erected for construction zones located on other highways meeting the foregoing requirements (i.e., thirty days, at least 0.50 miles in length, and stationary work) if required by the agency’s procedures adopted under 5501:2-10-02(C) or at the discretion of the Director.

The signs should be dual-mounted on a directional roadway of a divided highway, but need only be mounted on the right side of an undivided roadway or ramp.

The first R11-H5a sign shall be placed between the ROAD WORK AHEAD or other similar Warning Sign and the next sign in the sequence. Additional signs are required for long construction zones or where ramps or through streets junction within the construction project work limits. Signs shall be erected on each entrance ramp, near intersections of through roads to advise entering or turning traffic, and at least once every 2 miles through the construction work limits.

The signs shall be furnished, erected, maintained in good condition and/or replaced as necessary and subsequently removed by the entity which erects the traffic controls within the project. Signs shall be mounted at the appropriate offsets and elevations as prescribed by the OMUTCD. They shall be mounted on supports meeting current safety criteria.

Where construction activity affects only one directional roadway of a divided highway with a barrier or wide median, signs shall not be erected for traffic on the opposing directional roadway or ramp.

Signs shall be covered or removed when a construction zone is discontinued for a period of thirty days or more. Additionally, the agency may require signs to be covered or removed for a specific shorter period.

Where a series of ROAD WORK AHEAD signs are provided, with supplemental distance plates, on ODOT-maintained highways, the R-11-H5a sign shall be placed following the final ROAD WORK AHEAD sign immediately preceding the location at which construction activity begins.

Erection of R11-H5a signs in a temporary traffic control zone on ODOT-maintained highways can be initiated in three different ways, depending on the nature of the construction:

1. For ODOT construction projects, a determination will be made during the design phase as to whether the proposed construction activities will comply with requirements for the signs. When signs are required, they should be included in the construction contract plans for furnishing, erection, maintenance, covering, removal, etc., by the contractor. Prior to commencement of pertinent construction activities, the project engineer will assure that the assumptions concerning construction conditions are still valid and that the signing still applies in the manner originally determined.

The project engineer shall assure that signs are erected, maintained in good condition, covered, uncovered, repaired, replaced or removed by the contractor in a timely manner.
See Section 642-27 (Plan Note 642-27) for more detail regarding erection of R11-H5a signs on multi-lane construction projects.

2. For maintenance work by ODOT forces, the District Highway Management Administrator shall identify those specific work areas which meet the criteria for erection of R11-H5a signs and arrange for furnishing signs, sign erection, maintenance covering and removal accordingly.

3. For non-ODOT construction, maintenance or utility work, a construction company, utility company or property owner may propose work within the right-of-way of a rural state highway and request a permit for such work under the requirements of SOP PH-P-403. At that time the company or property owner may also request permission to use R11-H5a signs for specified portions of the work. The request shall include a plan showing the proposed size, location and duration of erection of each sign. If approved, it is the responsibility of the company or owner to furnish the appropriate signs and erect, maintain, cover, uncover and remove them in accordance with the requirements of this Section.

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<tr>
<td>R11-H5a</td>
<td>Major Conventional, Expressway &amp; Freeway</td>
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605-5 Warning Signs

605-5.1 General

Warning Signs in temporary traffic control zones are addressed in OMUTCD Chapter 6F. Section 605-5 will be used to provide additional information about Warning Signs discussed in the OMUTCD if needed. Information about Warning Signs used in temporary traffic control zones that are not currently addressed in the OMUTCD are discussed in Section 605-6.

If a temporary traffic control zone requires Warning Signs different from those existing, the existing permanent Warning Signs shall be removed or covered and superseded by the appropriate temporary Warning Signs.

Signing in the advance warning area (OMUTCD Figure 6C-1 and Figure 698-1) must be adequate to inform the approaching road user of conditions downstream. The ROAD WORK AHEAD sign (W20-1), is normally provided and is followed by appropriate signing for the conditions at the site (see OMUTCD Part 6 and the MT series of SCDs). When there is a need to provide notice for several miles in advance, it is necessary to repeat the ROAD WORK AHEAD sign every mile and to supplement it with a plaque to provide the distance to the beginning of the work. Where traffic queues are expected, advance notice of the potential...
for stopped traffic should be provided by the proper signing, such as BE PREPARED TO STOP (W3-4).

When it is necessary to provide a distance with a warning message, it is ODOT practice to provide this distance on a supplemental plaque mounted below the Warning Sign. The message on the Warning Sign will include the word “AHEAD” rather than the distance. Portable changeable message signs (PCMS) are very helpful in providing advance information to approaching traffic, particularly if this information is to be modified frequently. See Section 605-9 for more information on PCMSs.

605-5.2  Design

As noted in ODOT Section 6F.16, with some exceptions, Warning Signs in temporary traffic control zones shall be diamond shaped with a black symbol or message on an orange background. Mounting or space considerations may justify a change from the standard diamond shape, but such variations require prior approval of the highway authority.

Warning Signs used for incident management may have either an orange background or a fluorescent pink background. However, in emergencies, available signs having yellow backgrounds may be used if neither fluorescent pink nor orange signs are readily available.

605-5.3  Sizes

Except as noted herein, signs used for temporary traffic control zones and incident areas shall be sized based on the provisions of ODOT Chapter 6F.

605-5.4  Spacing

Where highway conditions permit, Warning Signs should be placed at varying distances in advance of the work area, depending on the roadway type, condition and speed. Where a series of two or more Warning Signs is used, the closest sign to the work area should be placed approximately 100 feet away for low-speed urban streets to 1,000 feet away or more for expressways and freeways.

OMUTCD Table 6C-1 presents the suggested spacing of Warning Signs for four general roadway types: urban (low speed), urban (high speed), rural and expressway/freeway.

605-5.5  ROAD (STREET) CLOSED AHEAD Sign (W20-3)

As noted in OMUTCD Section 6F.20, the ROAD (STREET) CLOSED AHEAD sign (W20-3) should be used ahead of that point where a highway is closed to all traffic, or to all but local traffic. It may be used in conjunction with appropriate distance legends or with other Warning Signs. Where used on high-speed facilities, the 48-inch size sign shall be used. Where speeds are 40 miles per hour or lower and volumes are moderately low, the 36-inch size may be used.

605-5.6  ONE LANE ROAD AHEAD Sign (W20-4)

As noted in OMUTCD Section 6F.21, the ONE LANE ROAD AHEAD sign (W20-4) shall be used only in advance of that point where vehicular traffic in both directions must use a common single lane. Where used on high-speed facilities, the 48-inch size sign shall be used. Where speeds are 40 miles per hour or lower and volumes are moderately low, the 36-inch size may be used.

605-5.7  LANE(S) CLOSED AHEAD Sign (W20-5, W20-5a)

As noted in OMUTCD Section 6F.22, the LANE CLOSED AHEAD sign (W20-5) shall be used in advance of that point where one or more lanes of a multi-lane roadway are closed.
The sign may be used in repetition, in conjunction with appropriate distance legends, or with other Warning Signs. Where used on high-speed facilities, the 48-inch size sign shall be used. Where speeds are 40 miles per hour or lower and volumes are moderately low, the 36-inch size may be used.

605-5.8 Flagger Sign (W20-7, W20-7a)

As noted in OMUTCD Section 6F.31, the Flagger symbol sign (W20-7a) should be used before any point where a flagger is stationed to control traffic. The sign may be used in conjunction with other Warning Signs, such as BE PREPARED TO STOP (W3-4). The 48-inch size sign shall be used regardless of highway classification.

605-5.9 SURVEY CREW AHEAD Signs (W21-H6)

As noted in OMUTCD Section 6F.38, the SURVEY CREW AHEAD sign (W21-H6) should be used to warn of survey crews working in or next to the roadway.

605-5.10 Blasting Zone Signs (W22-1, W22-2, W22-3)

As noted in OMUTCD Sections 6F.40 through 6F.43, Blasting Zone signing shall be used in advance of a temporary traffic control zone where explosives are being used.

605-5.11 Construction Arrow Sign (W1-H11)

The Construction Arrow sign (W1-H11) (see OMUTCD Section 6F.50.1) should be used where it is necessary to guide traffic through construction areas, or where road work is in progress. This sign is often placed along lane shifts where it may be determined that traffic guidance is necessary. Examples of use of the Construction Arrow sign are presented in OMUTCD Figures 6H-31, 6H-32 and 6H-36 and in SCDs MT-102.10 and 102.20.

605-5.12 SHOULDER CLOSED Signs (W21-5a, W21-5b)

SHOULDER WORK signs are addressed in OMUTCD Section 6F.37. On expressways and freeways, the RIGHT (LEFT) SHOULDER CLOSED sign (W21-5a) and RIGHT (LEFT) SHOULDER CLOSED AHEAD sign (W21-5b) should be used in advance of the point where the shoulder work occurs and should be preceded by a ROAD WORK AHEAD sign (W20-1).

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Route Type</th>
<th>Size Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>W21-5a &amp; W21-5b</td>
<td>Conventional</td>
<td>36 x 36</td>
</tr>
<tr>
<td>W21-5a &amp; W21-5b</td>
<td>Expressway &amp; Freeway</td>
<td>48 x 48</td>
</tr>
</tbody>
</table>

605-5.13 Shoulder Drop-Off Sign (W8-17)

OMUTCD Section 6F.44 indicates that the Shoulder Drop-Off sign (W8-17) “should be used when a shoulder drop-off, adjacent to the travel lane, exceeds 3 inches in depth for a continuous length along the roadway, based on engineering judgment.” However, SCD MT-101.90 has been developed to address shoulder drop-off situations on ODOT-maintained freeways, expressways and other highways with speeds of 45 mph or greater and minimal driveways. If the guidance in the SCD is followed, there should be no need for the W8-17 sign.

Where the sign is appropriate, it shall be installed by the end of the day in which the drop-off is created.
### 605-5.14 UNEVEN LANES Sign (W8-11)

The UNEVEN LANES sign (W8-11) is addressed in **OMUTCD Section 6F.45**. It should be used during operations that create a difference in elevation between adjacent lanes.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Route Type</th>
<th>Size Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8-11</td>
<td>Conventional</td>
<td>36 x 36</td>
</tr>
<tr>
<td>W8-11</td>
<td>Expressway &amp; Freeway</td>
<td>48 x 48</td>
</tr>
</tbody>
</table>

### 605-5.15 NO CENTER LINE and NO EDGE LINE Signs (W8-H12, W8-H12a)

NO CENTER LINE and NO EDGE LINE signs (W8-H12 and W8-H12a) are addressed in **OMUTCD Section 6F.47**. They should be used when the work obliterates the center or edge line. These signs should be placed at the beginning of the zone and repeated at 2-mile intervals in long zones to remind the road users. They should also be used at major connections, traffic generators, and/or at appropriate intervals as determined by the project engineer, to advise road users entering within the zone. For acceptable temporary pavement marking standards see **Section 605-11.11**.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Route Type</th>
<th>Size Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8-H12 &amp; W8-H12a</td>
<td>Conventional</td>
<td>36 x 36</td>
</tr>
<tr>
<td>W8-H12 &amp; W8-H12a</td>
<td>Expressway &amp; Freeway</td>
<td>48 x 48</td>
</tr>
</tbody>
</table>

### 605-6 Special Warning Signs

#### 605-6.1 General

This Section is intended to address signs developed for use on ODOT-maintained highways that are not currently addressed in the **OMUTCD**. As noted in **OMUTCD Section 6F.51**, there may be a need for various Warning Signs that are not in **OMUTCD Part 6**. Some of these will be found in **OMUTCD Part 2** and others may be developed because of special conditions not yet addressed in the **OMUTCD**. These “special” Warning Signs may eventually be incorporated into the **OMUTCD**; however, if their use is limited they may not be incorporated into that manual. Special Warning Signs should conform to the general requirements of color, shape and alphabet size and series. The sign message should be brief, legible and clear.

#### 605-6.2 Notice of Closure Signs (W20-H13, W20-H14)

Notice of Closure signs (W20-H13 and W20-H14) are intended to give advance notice to the road user of a scheduled road closure. The information provided on these signs includes the
scheduled date of closure and the number of days of the scheduled closure. The W20-H13 also provides a telephone number for information and is the preferable sign. The selected sign should be erected at the point of closure except that more flexibility is acceptable in locating the signs on ramps. The sign should be erected at least one week in advance of a scheduled road or ramp closure and shall be erected on the right-hand side of the road or ramp, facing traffic. Additional details on placement of the Notice of Closure signs is provided in Section 642-8 (Plan Note 642-8).

Some freeway and expressway projects require temporary closures of entrance and exit ramps in order to facilitate the work. This can create a situation where motorists are able to exit at an interchange, but are unable to reenter the freeway or expressway because of a temporary closure of the entrance ramp. This can create a situation where the exit and same direction entrance ramps are several miles apart. Since this is not the usual situation, it is not expected by drivers. Although trailblazing to the entrance ramp may be provided, the lack of direct reentry can be confusing and irritating, and some through drivers would choose not to exit at such an interchange if they were given advance warning.

The black on orange NO REENTRY _____ BOUND sign has been developed for this situation. When an entrance ramp closure may create a problem on freeways and expressways, this sign should be mounted as a supplemental panel with one or more of the Guide Signs for the exit. For signs less than 12 feet in width, the two-line sign (W13-H8) is available. This sign width of the W13-H7 or W13-H8 may be increased to match the width of the Guide Sign.

Guide Signs in temporary traffic control zones are addressed in OMMUTCD Chapter 6F. Section 605-7 will be used to provide additional information about Guide Signs discussed in the OMMUTCD if needed. Information about Guide Signs used in temporary traffic control zones that are not currently addressed in the OMMUTCD are discussed in Section 605-8.

If a temporary traffic control zone requires guidance information different from that existing, the existing permanent Guide Signs shall be removed or covered and superseded by the appropriate temporary Guide Signs.
605-7.2  DETOUR Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-H9b, M4-9c, M4-10)

As noted in OMUTCD Section 6F.59, each detour shall be adequately marked with standard temporary Route Signs and destination signs.

A Route Sign or Street Name sign should be placed above or incorporated in the DETOUR sign to indicate the name of the route being detoured.

An End Detour sign (M4-8a or M4-8b) may be used to indicate that the detour has ended.

605-7.3  Advance Work Zone Information Signs

Advance Work Zone Information Signs may be required as part of the maintenance of traffic plan for major construction projects. The need for these signs is usually determined by the corridor management team during their review of the project. The signs are fixed message types and advise the road user of alternate routes, possible delays, etc. The signs are generally located at extreme distances from the work area.

To insure uniformity in the design and application of these signs, the following guidelines apply:

1. These signs shall be shown in the plans whether supplied by the contractor or by others (this choice shall be clearly indicated in the plans). The normal procedure is for the contractor to provide the signs.

2. The location of the signs shall be field checked by the designer to insure that there are no conflicts with existing features and other signs in the area. The designer will assure that signs are not blocked by being too close to other signs and that the road user has sufficient time to read, understand and act on the information provided by all of the signs.

3. The plans shall indicate the legend, level and size of the signs. The signs shall be considered Supplemental Guide Signs as described in OMUTCD Section 2E.35.

4. The signs shall be black on orange (including a black border). The layout shall conform to the OMUTCD and ODOT Guide Sign design standards (see SDM Appendix C).

5. Where appropriate, advance work zone information signs shall make use of the same exit numbers, route numbers, directions and destinations as shown on the permanent Guide Signs.

6. In some instances, instead of providing separate installations, it may be desirable to modify existing overhead Guide Signs. These changes are accomplished by providing black-on-orange overlays to cover portions of the existing signs. Letter size on these overlays should be the same as on the existing signs. When lane arrows are to be covered, rather than using a blank overlay, the legend “LANE CLOSED” shall be used. When a ramp is being closed, rather than using a blank overlay to cover the entire sign, the legend “CLOSED” shall be used on a diagonal overlay (lower left to upper right) on the sign. The size of lettering on overlays and the size of the overlay shall be indicated in the plans. The minimum letter size for “LANE CLOSED” shall be 10-inch E.

7. When regulatory information is provided, it shall be displayed separately as a standard black-on-white sign. Mixing black-on-white regulatory information on a black-on-orange information sign is prohibited.

8. If the road user is being detoured, or if an alternate route is provided, the route should be signed with assemblies consisting of the appropriate black-on-orange (DETOUR OR ALT) markers with a standard Route Sign and arrow plate. If more target value is desired,
this trailblazer information may be shown on an orange panel, M2-H3 type.

9. Route Sign assemblies shall be sized according to the type of road on which they are located in accordance with the OMUTCD.

10. Supports for sign installations shall conform to all existing standards for permanent signs.

11. These signs should not be attached to existing supports.

12. All advance work zone information sign installations located outside of the project work limits shall be paid for under appropriate 630 Items (signs, supports, concrete, breakaway connection, overlays, removals, etc.). They shall not be included in the lump sum bid for Item 614. This requirement does not apply to Advance Warning Signs or to sign installations within the work limits.

605-8 Special Guide Signs

605-8.1 General

Section 605-8 is intended to address signs developed for use on ODOT-maintained highways that are not currently addressed in the OMUTCD. There may be a need for various “special” Information (Guide) Signs that are not in the OMUTCD. They may eventually be incorporated into the OMUTCD; however, if their use is limited they may not be incorporated into that manual. Special Guide Signs should conform to the general requirements of color, shape and alphabet size and series. The sign message should be brief, legible and clear.

605-8.2 TRUCK Marker (M4-4)

This sign shall be used with standard Detour signs when it is necessary to establish a detour for truck traffic, but not other vehicles.

605-8.3 Exit Open/Closed Signs (E5-2, E5-2a, E5-H2b, E5-H2c)

Use of these signs is addressed in OMUTCD Section 6F.28 and Figures 6H-41 and 6H-42.

605-9 Portable Changeable Message Signs (PCMSs)

Portable Changeable Message Signs (PCMS) (see OMUTCD Section 6F.60) are traffic control devices with the flexibility to display a variety of messages to fit the needs of road and street authorities. These signs are used most frequently on high density, urban freeways, but have applications on all types of highways where highway alignment, traffic routing problems or other pertinent conditions require advance warning and information.

In addition to the standards and guidelines in OMUTCD Section 6F.60 and herein, additional guidelines for use of PCMSs can be found in Chapter 641 of this manual, Section 642-41 (Plan Note 642-41), and the Portable Changeable Message Sign handbook PCMS by FHWA, Report No.: FHWA-RD-03-066.

As noted in OMUTCD Section 6F.60, when abbreviations are used, they should be easily understood (see OMUTCD Section 1A-14).

Portable Changeable Message Signs will typically be placed in advance of any other temporary traffic control zone signing and should not replace any required signing. The location of the PCMS may have to be adjusted to keep the sign an appropriate distance in advance of traffic queues. Instead of relocating, an additional PCMS may be employed.

Diesel powered PCMSs should not be used in residential areas at night.
The Approved List of PCMSs for use on ODOT jobs can be found on the ODOT website at http://www.dot.state.oh.us/Divisions/ConstructionMgt/Materials/Approved-List/Pages/default.aspx.

605-10 Arrow Boards

605-10.1 General

An arrow board is a sign with a matrix of elements capable of either flashing or sequential displays (see OMUTCD Section 6F.61). This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a temporary traffic control zone.

Arrow boards are used primarily on multi-lane highways to notify road users of the need to exit the presently occupied lane due to a lane closure. Under such conditions, the use of the arrow board shall be mandatory. Where a multi-lane closure is necessary, a separate arrow board shall be used for each closed lane.

On two-lane highways, the boards may be used only in the caution mode. Display of the arrow or chevron modes shall not be permitted on two-lane highways.

An arrow board should be used in combination with appropriate signs, channelizing devices, or other temporary traffic control devices. Arrow boards will not solve difficult traffic problems by themselves, but can be very effective when properly used to reinforce signs and other traffic control devices. Necessary signs, barricades and traffic control devices shall be used in conjunction with the arrow displays.

Diesel powered boards should not be used in residential areas at night.

The Approved List for arrow boards is posted at: http://www.dot.state.oh.us/Divisions/ConstructionMgt/Materials/Pages/Flashing-Arrow-Panels.aspx. Supplement 1021 addresses the prequalification procedure for arrow boards.

605-10.2 Design

Arrow boards shall meet the minimum size, legibility distance, number of elements, and other specifications shown in OMUTCD Section 6F.61 and Figure 6F-6 and in Supplemental Specifications 821 and 921.

Type A arrow boards are appropriate for use on low-speed (≤ 40 miles per hour) urban streets. Type B arrow boards are appropriate for intermediate-speed (40 to 50 miles per hour) facilities and for maintenance or mobile operations on high-speed (> 45 miles per hour) roadways. Type C arrow boards are intended to be used on high-speed, high-volume roadways.

For additional guidance and requirements on use of arrow boards, see OMUTCD Section 6F.61.

605-11 Channelizing Devices

605-11.1 General

Channelizing devices guide road users through the work zone, indicate hazardous areas, and exclude road users from the actual work space. The following Sections provide information on channelizing devices that is in addition to the standards and guidelines provided in OMUTCD Chapter 6F. For information on barriers, see OMUTCD Sections 6F.70 and 6F.85 and Sections 605-11.7 and 605-14.

Channelizing devices for use in temporary traffic control applications include cones, tubular markers, vertical panels, drums, barricades, and temporary raised islands. Barriers may also
be used as channelizing devices. Intermixing of various types of channelizing devices (e.g.,
drums and cones) is not permitted.

Channelizing devices and their application shall conform to the OMUTCD, the following TEM
Sections and the SCDs. Temporary barriers are discussed in further detail in Section 605-
14. Crash cushions are discussed in Section 605-15. Temporary impact attenuators are
discussed in Section 605-15.3. Also see Section 640-2 for a discussion of some exceptions.

605-11.2 Placement

As noted in OMUTCD Section 6F.63:

1. The spacing of channelizing devices in a taper should not exceed a distance in feet equal
to the speed limit in miles per hour. For example, if the taper is on a roadway with an
existing 55 miles per hour speed limit, the devices should be spaced at about 55 feet.

2. To keep traffic out of a closed lane on a tangent section, channelizing devices should be
spaced a distance in feet of no more than two times the speed limit in miles per hour.

3. When channelizing devices have the potential of leading vehicular traffic out of the
intended traffic space, the devices should be extended a distance in feet of two times the
speed limit in miles per hour beyond the end of the transition area. This situation is
illustrated for the “southbound” traffic in OMUTCD Figure 6H-39. In this typical
application, the line of channelizing devices used for the “southbound” left-lane closing
has been extended to help avoid the possibility that the devices used to delineate the
crossover may also lead the traffic moving back into the “southbound” left lane into the
median area.

When cones are used at night on freeways and other multi-lane highways maintained by
ODOT, the maximum cone spacing shall be 40 feet.

All channelizing devices used in maintaining traffic should have a minimum lateral offset from
the edge of the traveled lane of 1.5 feet. A lateral offset of less than 1.5 feet may be used in
instances when the project length is short. However, attempts to provide larger offsets should
be made whenever possible.

605-11.3 Cones

This Section addresses requirements for traffic cones that are in addition to those found in
OMUTCD Section 6F.64.

Reflectorization of cones shall be as specified in OMUTCD Section 6F.64, and accomplished
with bands of Type G reboundable retroreflective sheeting (CMS 730.191).

Except for pavement marking operations, the minimum height for cones shall be 28 inches.
Cones used to protect the line during a pavement marking operation may be 18 inches (see
SCD MT-99.20).

In addition to the above requirements the following requirements shall apply:

1. Cones may be used on freeways and other multi-lane highways for either daytime or
nighttime operations; however, they shall not be used continuously, day and night. Upon
completion of work within the work period, the cones shall be removed. They may again
be placed on the highway in order to resume work in the following such work period. Any
lane closure which is expected to remain continuously, day and night, shall require the
use of drums or barriers.

Cones used at night on freeways and other multi-lane highways shall be at least 42
inches in height.

Night use of cones on freeways and other multi-lane highways shall be limited to that portion of the closure which is beyond the transition taper area. Night channelization of such transition taper shall be by use of drums.

Maximum spacing of cones, when used at night on freeways and other multi-lane highways, shall be 40 feet.

2. On other highways, there are no restrictions on the duration of work for use of cones, day or night. On these roadways, night use of cones is permitted along the entire zone, along the transition taper and beyond.

605-11.4 Drums

605-11.4.1 General

Section 605-11.4 addresses requirements for drums used to warn or channelize road users. These are in addition to those found in OMUTCD Section 6F.67.

Drums shall be ballasted in accordance with the manufacturer’s recommendations.

Drums shall be kept clean so that retroreflectivity is not compromised. Concrete sawing operations splash residue on sheeting, rendering it ineffective.

Owner identification markings on construction drums shall be no more than 1 inch in character height and located at least 2 inches below the retroreflective band or on the top or bottom horizontal surfaces of the drum.

Retroreflectorization of drums shall be provided by Type G reboundable sheeting complying with the requirements of CMS 730.191. Additional information regarding use of drums is available in CMS 614.03.

605-11.4.2 Lights on Drums

ODOT’s use of warning lights (OMUTCD Section 6F.83 and TEM Section 605-12.5) on drums is limited to Type A flashing lights for identification of spot hazards. ODOT does not use Type C steady-burning warning lights on drums. Research projects sponsored by ODOT and FHWA demonstrated that benefits from steady-burn warning lights mounted on retroreflectorized drums are insignificant. Therefore, the use of these lights on retroreflectorized drums used as channelizing devices was terminated at the end of the 1991 construction season.

ODOT will not fund steady-burning (Type C) warning lights on drums used for the purpose of channelization on ODOT-administered projects. If a local agency desires to include lights on drums for channelization, the additional cost of the lights must be funded with local funds.

605-11.5 Barricades, Tubular Markers and Vertical Panels

This Section addresses requirements for tubular markers, vertical panels, and Type I, II and III barricades that are in addition to those found in OMUTCD Sections 6F.65, 6F.66 and 6F.68, respectively.

Faces of barricades and vertical panels shall be retroreflectorized with Type G or Type H sheeting complying with CMS 730.19 and 730.192.

As with cones (Section 605-11.3), all tubular markers shall be retroreflectorized with bands
of Type G sheeting. For details on band widths and sequencing see OMUTCD Section 6F.65.

605-11.6 Direction Indicator Barricade

The Direction Indicator Barricade (see OMUTCD Section 6F.69 and Figure 6F-7) may be used in tapers, transitions and other areas where specific directional guidance to road users is necessary. However, if used, Direction Indicator Barricades should be used in series to direct road users through the transition and into the intended travel lane.

The face of the barricade shall be retroreflectorized with Type G or Type H sheeting complying with CMS 730.19 and 730.192.

605-11.7 Barrier Used as a Channelizing Device

Temporary traffic barriers (see OMUTCD Section 6F.70) shall not be used solely to channelize road users, but also to protect the work space. When used for channelization, temporary traffic barriers should be of a light color for increased visibility. For nighttime use, the temporary traffic barrier shall also be supplemented with delineation. For additional information, refer to OMUTCD Section 6F.70 and Sections 605-14 and 605-19.

605-11.8 Temporary Raised Islands

Temporary raised islands (see OMUTCD Section 6F.75) shall be used only in combination with pavement markings and other suitable channelizing devices. Except when recommended by an engineering study, they should only be used on roadways with speeds of 40 miles per hour or less.

605-11.9 Opposing Traffic Lane Divider

The Opposing Traffic Lane Divider sign (see OMUTCD Section 6F.76) is a delineation device used in a series to separate opposing vehicular traffic on a two-lane, two-way operation. Its use is limited to locations where speeds are 40 miles per hour or less. The Opposing Traffic Lane Divider sign (W6-4) is shown in OMUTCD Figure 6F-4 (sheet 1 of 3).

605-11.10 Pavement Markings

605-11.10.1 General

Section 605-11.10 provides additional information and support for information in OMUTCD Section 6F.77. The provisions herein shall not be considered applicable for short-term, mobile or incident management temporary traffic control zones.

Either permanent or temporary pavement markings (OMUTCD Section 6F.78) shall be in place prior to opening the road or lane to road users. See Section 605-11.11 for additional information on temporary pavement markings.

Adequate pavement markings shall be maintained along paved streets and highways in temporary traffic control zones. The intended vehicle path should be defined in day, night, and twilight periods under both wet and dry pavement conditions. The work should be planned and staged to provide the best possible conditions for the placement and removal of the pavement markings.

Road users should be provided pavement markings within a temporary traffic control zone comparable to the pavement markings normally maintained along such roadways, particularly at either end of the temporary traffic control zone. The following guidelines set forth the level of adequate markings, delineation and obliteration for various temporary traffic control zone situations.
1. All pavement markings shall be in accordance with OMUTCD Chapters 3A and 3B, except as indicated in Section 605-11.11.

2. Pavement markings shall be maintained along highways in all long term stationary temporary traffic control zones (see Section 606-3). The pavement markings shall match the markings in place at both ends of the temporary traffic control zone. Particular attention should be given to ramp gore areas.

3. Pavement markings shall be placed, along the entire length of any surfaced detour or temporary roadway prior to the detour or roadway being opened to road users.

4. Markings should be provided in intermediate-term stationary traffic control zones if practical (see Section 605-11.11, 605-13.2, and 641-10.2). Where pavement marking is not provided, another form of channelization such as drums shall be provided. On multi-lane highways, lane line markings may be necessary, as other forms of channelization may not be appropriate.

5. Warning Signs, channelizing devices and delineation shall be used to indicate required road user paths in temporary traffic control zones where it is not possible to provide a clear path by pavement markings.

6. For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical. Pavement marking obliteration shall leave a minimum of pavement scars and shall remove old marking material. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration. Removable, nonreflective, preformed tape may be used where markings need to be covered temporarily (see Section 605-11.10.2).

7. All markings and devices used to delineate road user paths shall be carefully reviewed during daytime and nighttime periods.

605-11.10.2 Conflicting Pavement Markings

Conflicting pavement markings shall be removed by an approved method which will not scar the pavement or may be covered with removable, nonreflective, preformed tape which blends in with the existing pavement surface. Should it be decided to use the removable tape, the tape must be closely monitored, as it may be displaced due to traffic passing over it or inclement weather conditions. See Section 620-6 and CMS 614.11 and 641.10 for additional information.

605-11.11 Temporary Pavement Markings

As noted in Section 605-11.10.1, either permanent or temporary pavement markings shall be in place prior to opening the road or lane to traffic.

Temporary, or interim, pavement markings are those that are allowed to remain in place until the earliest date when it is practical and possible to install pavement markings that meet the OMUTCD Part 3 standards for pavement markings. They should not be left in place for more than fourteen days unless justified by an engineering study.

In areas of long-line work such as resurfacing, where the roadway or lane remains open during construction, the new pavement marking shall be placed within fourteen days of removal or obliteration of the existing line(s). NO EDGE LINES (W8-H12a) signs shall be erected at locations lacking necessary edge lines.

All temporary pavement markings, including pavement markings for No-Passing Zones, shall conform to the requirements of OMUTCD Chapters 3A and 3B with the following exceptions:
1. All interim broken-line pavement markings shall use the same cycle length as permanent markings and be at least 4 feet long, except that half-cycle lengths with a minimum of 2-foot stripes may be used for roadways with severe curvature (see OMUTCD Section 3A.06). This applies to white lane lines for traffic moving in the same direction and yellow center lines for two-lane roadways when it is safe to pass.

2. The center line shall either be full dimensional for No-Passing Zones or an abbreviated Class II center line may be used for a maximum of three consecutive calendar days as long as DO NOT PASS (R4-1) and PASS WITH CARE (R4-2) signs are erected as required by CMS 614.04. At the end of the three day time period, a center line consisting of full dimensional no passing markings must be installed. Also, signs may be used instead of pavement markings on low-volume (as defined in Section 500) roads for longer periods. These signs should be placed in accordance with OMUTCD Sections 2B.28, 2B.29 and 2C.45.

3. Edge lines shall be provided except for short periods (3 days maximum) at locations where another form of identification is provided, such as drums or cones.

4. Interim gore marking shall be continuous 4-inch lines placed at the theoretical gore of an exit ramp or diverging roadway.

605-11.12 Raised Pavement Markers

The use of temporary raised pavement markers in temporary traffic control zones is addressed in OMUTCD Section 6F.79, Section 641-25 and in SCD MT-99.30.

Raised pavement markers should be considered for use along center lines and lane lines on surfaced detours or temporary roadways, and other changed or new travel-lane alignments.

605-11.13 Delineators

As noted in OMUTCD Section 6F.80, delineators may be used in temporary traffic control zones to indicate the alignment of the roadway and to outline the required vehicle path through the temporary traffic control zone. When used, delineators shall be used in combination with, or be supplemental to, other traffic control devices.

Delineators shall be mounted on crashworthy supports so that the retroreflective unit is approximately 4 feet above the near roadway edge. The standard color for delineators used along both sides of two-way streets and highways and the right side of one-way roadways shall be white. Delineators used along the left side of one-way roadways shall be yellow. Spacing along roadway curves should be as set forth in OMUTCD Section 3F.04, and should be such that several delineators are always visible to the driver.

605-12 Lighting Devices

605-12.1 General

Lighting devices (OMUTCD Section 6F.81) should be provided in temporary traffic control zones based on engineering judgment. They may be used to supplement retroreflectorized signs, barriers and channelizing devices.

Four types of lighting devices are commonly used in temporary traffic control zones. They are floodlights, flashing warning beacons, warning lights and steady-burn electric lamps.

During normal daytime maintenance operations, the functions of flashing warning beacons are adequately provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle. Vehicle hazard warning lights are permitted to be used to supplement
these lights; however, they shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.

605-12.2 Floodlights

Standards and guidelines for the use of floodlights in temporary traffic control situations are addressed in OMUTCD Section 6F.82.

Lighting is often provided to illuminate the roadway at locations of significant geometric change. For example:

1. All temporary crossover areas shall be illuminated as shown in SCD MT-100.00.

2. Some projects involve special situations. If a project requires illumination for special situations, the Office of Traffic Engineering should be contacted for design guidance.

605-12.3 Flashing Warning Beacons

Flashing Warning Beacons (see OMUTCD Section 6F.77) are often used to supplement a temporary control device.

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

605-12.4 Steady-Burn Electric Lamps

As noted in OMUTCD Section 6F.83, steady-burn electric lamps are a series of low-wattage, yellow, electric lamps, generally hard-wired to a 110-volt external power source. They may be used in place of Type C steady-burning Warning Lights (see Section 605-12.5).

605-12.5 Warning Lights

Warning lights are portable, powered, yellow lens-directed, enclosed lights (see OMUTCD Section 6F.78). They may be used in either flashing (Type A or B) or steady (Type C) modes. The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. See Section 605-11.4.2 for additional information about the use of steady-burn warning lights with drums.

605-13 Temporary Traffic Control Signals

605-13.1 General

It is often necessary to install temporary traffic signals in order to maintain traffic through temporary traffic control zones. As noted in OMUTCD Section 6F.84, temporary traffic control signals used to control road user movements through temporary traffic control zones and in other temporary traffic control situations shall meet the applicable provisions of OMUTCD Part 4. OMUTCD Section 6F.84 and this Part of the TEM provide additional information on the use of traffic signals in temporary traffic control zones. Part 4 of this Manual should also be reviewed for applicable information.

OMUTCD Figure 6H-12 and SCDs MT-96.11, 96.20 and 96.26 address the use of temporary traffic signals to maintain two-way traffic in a single lane (see Section 641-10). Additional guidance on the design of temporary traffic control signals is provided in Section 605-13.2.

The traffic signal system may either be constructed of standard signal components conforming to SCDs MT-96.11, 96.20 and 96.26 (Section 641-10), or it may be a portable
traffic signal (PTS) which is essentially self-contained and mounted on trailers (Section 605-13.3)

For common procedures for maintaining traffic signals during construction, see the maintenance of traffic signals and flasher notes found in Chapter 642.

Simple, two-phase traffic signal systems shall not be used for situations where traffic, including contractors’ vehicles, will be entering the traffic stream, from the work site, between signals. Such intermediate access points shall be kept to a minimum, or avoided completely if possible. If traffic must enter the traffic stream at intermediate locations, an additional signal shall be located at each such location. Each such signal shall be traffic actuated.

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

605-13.2 Duration of Work

For temporary traffic signals which will be in continuous operation for seventy-two hours or less, pavement marking shall be as shown in SCDs MT-96.11 (see Section 641-10) with the following exceptions and qualifications:

- Temporary pavement markings and temporary raised pavement markers are not required.
- Removal of existing conflicting pavement markings is not required if drums (or cones during daylight hours only) provide continuous positive guidance for vehicles.

605-13.3 Portable Traffic Signal (PTS)

The following shall apply to a Portable Traffic Signal (PTS):

1. A PTS shall conform to all OMUTCD requirements for traffic control signals including Section 4D.20.

2. Each signal head shall have three 12-inch vehicular indications (red, yellow and green) and their candlepower distributions shall not be less than specified for standard 12-inch signal heads in the ITE Standard for Adjustable Face Traffic Signal Heads.

3. The systems may be powered by engine driven generators or by stored battery charge. The systems, including batteries, shall be designed to provide electrical energy which will maintain the above described candlepower distribution for at least twenty-four hours at full output.

   The dimming of a PTS shall be permitted in accordance with the OMUTCD. The unit may include a photocell and circuitry which will permit the yellow lens of the PTS light output to be reduced by up to fifty percent during night hours. The amount of dimming, and the choice of not dimming shall be operator selectable.

4. The signal unit generator battery and electronic controls shall be completely inaccessible to unauthorized access, and protected by a sturdy lockable metal enclosure.

5. Signal supports shall consist of sturdy brackets attached to a trailer. The erected assembly shall be designed to solidly support the roadside signals at the specified heights and be designed for 40 mile per hour wind loads. Signal head configurations for each approach shall be one post-mounted signal at 8 foot minimum height on the right side of the road, plus another signal cantilever mounted over the right-hand traffic lane at a minimum height of 16 feet and maximum height of 18 feet; or two post-mounted signal heads, each erected at 8 foot minimum height on both sides of the road. The lateral
Spacing between signals shall be not less than 8 feet center-to-center.

6. The trailer and supports shall be orange. The signal heads shall be yellow.

7. The control portion of the PTS shall meet **NEMA** environmental standards. An independent laboratory test report shall be provided to verify compliance with the **NEMA** environmental standards.

8. The PTS shall be capable of operating in manual, fixed-time and traffic-actuated modes.

9. The controllers for the PTS system shall electronically communicate to each other by cable, radio or other method approved by the **Director**.

10. It shall not be possible even under manual control: to program the yellow clearance interval for less than three seconds; or for the green interval to be displayed for less than five seconds.

11. All timing intervals shall be set in increments of one second or less.

12. The controller shall provide a variable all red-clearance interval from zero to six hundred seconds.

13. The controller shall provide a method for insuring that the pairs of signal heads cannot display conflicting indications. This shall include at least a system which will identify, as a conflict, the display of a green in one direction while displaying: a green in the conflicting direction; a yellow in the conflicting direction; or the all-red clearance interval for a conflicting approach. Further, a controller will be determined to be in conflict if a displayed green is less than five seconds or a displayed yellow is less than three seconds. Upon determination that a conflict exists, all signal heads shall display flashing red as described in **item 15**.

14. The controller shall provide a red flash cycle that shall be flashed continuously at a rate of not less than fifty nor more than sixty times per minute. The illuminated period of each flash shall be not less than half, nor more than two-thirds, of the total flash cycle.

15. The controller shall have circuitry which will detect low voltage and prevent the occurrence of an unsafe signal indication. This “brown out” circuit shall hold the signal safe until adequate voltage is resumed. If a microprocessor is utilized, appropriate circuitry shall be included that will reset the processor when needed while holding the signal in an all-red condition. When the processor is removed from the circuitry, the signal shall default to a safe condition.

16. If the PTS utilizes radio transmission equipment:

   a. The transmitter shall be an accepted **FCC**-type and shall not exceed 1 watt output per **FCC Part 90.17**. The manufacturer shall also comply with all specific limitations noted in **FCC Part 90.17**.

   b. In case of radio interference or failure, the PTS shall display all **red**.

   c. If an **FCC** license is required, a copy shall be kept on file with the contractor.

17. The contractor shall inspect the PTS at least once each hour for the first eight hours after it is set up or reconfigured. Thereafter, he shall inspect it at least every twenty-four hours, including weekends. The inspections are to determine that it is operating correctly and efficiently, that the signals are properly aimed, and that the battery charge remains sufficient.
18. The contractor or supplier shall submit a letter signed by the manufacturer certifying that the candidate PTS complies with each of the above requirements. The letter shall also convey detailed engineering information, drawings and descriptions which describe how each requirement is satisfied.

Each PTS determined to meet this specification will be shown on an approved list maintained by the Office of Traffic Engineering (OTE) and available on the Office of Materials Management website. The address for the Materials Management website is: http://www.dot.state.oh.us/Divisions/ConstructionMgt/Materials/Pages/default.aspx.

605-14 Temporary Traffic Barriers

605-14.1 General

Temporary traffic barriers are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and designed to protect workers, bicyclists and pedestrians (see OMUTCD Section 6F.85). More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO’s Roadside Design Guide (see Section 193-12).

Because the protective requirements of a temporary traffic control situation have priority in determining the need for temporary traffic barriers, their use shall be based on an engineering study.

At a minimum, positive protection devices shall be considered in work zone situations that place workers at increased risk from motorized traffic, and where positive protection devices offer the highest potential for increased safety for workers and road users, such as:

1. The work zone provides no means of escape for workers (e.g., tunnels and bridges).
2. Adjacent lanes, carrying traffic flowing in opposite directions on Interstates, freeways, and other high-speed (>45 miles per hour) multi-lane divided highways (see SCDs MT-95.70 and MT-95.71, and PISs 209572 and 209573).
3. Long-term work zones (e.g., two weeks or more).
4. Workers close to travel lanes open to traffic.
5. Drop-off areas (see MT-101.90).
6. Projects with high operating speeds and high traffic volumes.
7. Bridge decks where the parapet or guardrail is removed (see SCD PCB-91 and the Design Data Sheet PCBDD (Office of Structural Engineering website Standards page: http://www.dot.state.oh.us/Divisions/Operations/Structures/standard/Pages/default.aspx)).

Warning lights or steady-burn electric lamps may also be mounted on temporary traffic barrier installations. When serving the additional function of channelizing vehicular traffic, temporary traffic barriers should be a light color for increased visibility.

605-14.2 Length of Need

The method used to design the length of need and location of barrier for maintenance of traffic applications should be as discussed in L&D Manual Volume One, Sections 602.1.2 and 602.1.3 for determining barrier length.

Length of need typically does not include attenuators, thus work zone design must take this into account.
605-14.3 Movable Barrier

A movable barrier is a linear system of connected barrier segments that can rapidly be shifted laterally by using a specially designed transfer vehicle. The transfer is accomplished in a manner that does not interfere with vehicular traffic in adjacent lanes. Applications of movable barriers include the following:

1. Closing an additional lane during work periods while maintaining the advantage of having the travel way separated from the work space by a barrier.

2. Closing an additional lane during off-peak periods to provide extra space for work activities without adversely impacting vehicular traffic flow; and

3. Creating a temporary reversible lane, thus providing unbalanced capacity favoring the major direction of vehicular traffic flow.

For more information on this device see OMUTCD Section 6F.85 and Figure 6H-45, and Section 606-18.

605-14.4 Temporary Guardrail

All guardrail used as a temporary barrier in maintenance of traffic applications shall conform to the same standards required for permanent guardrail in L&D Manual Volume One, Section 603.1.1.

Guardrail should be as detailed in the current Roadway Standard Construction Drawings. Any variation from these standards shall be submitted for approval by the Office of Roadway Engineering at the design stage, on a case-by-case basis.

Delineation of guardrail shall be by use of barrier reflectors (Section 605-19) mounted at 50-foot spacing.

605-14.5 Portable Barrier (PB)

Portable Barrier (PB) includes both portable concrete barrier (PCB) and portable steel barrier. (It does not include portable water-filled barrier.)

605-14.5.1 Barrier Reflectors, Object Markers and Glare Screens

Delineation of PB shall be provided by use of barrier reflectors and object markers. Barrier reflectors shall be mounted on all PB used for traffic control. Barrier object markers shall be mounted on top of all PB used for traffic control which does not have glare screen. Where glare screen is provided, the glare screen shall be equipped with vertical stripes on paddles. Additionally, object markers shall be provided on top of all permanent concrete barrier located within 5 feet of the edge of the adjacent travel lane.

Maximum spacing for barrier reflectors and object markers shall be 50 feet as shown in SCD MT-101.70. Where both barrier reflectors and object markers are provided on the same device, these items shall be staggered. See Section 605-19 for further information on barrier reflectors and object markers and Section 641-19 for more information about SCD MT-101.70.

Glare screen should be considered for use on PB in accordance with L&D Manual Volume One, Section 604.1. See Section 605-18 for additional information.

605-14.5.2 End Treatment

The exposed end of the PB should be located at a distance from the edge of the traveled
way equal to the clear zone distance for the facility as discussed in L&D Manual Volume
One, Section 600.2. When this is not practical, impact attenuators shall be provided on
the exposed ends of PB located within the clear zone.

Exposed ends of PB located outside the clear zone shall be tapered. If two PB runs
overlap, with the first PB protecting the road user from the leading end of the second,
that leading end does not need to be tapered.

For acceptable flare rates for PB, see L&D Manual Volume One, Figure 602-1 and the
SCDs.

See Section 620-2 for information on the NCHRP 350 requirements.

605-14.5.3 Anchoring PB

Anchoring of PB may be considered to prevent excessive deflections of the barrier. For
example, where a deflection by one vehicle could relocate the PB into the path of
opposing traffic, or on bridge decks where a deflection could cause the PB to fall from the
deck. Anchoring of PB located on bridges is required as shown in SCD PCB-91.
Anchoring drawings of portable steel barrier are shown in the approved products list
maintained by Roadway Standards.

605-14.5.4 PB Connections

The hinged connection and J-J Hook connection for PCB currently meet NCHRP Report
350 Test Level 3 (TL-3) crash test criteria. For additional information, see SCD RM 4.1
and RM 4.2. The pin connection used by portable steel barrier also meets NCHRP
Report 350 TL-3 crash test criteria. Refer to the shop drawings for portable steel barrier
on the approved products list maintained by Roadway Standards.

605-14.5.5 Grading of Cross Slopes

Where PB is located beyond the edge of the paved shoulder, the cross slope within the
clear zone, including the surface on which the PB is placed, shall be graded at 10:1 or
flatter. If the cross slope is steeper than 10:1, the PB shall be terminated on the paved or
graded surface rather than on the cross slope. The PB shall be extended along the paved
or graded surface as necessary to satisfy the length of need (L&D Manual Volume One,
Section 602.1.2), and then terminated using an impact attenuator.

605-14.6 Plastic Water-Filled Barrier (Used as a Longitudinal Barrier)

A longitudinal barrier provides positive separation and redirective capability in work zones;
however, it deflects laterally upon impact. A plastic water-filled barrier (PWFB) deflects
significantly more than PB; therefore, it cannot be used as a direct substitute for PB.

For certain types of situations the designer may specify PWFB. For example, PWFBs may
have advantages over PB in the following situations:

1. Intermediate-term work zones.
2. Emergency management situations.
3. Moving operations, particularly on low-speed urban roadways.
4. Locations with limited vertical clearance, due to equipment needed to place.
5. Locations requiring restricted dead loads, i.e., bridge decks.
When specifying a PWFB, the designer must consider the following factors:

1. There is assurance adequate clearance exists behind the barrier to accommodate the expected deflections.

2. The PWFB must meet the appropriate NCHRP Report 350 Test Level and have an FHWA acceptance letter for that test level. For example, the Rhino Barrier does not meet TL-3, but it does meet TL-2. A complete listing of accepted devices is found on the FHWA web site at: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road硬件/barriers/.

3. Each of the currently approved products have met crash testing criteria by testing their products with a number of interconnected units to achieve the necessary tension needed. Therefore, before a product can be specified, the designer must ensure this minimum length is provided in the plans, even if it greater than the length of need as calculated in Section 605-14.2.

4. The PWFB shall be flared outside the clear zone unless terminated with a crashworthy end treatment.

The designer is encouraged to accommodate all of the products in a generic design. However, if the site has limitations, and only one or two PWFB will work on a project due to the limitations of the other products, the designer is obligated to specify only the appropriate PWFB. Unless the designer specified a particular PWFB, a contractor is free to choose any of the FHWA accepted NCHRP Report 350 PWFB.

The contractor shall install the selected product as per the manufacturer’s recommendations and in accordance with the factors stated above. All Test Level 3 products were crash tested by utilizing some sort of a steel cage, or connectors, so it is imperative the contractor install these "upgrade kits" to match the crash tested design.

605-14.7 Plastic Water-Filled Barrier (Used as a Barricade)

In locations where the water-filled barrier is used primarily as a channelizing device, the length of the barrier is determined in a manner similar to that for drums. They may also provide a higher level of channelization at certain locations where drums would normally be used, such as at exit ramps.

605-15 Crash Cushions

605-15.1 General

As noted in OMQTCD Section 6F.86, crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two types of crash cushions that are used in temporary traffic control zones are stationary crash cushions and truck-mounted attenuators. Crash cushions in temporary traffic control zones help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles and other obstacles. Specific information on the use of crash cushions can be found in AASHTO's Roadside Design Guide (see Section 193-12).

Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced.
605-15.2 Stationary Crash Cushions

Stationary crash cushions are used in temporary traffic control zones in the same manner as permanent highway installations to protect drivers from the exposed ends of barriers, fixed objects and other obstacles. Stationary crash cushions shall be designed for the specific application intended.

See Sections 642-30 and 642-31 for related Plan Notes and additional information.

Sand barrel arrays may be used in work zones to provide temporary protection for wide hazards. For ease of moving, they may be mounted on pallets or skids that are 4 inches or less in height. See L&D Manual Volume One, Section 603.4.4 for additional information.

605-15.3 Truck-Mounted Attenuators

Truck-mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks and they should be used in accordance with the manufacturer’s specifications. If used, they shall be located in advance of the work area, workers or equipment to reduce the severity of rear-end crashes from errant vehicles.

Chapter 9 of AASHTO’s Roadside Design Guide (see Section 193-12) and Section 602-8 contain additional information regarding the use of shadow vehicles.

For more detail see L&D Manual Volume One, Section 603.2.

605-16 Vehicle-Arresting Systems

Vehicle-arresting systems are addressed in OMUTCD Section 6F.83.

605-17 Rumble Strips

Rumble strips (see OMUTCD Section 6F.87 and TEM Section 1415) consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that alert drivers to unusual vehicular traffic conditions. Through noise and vibration they attract the drivers attention to such features as unexpected changes in alignment and to conditions requiring a stop.

The first rumble strip pad should be placed before the advance warning devices. The last pad should be placed a minimum of 250 feet in advance of the traffic condition.

A RUMBLE STRIPS sign (W8-H16) warning drivers of the onset of rumble strips may be placed in advance of any rumble strip installation.

Although the intent of the rumble strips is to alert the road user, the noise may also attract the attention of non-road users on adjacent property. This would be unacceptable in residential areas.

605-18 Screens

 Screens (see OMUTCD Section 6F.88) are used to block the road users’ view of activities that can be distracting. Screens might improve safety and vehicular traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming vehicular traffic. They can also help contain the work area and reduce the accumulation of dust and debris on the pavement.

On ODOT-maintained highways a glare screen shall be used at all crossover locations unless a 50-inch portable barrier (PB) is provided.
The upper portion of the 50-inch portable barrier (PB) serves as a glare screen (see SCD RM-4.1 for details).

Paddle, or intermittent, type glare screens may be mounted on the top of 32-inch PB.

See Section 642-21 (Plan Note 642-21), L&D Manual Volume One, Section 604 and SCD MT-95.70 or MT-95.71 for additional guidance.

The choice of 32-inch PB, with screen, or 50-inch is often left to the contractor.

Glare screen can be a maintenance problem. If PB will be in place over the winter during plowing operations, or if the PB is otherwise expected to be hit a lot, the 50-inch PB should be specified. Plowing over the top of a 50-inch PB is possible; however, it is not preferred.

605-19 Barrier Reflectors and Object Markers

Barrier reflectors shall be mounted on all portable barrier on ODOT-maintained highways, and barrier object markers shall be mounted on top of all portable barrier which does not have glare screen.

Barrier reflectors and object markers shall also be mounted on top of all permanent concrete barrier and guardrail located within 5 feet of the edge of the adjacent travel lane (see Plan Notes 642-51 and 642-52 in Chapter 642).

The minimum reflective surface area for the reflector portion of a barrier reflector should be 7 square inches.

The reflectors shall be mounted on the face of the barrier with the top of the reflector approximately 26 inches above the base and at a maximum spacing of 50 feet.

Attachment of the reflector shall be by a suitable corrosion resistant fastener, bracket or adhesive. Barrier reflectors shall be the same color as the adjacent edge line. When adjacent to a reversible traffic direction lane, barrier reflectors shall be white on one side and yellow on the other side, such that regardless of the direction of travel of the road user, the yellow barrier reflectors will be visible to road user’s left and white barrier reflectors will be visible to the road user’s right side.

Barrier object markers shall be 6 inches wide and at least 12 inches high. They shall have orange (fluorescent red-orange or fluorescent yellow-orange) retroreflective sheeting. If used with two-way traffic, two-way barrier object markers shall be used.

Spacing for barrier object markers shall be at 50-foot maximum centers midway between the face-mounted reflectors. When adjacent to a reversible traffic direction lane or between opposing traffic flows, they shall be mounted in pairs facing traffic from each direction.

605-20 Increased Barrier Delineation

605-20.1 General

On freeway and expressway projects, increased barrier delineation shall be installed on all portable barrier and concrete permanent barrier located within 5 feet of the edge of the traveled lane under either of the following conditions: along tapers and transition areas; and along curves (outside only) with degree of curvature greater than or equal to 3 degrees.

605-20.2 Linear Delineation Panels

Linear delineation panels shall consist of panels of delineation, approximately 34 inches long and 6 inches wide and shall be “crimped.” Panels shall be provided at the rate of one per
section of portable barrier, or one panel every 10 feet on permanent portable barrier, spaced evenly along the length of the run. The panels shall be mounted such that the tops of the panels are 26 inches above the pavement. See Plan Note 642-50 in Chapter 642 for further details.

605-20.3 Triple Stacking of Barrier Reflectors

Triple stacking of barrier reflectors shall consist of attaching three barrier reflectors, aligned vertically, at locations where a single barrier reflector would be otherwise attached. There shall be no open space between the adjacent barrier reflectors. The top of the middle barrier reflector shall be located 26 inches above the pavement. See Plan Note 642-50 in Chapter 642 for further details.

605-21 Future and Experimental Devices

The States, FHWA, AASHTO, the Transportation Research Board (TRB), and other organizations conduct research and experimentation on new traffic control and safety devices.

The TEM may be used to distribute information on experimental devices that have been approved for use, and on new devices that have yet to be incorporated into the OMUTCD.
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606 TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES

606-1 General

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

Previous Chapters in this Part of the TEM have reviewed general policies, standards and guidelines regarding temporary traffic control zones and the related devices. Tables 697-1a through 697-1f provide a review of various options available in choosing the appropriate temporary traffic control activities. Chapter 606 provides a general discussion about various types of temporary traffic control activities. Chapter 607 and OMUTCD Chapter 6H provide more detailed guidelines about specific typical applications of temporary traffic control. Chapters 640, 641, 642 and 643 include additional information intended to aid in preparing Temporary Traffic Control (Maintenance of Traffic or MOT) Plans.

The discussion in this Chapter regarding types of temporary traffic control activities has been organized into the same general categories used in OMUTCD Chapter 6G:

1. Work Duration.
2. Location of the Work.
4. Work Outside of the Shoulder.
5. Work on the Shoulder with No Encroachment.
7. Work Within the Median.
8. Work Within the Traveled Way of Two-Lane Highways.
10. Work Within the Traveled way of Multi-lane, Nonaccess Controlled Highways.
11. Work Within the Traveled Way at an Intersection.
12. Work Within the Traveled Way of Expressways and Freeways.
13. Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway.
15. Interchanges.
17. Work Affecting Pedestrian and Bicycle Facilities.
18. Temporary Traffic Control During Nighttime Hours.

606-2 Typical Applications

The typical applications of temporary traffic control zones addressed in the OMUTCD and this Chapter are organized according to duration, location, type of work and highway type. OMUTCD Table 6H-1 and the Figures Index for Chapter 69 provide listings of the typical applications shown in these manuals. These typical applications address the use of various temporary traffic control methods, but do not include a layout for every conceivable work situation.

Typical applications for which Traffic SCDs have been prepared are discussed in Chapter 641.

The typical applications should be modified, as necessary, to fit the conditions of a particular temporary traffic control zone. 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.

Decisions regarding the selection of the most appropriate typical application to use as a guide for a specific temporary traffic control zone require an understanding of each situation. Although there are many ways that work zone applications could be categorized, four factors are used to generally characterize the typical applications addressed in Chapter 607 and OMUTCD Chapter 6H. Those four factors are: work duration, work location, work type and highway type.

606-3 Work Duration

As noted in OMUTCD 6G.02, work duration is a major factor in determining the number and types of devices used in temporary traffic control zones. The duration of a temporary traffic control zone is defined relative to the length of time a work operation occupies a spot location.

OMUTCD 6G.02 establishes the following five categories of work duration and discusses each one:

1. Long-term stationary is work that occupies a location more than three days.
2. Intermediate-term stationary is work that occupies a location more than one daylight period up to three days, or nighttime work lasting more than one hour.
3. Short-term stationary is daytime work that occupies a location for more than one hour within a single daytime period.
4. Short duration is work that occupies a location up to one hour.
5. Mobile is work that moves intermittently or continuously.

606-4 Location of Work

As noted in OMUTCD 6G.03, the choice of temporary traffic control needed for a temporary traffic control zone depends upon where the work is located. As a general rule, the closer the work is to road users, the greater the number of temporary traffic control devices that are needed. Procedures are described in OMUTCD Chapter 6G and herein for establishing temporary traffic control zones in the following locations:

1. Outside the shoulder;
2. On the shoulder with no encroachment;
3. On the shoulder with minor encroachment;
4. Within the median; and
5. Within the traveled way.

606-5 Modifications To Fulfill Special Needs

The typical applications in O MUTCD Chapter 6H and herein illustrate commonly encountered situations in which temporary traffic control devices are employed. Supplemental information provided in this Part of the TEM should also be consulted to insure compliance with ODOT standards. Other devices may be added to supplement the devices indicated in these figures. 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.

When conditions are more complex, typical applications should be modified by incorporating appropriate devices and practices from the list provided in O MUTCD Section 6G.04.

Temporary traffic barriers serving as temporary traffic control devices shall conform to requirements for such devices as set forth throughout Part 6 of the O MUTCD and TEM.

606-6 Work Outside of Shoulder

When work is being performed off the roadway (beyond the shoulders, but within the right-of-way), little or no temporary traffic control may be needed. See O MUTCD Section 6G.06 and Figure 6H-1 for information on this situation.

In these situations, a single Warning Sign, such as SHOULDER WORK AHEAD (W21-H5), 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 symbol.

If work vehicles are on the shoulder, a SHOULDER WORK AHEAD sign may be used. For mowing operations, the MOWING AHEAD sign (W21-8) may be used. Where the activity is spread out over a distance of more than 2 miles, the SHOULDER WORK AHEAD sign may be repeated every 1 mile. A supplementary plaque with the message NEXT X MILES plate (W7-3a) may be used.

Caution is advised. The type of work being performed must be considered. If a drop-off is created within the clear zone, additional traffic control may be needed (see Section 640-6).

606-7 Work on the Shoulder with No Encroachment

Generally, when a highway shoulder is occupied or closed a SHOULDER WORK AHEAD sign (W21-H5) or the RIGHT (LEFT) SHOULDER CLOSED sign (W21-5a) is used. See O MUTCD Section 6G.07 and Figures 6H-3, 6H-4 and 6H-5.

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. Where the condition extends over a distance in excess of 1 mile, the sign should be repeated at 1-mile intervals.

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

606-8 Work on the Shoulder with Minor Encroachment

O MUTCD Section 6G.08 and Figure 6H-6 address situations where work on the shoulder encroaches slightly into the traveled way.
600 TEMPORARY TRAFFIC CONTROL

606-9 Work Within the Median

As noted in OMUTCD Section 6G.09, if work in the median of a divided highway is within 15 feet of 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.

606-10 Work Within the Traveled Way of Two-Lane Highways

Techniques for controlling vehicular traffic under one-lane, two-way conditions are described in OMUTCD Section 6G.10 and Section 602-7. For the ODOT-maintained system, the techniques used most often are:

1. Flaggers (see OMUTCD Figure 6H-10 and SCDs MT-97.10, 97.11 and 97.12);
2. Temporary traffic control signal (see OMUTCD Figure 6H-12, Section 607-13, SCDs MT-96.11, 96.20 and 96.26).

However, in low-volume situations STOP/YIELD sign control (see OMUTCD Figure 6H-11 and Section 607-12) may be considered.

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 OMUTCD Figures 6H-7, 6H-8 and 6H-9.

606-11 Work Within the Traveled Way of Urban Streets

In urban temporary traffic control zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns should be prohibited at intersections, and how to maintain access to business, industrial and residential areas. See OMUTCD 6G.11.

If the temporary traffic control zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. Chapter 603, and OMUTCD Figures 6H-28 and 6H-29 contain additional information regarding controlling pedestrian movements near work zones.

If the temporary traffic control zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided. 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. Additional information on bikeways may be found in OMUTCD Part 9, Part 9 of this Manual, the Guide for the Development of Bicycle Facilities and from the Office of Local Projects.

606-12 Work Within the Traveled Way of Multi-lane, Nonaccess Controlled Highways

Work on multi-lane highways can be divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures and closures on five-lane roadways. These situations are addressed in OMUTCD Section 6G.12 and Figures 6H-30, 6H-31, 6H-32, 6H-33, 6H-34, 6H-35 and 6H-37. Related Traffic SCDs are discussed in Chapter 641.

When a roadway must be closed on a divided highway, a median crossover may be used (see Section 606-16).

606-13 Work Within the Traveled Way at an Intersection

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 temporary traffic control plan is obtained by combining features shown in two or more of the intersection and pedestrian typical applications. OMUTCD Section 6G.13 and Figures 6H-21 through 6H-27 address work within the traveled way at an intersection.

606-14 Work Within the Traveled Way of Expressways and Freeways

Temporary traffic control problems might occur under the special conditions encountered where vehicular traffic must be moved through or around temporary traffic control zones on high-speed, high-volume roadways. Although the general principles outlined in the OMUTCD and this Manual are applicable to all types of highways, high-speed, access-controlled highways need special attention in order to safely and efficiently accommodate vehicular traffic while also protecting workers. See OMUTCD Section 6G.14 and Figures 6H-33 and 6H-35 through 6H-37 for information on this type of work.

Traffic SCDs have also been developed to address lane closures on freeways and expressways. Lane closure procedures are discussed in Chapter 641.

Also see Policy 516-003 (P) Traffic Management in Work Zones - Interstate and Other Freeways (see Chapter 1599).

OMUTCD Table 6C-3 provides information on the length of the merging and shifting tapers. Taper rates for shifts are also addressed in Section 602-5.3.

606-15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

OMUTCD Section 6G.15 addresses work involving two-lane, two-way traffic on one roadway of a normally divided highway.

OMUTCD Figure 6H-39 addresses 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 OMUTCD Figures 6H-40 and 6H-41. Related Traffic SCDs are discussed in Chapter 641.

606-16 Crossovers

Crossover construction refers to the concept of maintaining two-way traffic operation on one side of a divided highway while the contractor performs work on the other side of the roadway. See OMUTCD 6G.16 and Figure 6H-39. As noted in Section 641-9.2, design of crossover roadways is also addressed in Section 640-12 and Figures 698-6 through 698-9. There is also additional information on this work in Sections 607-12 and 607-13, SCD MT-95.70, 95.71 and 99.30, and PISs 209572 and 209573.

One disadvantage of crossover construction is that in order to provide entrance and exit ramp access in the direction of travel of the shifted traffic, temporary pavement will be necessary at each interchange. Crossover construction is most beneficial on projects where ramp access is not mandatory. For further information on the advantages and disadvantages of crossover construction, see the compendium of options presented in Tables 697-1a through 697-1f.

606-17 Interchanges

Work in the area of interchanges on limited-access highways is addressed in OMUTCD 6G.17 and Figures 6H-40 through 6H-44. Additional information is also provided in Sections 607-13 through 607-15, Figures 698-4 and 698-5, and the SCD MT-98 series.

606-18 Movable Barriers

OMUTCD Section 6F.85 and Figure 6H-45 address a temporary reversible lane using movable barriers.

606-19  Work in the Vicinity of Highway-Rail Grade Crossings

OMUTCD Section 6G.18 addresses work in the vicinity of highway-rail grade crossings.

606-20  Control of Traffic Through Incident Areas

OMUTCD Chapter 6I and Chapter 608 address control of traffic through incident areas.

606-21  Work Affecting Pedestrian and Bicycle Facilities

OMUTCD Section 6G.05 addresses work affecting pedestrian and bicycle facilities. OMUTCD Chapter 6D and Sections 6F.74 and Chapter 603 provide additional information regarding steps to follow when pedestrian and bicycle facilities are affected by the worksite.

606-22  Temporary Traffic Control Through Nighttime Hours

OMUTCD Section 6G.19 provides additional information regarding temporary traffic control through nighttime hours.
607 TYPICAL APPLICATIONS

607-1 General

Chapter 606 presented a general discussion of typical temporary traffic control activities. Chapter 607 provides more detailed information about typical applications for a variety of situations commonly encountered.

Temporary traffic control applications are presented in OMUTCD Chapter 6H, in this TEM Chapter (and the related figures in Chapter 698), and in the SCD MT series. Applications shown in the OMUTCD present minimum standards permitted within Ohio. Traffic control applications presented in the SCDs are intended for use on ODOT administered projects, and are more restrictive than the applications presented in the OMUTCD. As noted in Section 600-3, applicable SCDs are also recommended for use in ODOT force-account work as much as practical. Additional guidance in proper application of temporary traffic control devices is presented in CMS 614.

In addition to information in the OMUTCD, figures and tables found in this Part of the TEM provide information for the development of temporary traffic control plans. OMUTCD Table 6C-3 is used for the determination of taper lengths, and OMUTCD Table 6C-1 can be used for Warning Sign spacing for various areas and roadway types.

While not every situation is addressed, the information illustrated in the OMUTCD, this Manual and the SCDs can generally be adapted to a broad range of conditions. In many instances, an appropriate temporary traffic control plan is achieved by combining features from various typical applications. 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 typical applications, while a third typical application 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, road user volumes, road vehicle mix (buses, trucks and cars) and road user speeds. Examples presented in the OMUTCD are guides showing how to apply principles and standards. Applying these guidelines to actual situations and adjusting to field conditions requires judgment. In general, the procedures illustrated represent minimum solutions for the situations depicted.

Other devices may be added to supplement the devices shown in the various applications presented in these documents. Device spacing may be adjusted to provide additional reaction time or delineation. Fewer devices may be used based on field conditions.

The legend for the symbols used in typical applications presented in the OMUTCD and this Manual is provided in OMUTCD Table 6H-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in OMUTCD Table 6C-1. Most of the typical applications show temporary traffic control devices for only one direction.

The following are general comments regarding the use of OMUTCD typical applications for ODOT work:

1. References to “activated rotating, flashing, oscillating or strobe lights” shall be interpreted as “activated yellow rotating, flashing, oscillating, or strobe lights.”

2. The Construction Arrow sign (W1-H11) may be used instead of the arrow board for lane closures on low-volume, low-speed roads and urban streets. The Construction Arrow sign may be used to supplement the arrow board on high-volume roads.
3. Traffic control signing for lane closure on multi-lane highways may be supplemented by Changeable Message Signs.

4. In long-term situations, additional advance Warning Signs may be desirable.

5. Concrete barrier is one method that may be used to close a lane for a long-term project. Use of a barrier should be based on the need determined by an engineering analysis. The layout of the barrier should prevent vehicles from impacting the ends of the barrier. According to the Roadside Design Guide (RDG) (Section 193-12), the barrier should be flared beyond the clear zone. An alternative procedure is to place an impact attenuator to protect traffic from the end of the barrier (see Section 605-14).

6. Where ramps exist within the limits of the project, the EXIT OPEN, EXIT OPEN AHEAD, EXIT CLOSED, and EXIT CLOSED AHEAD signs shall be used, as shown in the SCD MT-98 series.

7. Where entrance ramps are located within the project limits and the mainline gaps are insufficient to provide proper merging, consideration should be given to closing the ramps.

607-2 **Blasting Zone (OMUTCD Figure 6H-2)**

On a divided highway, the signs should be mounted on both sides of the directional roadways.

607-3 **Road Closed with Off-Site Detour (OMUTCD Figure 6H-8)**

For unnumbered routes, the M4-9 DETOUR sign may be used instead of the M4-8 DETOUR sign.

607-4 **Lane Closures on Low-Volume, Two-Lane Road (OMUTCD Figure 6H-11)**

In long-term operations, a double-yellow No-Passing Zone should be added on the approach for the closed lane. The No-Passing Zone shall have a length of “A” as determined from OMUTCD Table 6C-1.

607-5 **Lane Closure on Two-Lane Road Using Traffic Signals (OMUTCD Figure 6H-12)**

For high-volume applications, consideration should be given to installation of the BE PREPARED TO STOP sign (W3-4) in advance of the Signal Ahead sign (W3-3).

607-6 **Temporary Road Closure (OMUTCD Figure 6H-13)**

When the temporary road closure occurs at night, Type A flashing lights should be used on advance Warning Signs and the flagger station shall be illuminated, except in an emergency.

607-7 **Detour for One Travel Direction (OMUTCD Figure 6H-19)**

A DETOUR sign with an advance arrow (M4-H9b) may be used in advance of a turn. On multi-lane streets, a DETOUR sign with an advance turn arrow should be used in advance of a turn.

607-8 **Right Lane Closure - Far Side of Intersection (OMUTCD Figure 6H-22)**

For long-term operations, pavement markings may be used to highlight the right-only movement.

607-9 **Mobile Operation on Multi-lane Road (OMUTCD Figure 6H-35)**

Shadow vehicle 2 in this figure may be equipped with a truck-mounted attenuator.
607-10 Lane Shift on Freeway (OMUTCD Figure 6H-36)

Additional signing should be provided as shown in SCDs MT-102.10, MT-102.20 and MT-102.30. This signing includes the TRUCKS USE LEFT (RIGHT) LANE sign (R-4-5, R-4-H5a) if the use of the shoulder is involved and it cannot adequately accommodate trucks. The Construction Arrow sign (W1-H11) should be used to supplement the drums used along the approaching shift taper.

SCD MT-99.30 addresses additional requirements for delineation along lane shifts of 4 feet or more.

607-11 Interior Lane Closure on Freeway (OMUTCD Figure 6H-38)

OMUTCD Figure 6H-38 cannot be used on ODOT freeways as shown. For work on projects which include ODOT funding or administering, an adjacent lane shall also be closed. This adjacent lane may serve to give the contractor additional work space for equipment and work vehicles transportation, or it may serve as a lateral buffer.

607-12 Median Crossover on Freeway (OMUTCD Figure 6H-39)

OMUTCD Figure 6H-39 shows signing for closure of the right lane in advance of the crossover. A left-lane closing may be used instead. For example, a left-lane closure is shown in SCD MT-95.70 (see Section 641-9).

Additional information regarding crossovers is referenced in Section 606-16.

607-13 Median Crossover for Entrance Ramp (OMUTCD Figure 6H-40)

OMUTCD Figure 6H-40 and Figure 698-4 address traffic control for a median crossover to maintain access for an entrance ramp. Additional information regarding crossovers is referenced in Section 606-16. The following additional guidelines should be used with this application:

1. This typical application should be used for accessing an entrance ramp across a closed directional roadway of a divided highway.

2. The crossover shall be designed for each specific location and incorporated into the construction plans. A temporary acceleration lane that provides adequate Decision Sight Distance (DSD) for merging traffic should be provided. If the required DSD cannot be provided, consideration should be given to closing the ramp. See Table 697-10 for the required DSD. Additional DSD information is available in Figure 201-6 of the L&D Manual Volume One.

   Should physical restrictions exist that preclude these minimums being provided, engineering judgment should be used to determine if a safe merging operation can be provided. Factors such as volumes, gap availability, sight distance, percent trucks, availability of alternate routes, and emergency access should be considered. It may be necessary to statutorily lower the main line speed to accommodate the merging traffic. Documentation should be kept on file supporting the decision to provide a merge with less than the DSD in Table 697-10. The use of the STOP (R1-1) or YIELD (R1-2) signs shown should only be considered when the required distances shown in Table 697-10 cannot be provided and it is impossible or impractical to close the entrance ramp.

3. A broken edge line (dotted line) may be carried across the temporary entrance ramp to assist in defining the through vehicular travel lane.

4. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs (W6-3) and the DO NOT ENTER signs (R5-1) may be eliminated.
607-14 Partial Exit Ramp Closure (OMUTCD Figure 6H-43)

An additional ROAD WORK AHEAD sign (W20-1) should be added if traffic backs up onto the mainline.

607-15 Work in Vicinity of Entrance Ramp (OMUTCD Figure 6H-44 and Figure 698-5)

OMUTCD Figure 6H-44 provides traffic control information for work in the vicinity of an entrance ramp. Figure 698-5 depicts an alternative design that has been developed to provide additional geometric information pertaining to the required Decision Sight Distance (DSD) for long-term work zones (see Table 697-10). The following additional guidelines should be used with these figures:

1. The left diagram in OMUTCD Figure 6H-44 can be used for both short and long-term work zones where it is acceptable to close the outside mainline lane.

2. The right diagram in OMUTCD Figure 6H-44 should only be used for short-term operations where engineering judgment indicates that a safe merging operation can be provided. Factors such as volumes, gap availability, sight distance, percent trucks, availability of alternate routes and emergency access should be considered when deciding to provide this method of traffic control or closing the entrance ramp. It may be necessary to legally lower the mainline speed to accommodate the merging traffic.

3. When used, the YIELD sign (R1-2) shown in the right diagram of OMUTCD Figure 6H-44, should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic in order to select a safe gap in the mainline vehicular traffic flow. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed. If insufficient gaps are available, consideration should be given to closing the ramp.

4. Where a mainline lane is closed, the closure should be sufficiently in advance to stabilize vehicular traffic flow before encountering the merge.

5. For OMUTCD Figure 6H-44 the mainline merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.

6. If the ramp curves sharply to the right, Warning Signs with Advisory Speed plaques located in advance of the terminal should be placed in pairs (one on each side of the ramp).

7. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the Yield Ahead sign (W3-2a) reading NO MERGE AREA (W23-H2).

8. Figure 698-5 should typically be used when designing long-term on-ramp merges with a mainline work zone. See Table 697-10 for the required Decision Sight Distance (DSD). Additional DSD information is available in Figure 201-6 of the L&D Manual Volume One.

Should physical restrictions exist that preclude these minimums being provided, engineering judgment should be used to determine if a safe merging operation can be provided. Factors such as volumes, gap availability, sight distance, percent trucks, availability of alternate routes, and emergency access should be considered. It may be necessary to legally lower the mainline speed to accommodate the merging traffic. Documentation should be kept on file supporting the decision to provide a merge with less than the DSD in Table 697-10. The use of STOP (R1-1) and YIELD (R1-2) signs shown in the OMUTCD should only be considered when the required distances shown in Table 697-10 cannot be provided and it is impossible or impractical to close the entrance ramp.
Section 606-17 and SCDs MT-98.10 and 98.11 provide additional traffic control information for this application.
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608 Incident Management

608-1 General

Traffic incidents are unpredictable, unique occurrences which restrict traffic flow. They are unplanned events such as emergencies and crashes, and each must be addressed individually. Effective incident management can help to increase safety at an incident scene, reduce costs associated with incidents and quickly restore traffic to its original flow.

OMUTCD Chapter 6I and Chapter 608 describe various incident management tools that can be effective in handling different types of incidents. Typically, each incident will require a unique approach and solution.

608-2 Ohio QuickClear Program

The Ohio QuickClear Program is an effort by ODOT, ODPS and various interested organizations to develop a checklist for incident responders and a best practice guide for incident management. The Program is “committed to maintaining the safe and effective flow of traffic during emergencies as to prevent further damage, injury or undue delay of the motoring public.” The idea behind QuickClear is to get traffic moving as safely and quickly as possible, through the timely removal of disabled vehicles from traffic lanes to the shoulder, or, if possible, to the nearest interchange to decrease severe congestion delay and secondary crashes caused by incidents.

QuickClear focuses on the ideas of multiple agency cooperation. Each first response agency has different goals and agendas. For law enforcement the focus is on preserving the scene for the collection of evidence to determine negligence, while the fire department is concerned with protecting the scene including the victims and personnel. Along with these agencies, ODOT and other transportation organizations direct their efforts on traffic management and incident clearance, while towing companies are responsible for the removal of vehicles from the incident scene. It is essential for all of these agencies to work together using QuickClear methods to ensure that everyone can complete their job as safely, quickly and efficiently as possible.

While most of the emphasis about QuickClear in Ohio has been on urban freeways, QuickClear practices can also provide benefits on rural highways as well. These methods can help reopen rural roads in a timely manner, avoiding or minimizing the use of extensive detours or road blocks.

More detailed information on the Ohio QuickClear Program and QuickClear practices can be found on the web using the QuickClear link from the ODOT homepage, or using the link provided in Table 197-3 (www.dot.state.oh.us/quickclear.aspx).

Information about the Ohio QuickClear Program is currently being presented to first responders, Emergency Management Agencies (EMA), local jurisdictions and other groups around the State. This effort is intended to improve awareness of the program and further relationships and dialogue among the various agencies. Presentations can be scheduled through the QuickClear website mentioned above. All first responders are encouraged to use QuickClear methods to provide safer and more efficient roadways.

For effective incident management, including QuickClear procedures, debriefing or after-action meetings should be held after incidents resulting in excessive closures. It is desirable for all agencies involved in the management of the incident to participate in the meeting. These meeting are intended to ensure that continued improvements are being made in regard to incident management techniques and that all parties involved in incident response are aware of new practices by other agencies.
608-3 Incident Logging

To help with overall incident management, it is important to log traffic incidents. These logs can be reviewed at a later date to help improve incident management techniques, or they can be used for secondary crash research purposes. Whatever the reason, all incidents that result in freeway closures should be logged. The route, mile marker, time of closure, time of opening, duration and cause of closure should always be documented in some way.

Eventually, all Freeway Management Systems (FMS) (see Chapter 1303) will have incident logging capabilities. The Ohio Transportation Information System (OTIS) (see Section 1501-3), also has incident logging capabilities which are currently available to all ODOT Districts. In the future, these two may be linked.

608-4 Permitted Lane Closure Schedules (PLCSs)

Permitted Lane Closure Schedules (PLCSs) for freeway and roadway segments should be evaluated for every incident. For more information on ODOT PLCSs see Section 630-4. A complete list of PLCSs is contained on the ODOT website at http://plcm.dot.state.oh.us (Table 197-3). Ideally, such schedules would be established for all highways to manage delays due to incidents and recurring congestion. Additional benefits of using PLCS requirements include reducing exposure of fire personnel, EMAs, law enforcement, and other responders to traffic hazards, and reducing the danger of secondary crashes to the public. Priority should be given to PLCS segments for all types of incidents, including crashes and diesel spills. It may not be possible to expedite the opening of PLCS segments for every incident (for example, some hazardous material (HazMat) incidents and unusual circumstances). However, all agencies should make every effort to follow the protocols and attempt to open lanes as soon as possible, particularly in order to not violate PLCS closure restrictions.

608-5 Reserved for Future Use

This space is reserved for future use.

608-6 Detour Playbook

The ODOT Detour Playbook, usually referred to simply as the Playbook, is a set of predetermined detour routes for PLCS segments across the State. Each detour is referred to as a Play. Originally, the detours were developed by each District individually. The detours for each District were compiled and stored in a variety of ways available in hard copies and/or electronically. These detours or “Plays” were consolidated by Central Office and integrated into the Playbook. Currently, the Playbook can only be accessed by ODOT personnel on the intranet using the link provided in Table 197-3. In the future, the Playbook may be made available to other non-ODOT agencies, but the process for this distribution is still being developed.

For incidents that result in excessive closures, it is suggested that a Play (detour) be enacted. This will help to reduce congestion around the incident scene and will help to protect first responders. It should be noted that only PLCS segments will have Plays available. If a non-PLCS is expected to be closed for an extended amount of time it is recommended that a detour also be established to assist with traffic, but this detour will need to be created and implemented at the incident scene. If an incident results in a Play being used, the various agencies in the area should review the effectiveness of the chosen Play during the debriefing, or after-action meeting. At the debriefing, improvements to the Play and overall incident response should be discussed. See Section 608-2 for more information on debriefings.

When the Districts draft new Plays or revise old ones, the affected local jurisdictions should be consulted to review the plan, provide comment, and exchange or update contact information. Each District should update their Plays prior to each construction season to reflect any necessary revisions that may be caused by construction or changes to the roadways.
608-7 **Hazardous Materials (HazMat)**

Currently, ODOT is developing procedures for HazMat spills. Although HazMat incidents constitute a small percentage of the incidents occurring on Ohio’s roadways, they are responsible for a large portion of the delay. Several endeavors are underway to address these incidents. At this time, ODOT is to contact a contractor or HazMat Team to perform the cleanup. However, a specific HazMat contract may be developed by the OTE to help facilitate this process in the future.

608-8 **Diesel Spills**

608-8.1 **General**

The cleanup of diesel spills is a reoccurring problem in Ohio. In the past, small scale spills (less than 300 gallons) have caused roadways to be closed for hours. Through task force discussions, it was estimated by the Ohio Environmental Protection Agency (OEPA) that approximately ninety percent of freeway closures are the result of spilled or leaked diesel fuel from commercial vehicles. After examining these incidents, it was determined that a new set of procedures needed to be established to help facilitate the timely cleanup of diesel spills.

Diesel spills have often resulted in travel lanes remaining closed to motorists for an extended period. These delays are most commonly attributed to the fact that the trucking company responsible for the cleanup cannot be contacted or cannot provide cleaning operations in a timely manner.

ODOT has established a uniform statewide procedure, overseen by the Division of Operations, to provide for removal of small diesel fuel spills from freeway travel lanes by ODOT staff. This procedure shall only apply to those areas covered under the PLCSs (see Sections 608-4 and 630-4) see Section 608-8.9 for guidelines on how to handle diesel spills on Non-PLCS roadways.

608-8.2 **For PLCS Segments**

608-8.2.1 **General**

The diesel spill cleanup activities are intended to expedite the opening of freeways and freeway lanes to traffic that are closed due to crashes, where:

1. Only a small quantity of diesel fuel has leaked or been spilled on the roadway surface, and

2. No other reasonable means is available to quickly and safely open the lanes.

These cleanup operations are in addition to performing ODOT’s usual traffic control activities, and will be performed under the supervisor’s direction. It is anticipated that the ODOT Highway Technician (HT) supervisor will be the County Manager and that the Freeway Service Patrol (FSP) operators’ supervisor will be the FSP Manager or the Highway Management Administrator (HMA). Supervisors and managers are required to direct staff to perform activities only within each person’s training capability, in cooperation with the first responders, and within the Incident Command System (ICS). See Section 608-9 for more information on ICS.

The following restrictions and criteria apply to ODOT diesel fuel spill cleanup activities, and are described in further detail later in this Section:

- Only personnel trained for diesel cleanup may participate in the handling of absorbent materials and diesel spill cleanup activities.
• The cleanup is limited to diesel fuel only.

• The cleanup is limited to 300 gallons of diesel fuel or less.

• This is a quick clean and is an expedient measure to quickly and safely open travel lanes to traffic.

• ODOT personnel will not use plugging material on tanks without additional required training.

• Follow the ICS. ODOT will cooperate with first responders and follow the ICS (see Section 608-9).

• Cooperate with first responders and OEPA at the County Manager’s direction.

• No contaminated material may be brought back to an ODOT facility.

608-8.2.2 Diesel Spill Training

Training is required for each ODOT Highway Technician assigned to a county with a PLCS segment of freeway. It is recommended that County Managers and other ODOT staff involved with incident management also attend the diesel spill training. The ODOT Office of Training, in cooperation with the Ohio Fire Academy will provide the diesel spill training, which will be presented in two parts. Part 1 consists of the HazMat and WMD (Weapons of Mass Destruction) Awareness training course provided by the Ohio Fire Academy. Part 2 consists of ODOT training, provided through the ODOT Office of Training. Part 2 will focus on ODOT-specific diesel spill cleanup initiatives and provides hands-on instruction.

Part 1 of the training is complete for all current HTs in counties with PLCS segments, and Part 2 will be implemented within the next several months. Additional training sessions will be provided as necessary for new hires. Questions concerning training and procedures may be referred to the Division of Operations.

It is recommended that County Managers, FSP Managers, and HMAs attend ICS training to help facilitate more effective diesel spill cleanups and incident management in general. HT staff will work under the supervision of their usual supervisors, all working within the ICS approach (Section 608-9).

608-8.2.3 Cleanup Procedures

ODOT’s diesel spill activities include evaluation of the material and quantity spilled or leaked, clearance from first responders and consideration of other options for spill removal. These activities are regulated to provide safety to ODOT staff and criteria for efficient cleanup.

Incident notification is to remain unchanged. Districts will receive notification of an incident in the usual manner. Activities related to diesel spills will be initiated based upon requests from first responders or ODOT incident management staff, when first responders confirm that no other hazardous materials are likely to present a danger to ODOT responders.

HT staff who encounter a leaking fuel tank are to follow the established safety procedures listed below, and will follow the instructions provided during the HazMat and WMD Awareness training course, including evaluating placarding, consulting the Emergency Response Guide (ERG) and exercising appropriate caution. HT staff will not approach a vehicle which appears to contain materials which may endanger them.
Freeway Service Patrol (FSP) operators or other staff may encounter hazardous materials incidents as part of their normal activities, or ODOT may receive a request for assistance from a responding agency. When ODOT receives notification of a fuel spill, the following factors shall be addressed:

1. Is the spill diesel fuel? If the truck is placarded for hazardous materials and first responders are not available or are not able to verify that the only leaking material is diesel, the HT staff will not approach the vehicle. HT staff shall not cleanup gasoline and other non-diesel fuel spills. However, HT staff may provide absorbent material and other supplies and equipment to first responders to use in the cleanup of non-diesel spills. Examples of absorbent material include clay (kitty litter), special purpose fuel absorbers (e.g. Floordry or Petesorb), or hydrophobic mat or roll material.

2. Is the spill reportable? A reportable spill is 25 gallons or more or any amount in a waterway. While the party responsible for the spill is required by law to report it to OEPA, ODOT should report a spill to OEPA even if other agencies indicate that it has been reported.

3. Is the spill quantity 300 gallons or less, which is defined as an incidental spill? As an aid in estimating the spill quantity, a typical full saddle tank contains 150 gallons. If both of a semi-tractor trailer’s saddle tanks were full and began leaking, the leak would not be more than 300 gallons. If the incident involved a tanker carrying diesel fuel cargo with a cargo tank leak, it should be assumed that the leak is more than 300 gallons. In that case, ODOT HT staff would not be allowed to participate in cleanup activities. However, once again, HT staff may provide absorbent material and other supplies and equipment to first responders to use in the cleanup of releases larger than 300 gallons.

If a truck’s saddle tank is leaking diesel fuel, in addition to using absorbent material, the HT staff may place a collection pool under the leak to contain it. However, HT staff may not use leak plugging products (referred to as Plug and Dike) without attending the applicable, more extensive training. For more information, contact the ODOT Office of Training. HT staff may provide leak plugging materials or other supplies and equipment to first responders who have been trained to use it in stopping the leak.

608-8.2.4 Removal and Disposal

After the diesel fuel spills have been contained and absorbed, the used absorption material shall be moved to the shoulder or berm, placed in a barrel or placed on and covered with visqueen sheeting, as appropriate. Weight shall be placed on the visqueen sheets to prevent wind or water from disturbing the material. After removing the diesel fuel and absorbent material, coarse sand shall be applied to the roadway surface to provide traction. Under no circumstances shall the used absorbent material or other material with diesel fuel to be brought to an ODOT facility. ODOT District personnel shall follow up to ensure that OEPA requires the responsible party to remove the absorbent material and other incident debris.

The ODOT diesel spill cleanup is a statewide initiative to provide a safe and quick option for opening freeway travel lanes to traffic when diesel is involved. This initiative is not intended to replace cleanup by the trucking company, its insurer or a cleanup service for the insurer. This procedure is intended for those situations in which the closure violates the PLCS or the County Manager determines that the closure is excessive due to lack of available cleanup services. The goal is to safely and efficiently restore traffic flows.

608-8.2.5 Documentation

As noted in Section 608-3, it is important to log traffic incidents. The ODOT HT or FSP staff who responds to a diesel spill incident shall document the incident. Some Districts
may choose to use existing documentation for this and some may create a special diesel spill response form. For recommendations, contact the Office of Traffic Engineering (OTE). The information collected shall be as complete as possible for each spill addressed by ODOT and shall be maintained in a District file. The information listed below should be documented for each spill.

- Time/date.
- Location (Roadway, County, milepost location).
- Estimated amount of diesel on roadway.
- Weather conditions.
- Responders on site (ODOT, OEPA, etc.).
- Name of trucking company.
- License plate number.
- Driver’s name.
- Fire/Police incident number.
- Time/Date on and off site.
- Information for cost recovery (material used) – type and amount.

Any reporting and documentation required by OEPA should also be followed. See the OEPA homepage or the web site listed in Table 197-3 for more information.

608-8.2.6 Additional Requirements

It is recommended that a copy of the Emergency Response Guide (ERG) be available to each spill responder. Districts may decide to keep the documents in State vehicles, to require each HT employee to carry them when on duty, or use other means of making them readily available. Training for use of the ERG is provided in the HazMat and WMD Awareness training course (Part 1) and copies are provided to HT staff at the Part 2 training. The ERG provides critical information for isolation zones and other criteria for use by anyone who encounters an incident involving a HazMat.

Each county with PLCSs is expected to have ready access to diesel spill equipment and supplies. Counties with PLCSs segments in which an Emergency Management Agency (EMA) routinely provides hazardous material cleanups may request a waiver from the ODOT Division of Operations Deputy Director, based on a District’s agreements with the local EMA that will exempt them from the storage of diesel spill cleanup material.

608-8.2.7 Program Evaluation

ODOT will use QARs to verify that personnel have current knowledge of policies and procedures, and to share best practices information.

608-8.3 For Non-PLCS Segments

On non-PLCS highway segments, the usual cleanup methods apply. These include response by the trucking company, its agent, the fire department or other responding agency. In some situations, the County Manager or District may decide that traffic volumes or other
circumstances warrant an ODOT response. The various limitations on ODOT response (maximum of 300 gallons of diesel fuel, diesel fuel only, etc.) noted in Section 608 shall also apply under these circumstances.

608-9 Incident Command System (ICS)/National Incident Management System (NIMS)

As noted in Subsection 608-8.2.1, all ODOT personnel working on an incident scene will be required to follow the Incident Command System (ICS). In the ICS there is an Incident Commander (IC) who functions as the leader for the incident response. Usually this role is held by the fire chief for large incidents, but other high ranking first responders may hold the position as well. Also, the position may change hands, from one IC to another, based on the stage of the incident clearance. For example, the fire chief may be in charge until all the victims have been removed from the scene. At this point, a police officer may take control to facilitate the vehicle removal process.

The ICS can also be classified under a unified approach. This means that there will be many leaders on the incident scene who will take charge of different tasks that need to be accomplished. All of these leaders will then report to one central IC who will help to facilitate the overall operation and who will not have to worry about the details of individual aspects of the incident response.

Incident management responders should also use the guidelines set forth by the National Incident Management System (NIMS). The address for the NIMS web site can be found in Table 197-3. Training for both the ICS and NIMS can be obtained through ODOT. Contact OTE for more information on these programs.

608-10 Freeway Service Patrol (FSP)

608-10.1 General

Freeway Service Patrols (FSPs) are another important component of incident management. Incidents have a negative impact on the efficient operation of freeways and FSPs help to minimize this impact. The mission of FSPs is to improve traffic safety and maintain traffic flow by efficiently clearing freeway travel lanes and shoulders of obstructions, and by assisting in traffic control around incidents. FSP services are currently being provided for the following metropolitan areas:

- Toledo District 2
- Akron District 4
- Columbus District 6
- Dayton District 7
- Cincinnati District 8
- Cleveland District 12

FSP operations are generally funded by Districts; however, one District has contracted out their FSP using outside funding. Also, some Districts have elected to provide limited FSP services in work zones in rural areas, particularly during holiday weekends and other peak travel times, to reduce the impacts of crashes and other incidents in areas with reduced capacity.

For any metropolitan area with a Traffic Management Center (TMC) (see Section 1303-1), which included Columbus and Cincinnati as of 2007, the FSP operators interact closely with TMC staff to exchange incident locations and pertinent information.

608-10.2 FSP Hours of Operation

The hours of operation for FSPs are anticipated to approximate the hours of peak traffic demand, since the FSP services provide the most benefit during this timeframe. Districts
may elect to provide FSP coverage beyond the hours of the local TMC and beyond the areas covered by a Freeway Management System (FMS.) However, in these cases, Districts shall provide a plan for the safety and direction of the FSP operators when they do not have radio communication or direct supervision from the District. There shall also be a redundant facility(ies) which will provide limited coordination and assistance to the FSP, during any FSP hours extending beyond TMC hours.

608-10.3 Duties of FSP

The FSP operators shall assist motorists, remove debris from travel lanes, assist with traffic control for major incidents, address small diesel spills (with the same restrictions as the HTs; see Section 608-8), and tag for future removal abandoned vehicles which are not blocking travel lanes. As noted in Subsection 608-10.4, the FSP operators shall at times also use the road grip tester while patrolling.

FSP operators also need to be alert to traffic as well as the subject vehicle, maintain cell phone or radio communication with the TMC, record license plates before approaching a vehicle, and use caution and safe operating procedures to ensure their own safety. Communication with law enforcement and other FSP operators is essential, particularly in areas without a TMC or during times without District radio communication.

FSP operators shall document their activities. This log information is entered into a database for future use. The logs of incidents, summarized in the database to provide the necessary performance reviews, shall contain at least the following information:

- Driver and vehicle.
- Incident location and type.
- Start time and end time of assistance provided.
- Type of assistance provided.

If a vehicle is blocking a travel lane, the FSP operator should assess the situation by pushing or pulling the vehicle from the travel lanes onto the off ramp, when practical, or the shoulder, and then call for law enforcement assistance, as needed. If a motorist refuses to allow the vehicle to be moved, the FSP operator should explain that they are causing a hazard not only to oncoming motorists, but to themselves as well. If the motorist still refuses, the FSP shall promptly contact law enforcement and wait for them to enforce the removal.

608-10.4 Reserved for Future Information

This space is reserved for future use.

608-10.5 Evaluation

Each District’s FSP program will be evaluated quarterly to review conformance to general ODOT policies as well as specific FSP guidelines. The quarterly review will include:

- Conformance to policies, in regard to routes and time per assist. Any assist exceeding 15 minutes duration (unless ODPS, the fire department or police are involved) shall be
documented to evaluate need and appropriateness of time spent.

- Conformance to general ODOT policy regarding employee conduct, safe vehicle operation, FSP operator safety, incident response procedures, correct data entry, etc.

- Review procedures for courteous and safe motorist assistance, distribution of customer response cards, etc.

The response data shall be recorded for evaluation and identification of areas exceeding requirements or needing improvement. The District TMC managers, FSP operators and OTE will work together to further develop minimum and desirable levels of service through the QAR process.

608-11 Buckeye Traffic Website

The Buckeye Traffic website (www.buckeyetraffic.org) offers snapshots of the video provided by CCTV cameras (see Section 1303-2), traffic, construction, weather and incident information. The link for this site is also available in Table 197-3. It is intended that this website will eventually display images from most, if not all, fixed and maneuverable CCTV cameras and webcams with Ohio traffic information.

Currently, the Buckeye Traffic website provides information for current lane closures to the public. Intercity travelers have the benefit of this information in their trip planning and decision making. Advance knowledge of road conditions and incidents may influence travelers to reroute, postpone or cancel a trip. If changes are not an option, the system lets drivers who do not alter their plans know to expect delays and they are able to plan accordingly. Historical information is only available to ODOT personnel at this time.

Districts are required to report all lane closures and enter them into the system. This includes both partial and full highway closures. Knowledge of these closures is critical for improvement. It also provides an essential ability to compare incidents to find similarities, and in turn enhancements, that need to be made to the incident management process. It is ODOT’s goal to keep the roads safe and open to the public, but sometimes, partially or completely closing the roadway is necessary. In these cases, the extent and duration of the closure should be minimized. Events such as this may be identified using Buckeye Traffic.

608-12 Ohio Transportation Information System (OTIS)

The Ohio Transportation Information System (OTIS) provided information on the web about construction, weather and incidents on Ohio highways. In 2008, the information in this system was incorporated into the Buckeye Traffic website.

608-13 Evacuation Plans

Currently, ODOT is developing evacuation route plans for the metropolitan cities in Ohio. It is anticipated that many of the plans will include contraflow operations on freeways in the evacuation areas. These route plans will be combined with procedures from other first response agencies in the future to help build an actual evacuation plan. Emergency plans will be coordinated with local jurisdictions and will be updated as new information becomes available.
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620 MATERIALS AND HARDWARE

620-1 General

Many features along a roadway and particularly within work zones present a hazard to the traveling public. These may be fixed objects, drop-offs, severe slopes, opposing traffic, construction materials and equipment, etc. In these instances, a positive means of separating traffic from these hazards must be employed.

Portable barrier, portable water-filled barrier, and guardrail are appropriate positive barriers for maintenance of traffic applications. However, the use of these positive barriers must be carefully considered on non-freeway / expressway routes due to property access concerns.

620-2 Safety Criteria

620-2.1 National Cooperative Highway Research Program (NCHRP) 350 Criteria

Work zone safety features, including barriers and impact attenuators, installed on the National Highway System (NHS) must demonstrate satisfactory crashworthy performance based on the National Cooperative Highway Research Program (NCHRP) 350 Report, Recommended Procedures for Safety Performance Evaluation of Highway Features, to be accepted by FHWA. The dates for mandatory compliance vary with different types of equipment. Section 620-7 provides a detailed discussion of NCHRP 350 compliance.

ODOT has determined that the NCHRP 350 criteria shall apply to any ODOT-maintained highway regardless of whether or not the highway is on the NHS. The NCHRP safety criteria can be found on the FHWA website under the Programs handled by the Safety Section, see Table 197-3.

620-2.2 Other Safety Criteria

In addition to the NCHRP 350 criteria, any work on ODOT-maintained highway shall meet the requirements of the OMUTCD and TEM.

Materials and equipment used on projects in the State of Ohio which are neither on the NHS nor on the state highway system must meet the criteria of the OMUTCD.

620-3 Sheeting

Faces of construction signs shall be retroreflectorized with Type G or Type H sheeting complying with CMS 730.19 and 730.192. Except for Warning Signs used in incident management areas, the background color of all construction Warning and Guide Signs shall be fluorescent orange as per CMS 614.03. For information regarding sheeting on other signs, see Section 220.

For Warning Signs in incident management areas, the background color may be fluorescent pink.

Guidelines for sheeting quality are provided in ODOT’s Quality Guidelines for Temporary Traffic Control Devices (Section 695-4). This document may be viewed on-line at: www.dot.state.oh.us/Divisions/Operations/Traffic/publications2/qualityguidelines/Pages/default.aspx.

620-4 Temporary Sign Supports

Temporary sign supports shall meet NCHRP 350 guidelines (Sections 620-2 and 620-7) as well as the requirements of SCD MT-105.10.
620-5 Roll-Up Signs

Roll-up signs shall conform to ASTM D 4956 Type VI, and shall be retroreflective fluorescent orange or pink, as appropriate. The wind resistant sign supports shall meet the crash testing requirements in the NCHRP Report 350, and be approved for use by FHWA.

620-6 Pavement Markings

620-6.1 General

Work zone pavement markings shall conform to CMS 614.11. Additional information on pavement markings in temporary traffic control zones is provided in OMUTCD Section 6F.77 and Sections 605-11.10 and 605-11.11.

620-6.2 Materials

Either CMS 642 (temporary paint) or CMS 740.06 (temporary tape) may be used on any surface which will either be removed or covered by another surface in a subsequent maintenance of traffic phase. Temporary pavement marking which would conflict with final traffic lanes shall be removable CMS 740.06 (Type I tape).

620-6.3 Dimensions

The line dimensions shall be as specified in CMS 614.11. Line dimensions wider than those specified may be used in cases where increased delineation is necessary.

620-7 NCHRP 350 Compliance

620-7.1 History of NCHRP Report 350

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) required the Secretary of Transportation to institute measures to enhance the crashworthy performance of roadside features to accommodate vans, mini-vans, pick-up trucks and 4-wheel drive vehicles. In recognition of this requirement, the 1993 National Cooperative Highway Research Program (NCHRP) Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features,” contained guidance for testing highway features with vehicles to access the safety performance of those features. The Federal rule making of 1993 adopted this report as the safety criteria to be used in the evaluation of all new installations of applicable highway features included in projects advertised for bids or installed by State forces or under force account work as the national standard on the National Highway System (NHS). The resulting nominal deadline for full compliance with the recommended guidelines in the NCHRP 350 Report was set at August 16, 1998. The safety criteria established by NCHRP 350 will be implemented on all roadways maintained by ODOT. The local public authorities at their own discretion can adopt NCHRP 350 as the safety standard on their roadways. However, all roadways maintained by local public authorities that are on the NHS must comply with NCHRP 350 requirements.

620-7.2 Categories

The following is a list of the categories, and examples of devices in each category:

1. Category 1 includes those items that are small and lightweight, such as channelizing and delineating devices. Included are items that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or from years of demonstrable, safe performance. These include cones, tubular posts, flexible delineator posts, and plastic drums with or without lights.

2. Category 2 includes devices that are not expected to produce significant vehicular
velocity change but may otherwise be hazardous. Examples of items in this category are barricades, portable sign supports, intrusion alarms, and the following devices with lights mounted on them: vertical panels and cones.

3. **Category 3** includes hardware that is expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. Examples are concrete protection barriers, fixed sign supports (mass > 100 lbs.), crash cushions, and other work zone devices not meeting the definitions of Category 1 or 2.

4. **Category 4** includes portable or trailer-mounted devices such as flashing arrow boards, temporary traffic signals, area lighting supports, and portable changeable message signs.

620-7.3 Responsibilities

620-7.3.1 Office of Roadway Engineering (ORE)

**NCHRP 350** issues relating to roadside barriers, end treatments and impact attenuators come under the responsibility of the Office of Roadway Engineering (on-line at: http://www.dot.state.oh.us/Divisions/ProdMgt/Roadway/Pages/default.aspx).

620-7.3.2 Office of Structural Engineering (OSE)

Permanent bridge railing and bridge mounted portable barriers are the responsibility of the Office of Structural Engineering. The implementations of these items have been addressed in their Bridge Design Manual in Sections 304.1, General and 304.3.5, Portable Concrete Barrier – Standard Bridge Drawings PBC-91 (on-line at: http://www.dot.state.oh.us/Divisions/Operations/Structures/standard/Pages/default.aspx).

620-7.3.3 Office of Construction Administration (OCA)

The provisions of **NCHRP 350** also apply to safety hardware and temporary traffic control devices used on construction projects. This information has been incorporated into the Construction and Materials Specification book in section 614 Maintaining Traffic (on-line at: http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specifications/2008CMS/2008Specbook.aspx).

620-7.3.4 Office of Traffic Engineering (OTE)

All work zone traffic control devices listed in Categories 1, 2, 3 and 4 that are not listed as an area of responsibility for the Offices of Roadway Engineering, Structural Engineering and Construction Administration are the responsibility of the Office of Traffic Engineering.

620-7.3.5 Districts

All work zone devices purchased for use by maintenance crews after the implementation dates shall be **NCHRP 350** compliant. The District should require all suppliers to provide a copy of the acceptance letter for all Category 1, 2, and 3 devices before any purchase is finalized if not on the Office of Materials Management’s website of approved devices.

A listing of **NCHRP 350** compliant devices may be found at the following website: http://www.dot.state.oh.us/Divisions/ConstructionMgt/Materials/Pages/TRAFFIC-CONTROL-DEVICES-IN-Work-Zone.aspx.
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630-1 General

The information in this Chapter is provided to assist planners and designers in the planning phase of a project or work assignment. For example, Section 1400 of the L&D Manual Volume Three indicates that a Maintenance of Traffic Alternative Analysis (MOTAA) will be performed and that is addressed in Section 630-5. Various tools that are available are also addressed herein and this information is intended to help in making the choice of which tool to use and how.

630-2 Compendium of Traffic Control Options

Tables 697-1a through 697-1f provide a summary of various traffic control strategies/options used to maintain traffic through work zones or to direct traffic around work zones, along with advantages and disadvantages of these strategies. These options should be reviewed in the initial stages of any project.

630-3 Detours

Because temporary traffic control is an essential part of the overall project design and can often affect the design of the facility itself, the decision to either maintain traffic on the existing facility or to utilize a detour must be made early in the planning process. Some of the items that should be considered are:

1. Type of project.
2. Length of project.
3. Duration of project.
4. Volume and type of traffic.
5. Availability of detours or alternate route.
8. Geometric requirements.
10. Effect on local activities and residents.
11. Construction techniques.
12. Pavement types.
13. Economics.
15. Adequacy of adjacent highways for use as detours, and the prohibition of construction and maintenance work along the detours while in use.
16. Railroad Grade Crossings.
In general, projects with detours shorten construction time, are less expensive to construct, and are safer for construction personnel. On the other hand, maintaining traffic generally is more convenient for the road user and has a less detrimental effect on local activities.

630-4 Permitted Lane Closure Schedules (PLCSs)

Lane closures on Interstate and other freeways shall meet the minimum criteria presented in Policy 516-003(P) (see Section 601-2 and Chapter 1511).

On the basis of this policy, ODOT has developed a series of lane closure schedules. These schedules indicate the hours of the day in which a lane closure is permitted at a subject work zone location. Maintenance of traffic (MOT) plans shall be in conformance with the permitted lane closure schedule (PLCS). However, as discussed in the policy, exceptions may be permitted, based on results of a queue length study or by waiver from the Multi-lane Coordinator (MLC) (see Section 601-2 and Chapter 1511).

If it is found that lane-closure requirements cannot be met at a reasonable cost at the subject work zone, the District has the option of applying to the Multi-Lane Coordinator (MLC) for a waiver or modification of the lane closure restrictions at the site. If such waiver is not approved, the maintenance of traffic plans shall be revised to meet the requirements of the PLCS.

The PLCS is available on the OTE website at the following address: http://plcm.dot.state.oh.us.

630-5 Maintenance of Traffic Alternative Analysis (MOTAA)

As noted in Section 630-1, Section 1400 of the L&D Manual indicates that a Maintenance of Traffic Alternative Analysis (MOTAA) will be performed. This analysis shall be submitted during the Preliminary Engineering Phase for review and approval for any projects following Paths 4 or 5 of the Project Development Process (PDP). For PDP Path 3 projects, only work zones on the Interstate or Interstate look-alike system need to be analyzed. Like many analyses, the MOTAA may not be applicable to certain projects. Specifically on urban/downtown projects, the consultant should meet with Central Office and District personnel to determine how the MOTAA should be completed.

The purpose of the MOTAA is twofold. First, it provides ODOT with information for use in determining if a part-width construction or crossover construction scenario is better for a given work zone. Secondly, it identifies potential problems, i.e., “constraints” with the various scenarios and allows ODOT to make an informed decision on how to address these problems prior to the actual detailed design of plans.

A Maintenance of Traffic Alternative Analysis (MOTAA) shall address the following requirements:

1. For Non-Interstate and Non-Interstate Look-alike Work Zones (Projects on PDP Paths 4 or 5):
   a. Investigate maintenance of traffic for each alternative.
   b. Include an evaluation of maintenance of traffic for ramps, local roads and cross streets.
   c. For each alternative determine:
      i. Number of lanes to be maintained.
      ii. Type of maintenance of traffic (i.e., signalized, detoured, part-width, runaround, crossover, etc.).
      iii. Lane widths.
iv. Typical sections.

2. For Interstate and Interstate Look-alike Work Zones (Projects on Paths 3, 4, or 5):

   Analyze the maintenance of traffic (MOT) for both part-width construction and crossover construction. Should the part-width and crossover alternatives prove to have significant MOT constraints, or prove impractical or otherwise not possible to construct, the analysis should then include the contraflow technique as one of the possible alternatives.

   a. Provide a Lane Configuration Diagram (schematic or sketch) covering the entire project length. Include the following information on each Diagram (see Figure 698-10):

      i. Arrows showing lane use, including merging and diverging ramps in relation to work areas and barriers.

      ii. All bridges.

   b. Provide cross sections between every interchange, on every bridge, at merge and diverge points (ramps), where overpass piers are present, and at other “pinch” points. Where bridge widths vary, show the narrowest part of the bridge. Cross sections shall be shown for all phases of all construction alternatives (part-width, crossover, contraflow, etc.) Existing cross sections shall also be included (see Figure 698-10).

   The following shall be used to create the above cross sections.

      i. The number of lanes to be provided during construction shall satisfy ODOT’s Policy 516-003(P), Traffic Management in Work Zones Interstate and Other Freeways (see Section 601-2 and Chapter 1511).

         The number of lanes required by this work zone policy is a starting point for the analysis. It is not meant to imply that a work zone policy exception will never be needed. In fact, ability to meet the work zone policy is one of the constraints that will be specifically examined in 2c. As noted in Sections 601-2 and 630-4, the permitted lane closure schedules (PLCSs) on ODOT’s web page define what hours a lane reduction is allowed on any segment of Ohio’s Interstate and Interstate Look-alike system. Any work zone that violates the PLCS will require a detailed queue analysis per the work zone policy and an exception request, if necessary, depending on the outcome of the queue analysis.

         ii. Typically show 11 foot lanes unless a narrower lane(s) provides significant benefits in terms of mitigating maintenance of traffic constraints as discussed in 2c. It is permissible to utilize 10 foot lane(s) on bridges where insufficient space cannot provide for all lanes to be 11 foot; however, the wider lanes are preferred whenever feasible. Show lane widths on cross sections.

         iii. All exit and entrance ramps are to be maintained with the same number of lanes during construction as pre-construction.

         iv. A minimum 1 foot clearance will be provided between lanes and barrier toes. Show all clearance/buffer widths on cross sections.

         v. Show existing beam spacing on bridge decks.

         vi. Show bridge deck cut lines in relationship to existing beams. Give the length of cantilevered section of bridge deck after the cut line.

         vii. Show a 2 foot paved shoulder where possible; and indicate locations where this is not possible.
c. Provide a table of constraints for the two alternatives (part-width and crossover construction) in the form of a “Constraint Table” (see Form 696-1a). Provide the same information for the contraflow alternative when applicable. In addition to this table, highlight any areas where the cross section required by ODOT’s Policy cannot be provided (e.g., cannot provide a 2 foot paved shoulder in a particular area.)

All of the constraints should be explicitly covered in the analysis. Do not provide general responses such as “no difference between options.” In addition, if a constraint is identified, indicate the magnitude where appropriate.

Providing the required number of lanes, entrance ramp merge distance and maintaining the same number of exit ramps are important emphasis areas. Should it not be feasible or financially prudent to provide them, explain in detail the issues that preclude them from being provided.

The Constraint Table (Form 696-1a) shall include the following categories:

i. Ability to comply with Work Zone Policy 516-003(P) (Chapter 1511).

ii. Ability to maintain all entrance and exit ramps.

iii. Ability to provide required entrance ramp merge decision sight distance (Sections 607-13 and 607-15, and Table 697-10).

iv. Right-of-way impacts.

v. Environmental impacts.

vi. Bridge widths.

vii. Significant impacts for construction duration and construction costs.

viii. Significant impacts to earthwork, retaining walls, pier clearances, profile differences, etc.

ix. Ability to maintain existing drainage and lighting systems.

x. Constructability and construction equipment access.

xi. Location of crossovers.

xii. Access impacts to important traffic generators such as hospitals, fire departments, industries, sports arenas, etc.

xiii. Longitudinal joints for concrete pavement.

xiv. Estimated Maintenance of Traffic costs.

It is not the intent of the MOTAA to require a detailed design of each alternative’s work zone. It is intended to identify and compare major potential constraints of the work zone alternatives.

The MOTAA may be a factor in choosing the preferred alternative and will serve as the basis for scoping the project’s work zone design. The analysis should be a comparison of alternatives that documents maintenance of traffic constraints. It should address the benefits and problems between the alternatives.
The analysis shall be submitted concurrently to the District and the Office of Traffic Engineering. The analysis shall include a project description indicating the type of work. For Non-Interstate and Non-Interstate Look-alike Work Zones (Major Projects only) the information required in Item 1 of this Section shall also be provided. For Interstate and Interstate Look-alike Work Zones, the following shall be included in the submission:

- **Background Information and Description of Alternatives.**

- **Lane Configuration Diagrams and Cross Sections.** Lane Configuration Diagrams (schematic or sketch) for the entire project length as described in 2a of this Section. The cross sections shall be provided for the locations called for in 2b. In the Lane Configuration Diagram, along with each roadway schematic or sketch, the corresponding cross sections shall be displayed on the same sheet. Each cross section location shall have its own identifier, i.e., do not repeat section ‘AA’ at a different location(s). If a cross section is provided at the same location in several phases, it shall be identified the same in each phase to provide easy identification.

- **Form 696-1a, Work Zone Constraints.** This form shall be incorporated into the analysis report. The content of each box in the form should indicate if that work zone constraint will be an issue with each alternative (part-width or crossover, and contraflow when applicable) and the level of impact: Low, Medium or High for Cost, Duration and Constructability. Where a constraint is identified, it should be clear in which phase(s) of construction the constraint will be present. The constraint shall also be explained with sufficient information for ODOT to determine the magnitude of the constraint (see Form 696-1b for an example).

- **Form 696-2a, Bridge Information.** This form shall be incorporated into the analysis report if any bridges are included within the project limits. This includes underpasses and overpasses as well as pedestrian and bicycle bridges. The form shall include the extent of work being completed on the bridge, type of bridge (e.g., overpass, underpass), length of bridge, existing pier spacing, existing bridge widths, bridge widths needed for each MOT alternative, future bridge width, and additional costs associated with the MOT for each bridge in each MOT scheme. Columns may be added to the table as needed (see Form 696-2b for an example).

- **Form 696-3a, Ramp Information.** This form shall be incorporated into the analysis report. The table shall include the ramp designation, number of lanes, ramp volume, ramp truck volume, decision sight distance, whether the ramp will be open or closed (if closed – duration of closure), and detours for closures. Columns may be added to the table as needed (see Form 696-3b for an example).

- **Form 696-4a, Cost Comparison.** A table comparing the cost and project duration for each alternative analyzed shall also be included. The costs are just best available engineering estimates. Major cost differences between alternatives should be noted (e.g. temporary bridge widening, temporary pavement, portable barrier, additional right-of-way, retaining walls, etc. (see Form 696-4b for an example).

- **Rolled Plans for Complex Projects.** For complex projects, ODOT requires a set of rolled plans showing the entire length of the project. Each construction phase with its corresponding traffic phase should be color coded. A legend shall be provided showing different colors for permanent roadway, permanent bridge, temporary roadway, temporary bridge, etc. Cross-hatching shall be shown on each construction area that is critical for the next phase. Other items to be denoted using colors or symbols include ramp closures, structures to be removed or demolished, color coding for traffic routing, and arrows showing direction of traffic flow.

A rolled plan shall also be included showing the existing profile and the proposed final profile of the entire project.

Complex projects, for this purpose, are defined as all urban projects, and non-urban projects which involve temporary pavements, significant localized alignment modifications from phase to
phase, etc. Projects which involve significant modifications to interchanges, with a high number of sub-phases, are also considered complex projects. Any project which involves more than two phases and a possible third phase to upgrade the shoulder could also be considered a complex project.

The MOTAA shall include a summary. It is not the responsibility of the design team to determine if one alternative is not feasible and therefore should not be analyzed. The alternatives should be analyzed and the information included in the report. ODOT will determine, based upon the analysis, which is the preferred alternative.

630-6 Conceptual Maintenance of Traffic

As noted in Section 140-7, Section 1400 of the L&D Manual requires that a Maintenance of Traffic (MOT) Conceptual Plan be submitted as part of the project development. This plan shall be based on the preferred alternative determined by ODOT after reviewing the MOTAA (see Section 630-5).

The MOT Conceptual Plan should include a stick drawing (schematic or sketch) of the preferred alternative covering the entire project. The drawing should include some, if not all, of the information listed in Section 630-5(2b). The information in Section 630-5(2c) shall be used to create the cross/transverse sections.

640  DESIGN INFORMATION

640-1  General

The goal of any maintenance of traffic strategy should be to safely route traffic through or around a construction area while providing room for the contractor to work effectively. Ideally this should be done while keeping the geometrics and traffic control as close to those for normal operating conditions as possible. This frequently requires the engineer to balance the needs of the contractor to construct the project with the needs of the traveling public to minimize delay, maintain safety and maximize cost-effectiveness. In order to adequately serve both the contractor and the traveling public, various maintenance of traffic strategies should be analyzed before determining the final strategy. The plans should have some built-in flexibility to accommodate delays or unforeseen changes in the work schedule, field conditions or traffic patterns. The impact on land owners must also be considered.

Per 23 CFR 630.1006, every plan shall have a Traffic Control, or Maintenance of Traffic (MOT), Plan (see Section 602-2) commensurate with the project's scope. This Chapter provides guidelines and references used in designing this MOT Plan. Generally, the Plan should include references to related SCDs and show details, notes, sequences, procedures, limitations, equipment, materials and other items required to maintain traffic. Chapter 641 provides additional design information related to specific typical applications and SCDs. Standard Plan Notes for temporary traffic control items are provided in Chapter 642.

Capacity constraints are vital considerations in preparing MOT Plans. In the following Sections, capacity constraints are discussed for various types of facilities. The traffic volumes used in each discussion of capacity are maximum values for which the corresponding lane closures can be used. Where traffic exceeds the constraining volumes, consideration should be given to limiting work to non-peak hours, establishing alternate routes or using the shoulder as a traffic lane. See other appropriate Sections, including Section 630-4 (Permitted Lane Closure Schedules), for further discussion on these considerations.

The designer must use engineering judgment in combining these guidelines with site-specific conditions to create a safe and efficient work zone environment. L&D Manual Volume Three, Section 1306 also provides the designer some guidance in developing MOT plans.

640-2  Geometrics

The following discussion of geometrics should be used as a guide where maintenance of traffic is to be accomplished using the existing facility. Geometric criteria to be used in designing and utilizing temporary roads are discussed in Section 640-11.

It is desirable to maintain lane widths equal to those on the existing facility. A reduction in the lane width will result in a reduction in lane capacity. The desired lane width on freeways and expressways is 12 feet. A 1.5 foot clearance from the edge line to the channelizing devices is also desirable. Where longitudinal concrete barrier is provided, a minimum clearance of 1.0 foot between the barrier and the adjacent travel lane shall be provided.

If lane width reduction on freeways and expressways is necessary, it is desirable to maintain a minimum width of 11 feet. Widths should not be less than 10 feet on any highway unless the lane widths on the existing facility are less than 10 feet. In no case shall the lane width be less than 9 feet. See Table 697-4 for required lane widths when the degree of curvature exceeds 10 degrees (horizontal curve radius is less than or equal to 500 feet). These lane width criteria shall also apply to freeway and expressway ramps. See the SCD MT-98 series.

Although the above criteria are considered to be desirable minimums, any additional pavement width should be made use of to provide 12 foot lanes and additional shoulder width, if possible, to maximize road-user safety.
On freeways and expressways, the lengths of acceleration lanes should be maximized to provide safe merging. See Section 641.12 and SCDs MT-98.10 and 98.11.

See Section 630-5 for guidance in determining appropriate geometric criteria during the Project Development Process.

Channelizing device offsets, discussed in Sections 605-11.2, should be provided in addition to lane widths. Attempts to provide larger offsets should be made whenever possible.

On spot improvement locations of very short length, such as bridge replacements or bridge reconstruction, (excluding Interstates and other freeways) where the clear roadway width (face to face of barrier or channelizing device) criteria stated above cannot be provided and a detour is not feasible, lateral clearance requirements to barriers and channelizing devices may be reduced. However, at no time on such a project shall the distance face-to-face of barrier and/or channelizing devices be less than 10 feet. See Table 697-4 for requirements on sharp curves (curve radius is less than or equal to 500 feet).

Where the horizontal alignment is to be altered from that of the existing roadway, the maintenance of traffic horizontal alignment shall conform to the criteria in L&D Manual Volume One, Sections 202.1 and 202.2. The designer should also ensure that the minimum stopping sight distance criteria in L&D Manual Volume One, Section 201.2 and the vertical clearances from L&D Manual Volume One, Section 302.1 are satisfied.

640-3 Sequence of Operation

The maintenance of traffic notes should include a sequence of construction activities to coordinate the maintenance of traffic details, especially on complex projects. The sequence should include any planned stages, phases or steps as well as particular procedures if appropriate.

A stage typically identifies a period in which work is concentrated in one section of the project site. Each stage may appear as a separate construction project, as the work in one section of the project site is completed before the work in another section of the site is begun. Consideration should be given to relocating advance Warning Signs with each stage change. Stages of construction may be separated by periods of inactivity. For example, this would be the case if the contractor is required to complete one stage by the end of one construction season, and is not permitted to begin the next stage until the beginning of the next construction season. Implementation of multi-stage construction is typically limited to large projects.

A phase typically identifies the duration of a specific traffic control set up. That is, at the point in time when one phase is ended and another phase is begun, a change in traffic control set up is involved. On freeway upgrading or resurfacing projects, the first phase often calls for traffic to be maintained on existing pavement while the shoulder is being improved for use as a travel lane in later phases. The final phase often calls for traffic to be maintained on the final pavement surface while miscellaneous work is being completed beyond the shoulder.

A step typically identifies a sub-phase. Often it becomes necessary to make modifications to the traffic control set up in one location within the project while the set up in general remains unchanged. There may be a small change in the construction activity taking place in one location, there may be a change in the location of the activity or the change in traffic control set up might be temporary. Any of these could be considered as an individual step if the designer finds a need for specifically identifying the set up.

On complex, multi-year Maintenance of Traffic (MOT) Plans consideration may be given to identifying project stages, phases and/or steps.
640-4 Lane Closure

Roadway construction often requires a reduction in the number of available lanes. This may require only a reduction in lane width or it may require complete lane closure. Lane closure may be required not only of the lane in which the activity is taking place, but also an adjacent lane in order to provide a barrier or a buffer between the workers and the vehicular traffic.

When there is a need to perform roadway maintenance or reconstruction in the interior lane of a freeway, an adjacent lane shall be closed in addition to the lane in which the maintenance or reconstruction is necessary. This additional lane may serve to provide access to construction traffic or equipment, or it may serve as a lateral buffer, see OMUTCD Figures 6H-37 and 6H-38. Caution is advised in the use of Figure 6H-38. Although this figure may be used to determine proper signing for splitting directional through movement, it does not provide for closure of the additional lane. Interior lane closure on ODOT projects shall be modified accordingly.

Before incorporating lane closures into the design of the MOT Plan, the effect of the lane closure on the traffic flow must be analyzed to insure that delay to the road users is kept within an acceptable range (see Section 640-13).

A minimum distance between adjacent lane closures should be provided. Suggested minimum distances are 2 miles in high-volume locations and 1 mile in low-volume locations. If the suggested distance cannot be provided, it is suggested that the lane closure be extended between the adjacent locations to form one continuous lane closure.

640-5 Use of Shoulders

640-5.1 General

Many maintenance of traffic situations require the use of either the full width or part-width of the paved shoulder as a traffic lane. Capacity, traffic characteristics, bridge width, work area location and existing shoulder characteristics all play a role in determining the extent of modifications and use of paved shoulders.

Any shoulder use for maintaining traffic requires evaluating the integrity of the shoulder pavement. Engineering judgment should be used in making this evaluation. The designer should consider the percentage of truck traffic and the existing pavement condition, including the composition.

SCDs MT-102.10, 102.20 and 102.30 are examples of use of the shoulder as a traffic lane.

640-5.2 Provisions for Use of Shoulders

When a shoulder is to be used as a traffic lane certain provisions shall be made:

1. Lane width, in accordance with Section 640-2, shall be maintained. This may require widening the existing shoulder.

2. The designer shall evaluate the strength of the shoulder and consider strengthening it or replacing it with temporary pavement.

   a. Shoulders used for maintaining traffic, which are determined to be of insufficient strength, should be completely removed and replaced in accordance with the requirements of L&D Manual Volume 1, Section 301.2 and the Pavement Design Manual (Section 194-11).

   b. Shoulders used for maintaining traffic, which are determined to be structurally sufficient, should also provide smooth travel. Provisions should be made to recondition shoulder surfaces that are rutted, raveled or otherwise insufficient.
3. The designer shall examine structures to ensure that sufficient width and height are maintained.

4. The designer should evaluate the roadside for obstacles which may require protection. Temporary protection may be required at obstructions that were not previously protected. In such a situation the clear zone values for the facility under normal conditions (L&D Manual Volume One, Figure 601-1) may be reduced by 12 feet, but shall never be reduced to less than 2 feet.

During any sequence of operations where traffic is to be maintained within 2 feet of the edge of the paved shoulder, the graded shoulder area adjacent to the paved shoulder should be considered for strengthening. A bituminous aggregate base placed 8 inches deep, or a composition with similar structural characteristics, should be specified for 2 feet beyond the edge of the temporary traveled lane. This treatment should be placed in conjunction with final graded shoulder treatments when such shoulder use is required on final surface course pavements. This treatment may be left in place.

Part-width use of shoulders may be required when either work or channelizing devices encroach upon the traveled lane adjacent to the shoulder.

Minimum clearance from existing obstructions may be reduced by 12 feet when traffic is shifted onto the shoulder.

640-5.3 Emergency Pull-Offs

When shoulders are used to maintain traffic over long distances, consideration should be given to providing emergency pull-offs in an attempt to minimize capacity reduction due to vehicle malfunction. This is particularly important when traffic is limited to only one lane in each direction. Signing for such pull-offs shall be erected in order to provide advance notice to the road user of the emergency pull-offs. These signs should be rectangular in shape, with black legend on orange background.

640-5.4 Existing Rumble Strips on Shoulders

Permanent, longitudinal rumble strips are often provided on freeway shoulders to alert the road user who diverts from the travel lane. Longitudinal rumble strips create a dilemma when providing lane-shifts in temporary traffic control zones. It may be necessary to remove or resurface longitudinal rumble strips when providing lane shifts. Or, if the temporary lanes can be aligned such that the wheels of the vehicles can straddle the rumble strip, it may be adequate to limit the rumble strip removal to the shift tapers.

640-6 Work Zone Drop-Offs

A pavement edge drop-off occurs when there is a vertical difference in height between adjacent road surfaces. Treatments for pavement edge drop-offs in construction work zones are shown on SCD MT-101.90. The drawing may be used as a designer's tool for determining the appropriate measures to specify in the plans for treatment or protection of drop-off conditions. The designer may also use it to develop designs or sequences of operations that would avoid or minimize drop-offs.

The treatments indicated on the SCD are intended for high-volume projects. For low-volume situations, a one-level drop in protection may be used, e.g., use drums instead of PB. For low-speed situations, protection may not be needed. In all situations, engineering judgment should be used to select the most appropriate treatment for each work zone.

Maintenance of traffic Plan Notes should address the treatment of any anticipated open trench areas. Whenever possible, it should be stipulated that trench excavating operations will not remove any more material than can be replaced by the end of each day's work. In areas where
this is not possible, or where adverse conditions prevent it, overnight trench openings shall be temporarily backfilled. See Plan Notes 642-14 and 642-15 in Chapter 642 for additional information.

640-7 Ramp Closure

640-7.1 Volume Considerations

In urban areas, consideration may be given to closing some entrance ramps. This can reduce the volume of traffic using the highway and minimize the negative effect on mainline traffic capacity caused by the ramp traffic merging onto the highway. Such closures could significantly improve traffic flow on the freeway; however, detours must be provided on the surface street system to handle the diverted traffic volume.

640-7.2 Geometric Considerations

Geometric conditions on ramps often make it difficult to perform work on the ramp while maintaining traffic. Consideration should be given to temporarily closing ramps and providing detours in such cases.

640-8 Detours

When a detour has been designated for a project (see Section 602-6), provisions must be made for erecting adequate Detour signing along with other appropriate traffic control devices. The plans shall specify all necessary detour traffic control in accordance with the ODOT and this Manual (also see related typical applications in Chapters 607 and 698). The plans shall provide the appropriate traffic control information, for installation by ODOT. On local or other projects where detour traffic control cannot be provided by the maintaining agency, the plans shall provide for installation by the contractor.

Reassurance Detour signing in rural areas should be erected at intervals not to exceed 2 miles. In urban areas, Detour signing should be spaced no more than two blocks apart.

640-9 Contractor Access

The traffic control plan shall address the need for access to the work zone. This is a particularly critical issue on freeways and expressways where concrete barrier protection is used. The designer must address the question of how to get equipment and material into and out of the work zone safely. The following should be considered:

1. Type of work zones likely to create ingress/egress problems (e.g., median work spaces that will require vehicles to merge into and out of high-speed traffic, work activities that require frequent delivery of materials such as paving projects.

2. Temporary acceleration and deceleration lanes for work vehicles should be provided.

3. The location of the access opening should provide good sight distance for oncoming traffic.

4. In extreme conditions – lane closures may need to be considered.

5. Openings in barrier walls should be planned to ensure the ends are properly protected and that the wall does not create sight distance issues.

6. Special warning signs may be necessary.

7. The use of Portable Changeable Message Signs should be considered.

On freeways and expressways using concrete barrier protection, the access points shall be laid
640-10 Private Driveway Access

Except as noted herein, where private drives exist within the work area, access to the drives shall be maintained. It may be necessary to adjust the work procedures to work around the drives as much as possible and to provide temporary access to the drives when normal access cannot be provided.

At urban residential locations, access to residential driveways may be denied for a few hours at a time after adequate advance notice of closure has been provided to the residents of the property involved.

640-11 Temporary Roads

640-11.1 General

A temporary road is any crossover, runaround, ramp, roadway, etc., whose sole purpose is to temporarily maintain traffic during construction. After construction is complete, temporary roads are typically removed.

Temporary roads are required when the existing roadway is inadequate to properly accommodate both the work and the traffic. They may also be required in certain cases where bridge construction or reconstruction does not facilitate part-width construction or realignment to the extent that the existing facility can serve as the temporary road. The use of runarounds and temporary structures in such cases shall be evaluated by the designer for cost-effectiveness and public service.

640-11.2 Design Speed

The design speed used in designing temporary roads shall be that which is discussed in Section 640-18.1.

640-11.3 Geometrics

The geometric design of temporary roads should be commensurate with the chosen design speed. Pavement design criteria are provided under CMS 615. Typical roadway plans for temporary roadway are provided in L&D Manual Volume Three, Figures 1306-6s and 1306-7s.

The horizontal alignment of temporary roads shall comply with the criteria discussed in L&D Manual Volume One, Sections 202.1 and 202.2. Superelevation of temporary roads is discussed in the following Section. Spirals are not required.

Crest and sag vertical curves on temporary roads should comply with L&D Manual Volume One, Section 203.3 using minimum criteria. Maximum allowable grades are the values shown in L&D Manual Volume One, Figure 203-1 under hilly terrain for the appropriate design speed.

Stopping sight distances shall meet or exceed the minimum criteria discussed in L&D Manual Volume One, Section 201.1 and pavement cross slopes shall be as discussed in L&D Manual Volume One, Section 301.1.5.

The designer shall also ensure that vertical clearances in conformance with L&D Manual Volume One, Section 302.1 (existing structures to remain) are provided.

Additional general information regarding geometric design is provided in Section 640-2.
640-11.4 Superelevation

Except as noted in Section 640-12, superelevation on temporary roads should conform to the requirements shown in L&D Manual Volume One, Figure 202-8 for design speeds greater than or equal to 50 miles per hour and L&D Manual Volume One, Figure 202-9 for design speeds less than 50 miles per hour.

640-11.5 Lane Width

Lane widths of temporary roads should conform to the requirements discussed in Section 640-2.

Where horizontal curve geometrics are less than adequate for the temporary road conditions (\(D_c > 10\) degrees), curve widening should be provided as called for in Table 697-4.

640-11.6 Guardrail Offset and Sideslopes

CMS 615.04, permits a minimum guardrail offset of 1.5 feet and a maximum side slope of 1.5:1. These dimensions are appropriate for absolute minimum design, but design above these values should be provided when feasible. For design speeds over 40 miles per hour, a minimum shoulder width and guardrail offset of 6 feet is desired and 4:1 side slopes are desired where right-of-way is available.

Barrier placement along temporary roads shall conform to the appropriate requirements of L&D Manual Volume One, Section 600.

640-11.7 Pavement

CMS 615.05, provides Class A and Class B pavement designs for temporary roads. These designs are intended to be specified on projects with large traffic volumes where the proposed project pavement design is stronger than either of these two designs. A temporary road pavement should not normally be stronger than the permanent pavement design of the project.

For a temporary road pavement design that is weaker than Class A or B, the design should be based on the anticipated total equivalent 18-kip single axle-load applications and determined from information contained in the Pavement Design Manual published by the Office of Materials Management.

For temporary road pavement that is to be used for a short time (less than two months) by moderate traffic volumes (2000 ADT or less), CMS Item 410 Traffic Compacted Surface, stabilized with CMS Item 616, may be provided.

640-12 Crossover Construction

640-12.1 General

For general information regarding crossover construction, see OMUTCD Section 6G.16 and Section 606-16. Further detail information on traffic control for crossovers is provided in the following Sections and in OMUTCD Figures 6H-39 and 6H-40, TEM Sections 607-12 and 607-13, Figure 698-4 and SCDs MT-95.70 and MT-95.71.

All temporary crossover areas shall be illuminated as shown on SCD MT-100.00, and the transition areas for temporary crossovers shall be delineated in accordance with SCD MT-99.30.

All temporary crossovers shall be removed at the completion of the current proposed work unless retention for future use is recommended and justified by the District. Any crossover
which is to remain for future use or left in place without use between construction seasons shall be camouflaged with an earth overlay so that the crossover area appears as part of the normal median.

640-12.2 Traffic Separation

The use of breaks in the traffic separation runs, to permit access, should not normally be allowed. For unusual circumstances where breaks are necessary, each end of the barrier shall be protected by a temporary impact attenuator.

640-12.3 Considerations for Reversed Flow

When a traffic diversion requires that two-way operation be maintained on a roadway which normally carries one-directional traffic, as is the case in crossover construction, the designer shall provide temporary barrier protection from hazards that are in the clear zone of the reversed movement. The designer should evaluate the project to ensure the proper barriers, bridge terminal assemblies, and guardrail end treatments, and to specify the appropriate changes or additions to barrier protection (see SCD MT-95.82). It is not necessary to change the lap in the existing guardrail.

640-12.4 Crossover Geometric Design

For guidance on traffic control for crossovers, see Section 640-12.1 and SCDs MT-95.70 and MT-95.71 and PISs 209572 and 209573. Figures 698-6 through 698-9 provide geometric detail information for two-lane crossovers. For single-lane crossovers, decrease all pavement widths by 12 feet, providing one 12-foot lane with 3-foot pave shoulders. The 3-degree reverse curves are appropriate for rural temporary crossovers. In urban areas the curvatures may be increased to 5 degrees provided the posted speed is reduced to 45 miles per hour. Superelevation for these curves shall be limited to 0.016 sloped toward the inside of the curves. Variations in design due to mainline curvature will be considered on a case-by-case basis.

The plans should detail temporary crossovers, including locations, horizontal alignment, typical sections, profiles, and pavement transitions to the existing pavement.

Crossover locations should be very carefully selected with traffic needs being the primary consideration. A tangent section on flat terrain is the most desirable location for constructing a crossover. The designer should field check possible crossover locations to select the optimum site and not necessarily choose the project limits as their location.

Regarding lane width on single-lane crossovers, there has been some debate in the past as to the proper width of the single lane. In discussion between OTE and the Office of Roadway Engineering, it was determined that this lane is to be 12-foot, with 3 feet of paved shoulder and 2 feet of aggregate shoulder on each side. This provides for the same typical section as does the two-lane crossover design provided in Figures 698-6 through 698-9, except that the pavement width is decreased by 12 feet. In the past, this drawing called for a 16-foot lane, as is typical of a permanent single-lane ramp, with a 1-foot shoulder on each side. However, a 12-foot lane width is adequate for a properly designed single-lane median crossover and will contribute to providing uniformity in temporary work zone geometrics among ODOT work zones.

640-13 Capacity

640-13.1 General

The following capacity restrictions should be evaluated for each project. The values have been developed to assist in identifying when traffic volumes may cause delays and/or backups during construction phases.
When traffic volumes exceed these values, other steps should be considered in preparing Maintenance of Traffic Plans. These include re-sequencing construction to allow additional lanes to be used, use of shoulders as traffic lanes, providing additional advance Warning Signs, use of alternate routes and corresponding signing, use of Portable Changeable Message signs or detours, and night work.

The above steps should be considered when the following conditions exist:

1. On two-lane highways where the ADT is greater than 6,000 (two-way) or where the peak hour traffic is greater than 600 vph (two-way).

2. On multi-lane non-freeway highways (more than two lanes, divided or undivided) where the directional ADT is greater than 14,000 per lane of traffic being maintained, or where the peak hour traffic is greater than 1,400 vph per lane of traffic being maintained.

On Interstate and other freeways, lane closures shall meet the minimum criteria presented in the Permitted Lane Closure Schedules (PLCSs), discussed in Sections 601-2 and 630-4. Development of the PLCSs is based on queue length analysis, in accordance with the criteria set forth in Section 640-13.2. If there is any question as to the validity of the lane closure schedule provided for a specific location, a queue analysis may be performed for the project site in an attempt to override the schedule provided in the PLCS.

### 640-13.2 Queue Length Predictions for Freeways

Except by waiver approval from the Maintenance of Traffic Exception Committee (MOTEC), queue lengths on freeways shall not exceed the maximum thresholds set forth in ODOT Policy 516-003(P) (see Chapter 1511). An analysis of traffic patterns within freeway sections shall be performed in order to develop maintenance of traffic strategies which attempt to meet these queuing thresholds. The queuing thresholds set forth in the Policy are as follows:

<table>
<thead>
<tr>
<th>Queue Length</th>
<th>Maximum Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.75 miles</td>
<td>Unlimited</td>
</tr>
<tr>
<td>0.75 - 1.5 miles</td>
<td>2 hours</td>
</tr>
<tr>
<td>&gt;1.5 miles</td>
<td>Not acceptable</td>
</tr>
</tbody>
</table>

**ODOT** has adopted the following procedure for predicting queue lengths in construction zones. The calculation is in two parts:

1. The first part requires use of the QUEWZ92 or QUEWZ98 software program to calculate the expected capacity through a given construction zone.

2. The second part requires the application of the calculated capacity to a spreadsheet program developed by **ODOT** for calculating potential queue lengths at a given construction site.

QUEWZ92 or QUEWZ98, which is an acronym for Queue and User Cost Evaluation of Work Zones, was developed by the Texas Transportation Institute (TTI) to calculate queue lengths in work zones and the associated costs of delay attributed to the reduction in available lanes. This program shall be used to calculate capacity, an intermediate output. Copies of the program may be purchased from McTrans Center (see Table 197-3).

Input requirements for the program are:

1. Number of directions in which lanes are closed (one or two);
2. Number of existing lanes for each direction;

3. Number of open lanes in work zone for each direction;

4. Length of the closure;

5. Time of the lane closure and work zone activity;

6. Traffic volumes (AADT or directional hourly counts);

7. Cost update factor, based on the Consumer Price Index (in today’s dollars expressed as a percent of 1990 dollars):

   \[ \text{Cost Update Factor, December 2000} = 133\%; \] and any future cost update factors can be calculated as: \( \text{Cost Update Factor} = \frac{\text{Consumer Price Index}}{130.7}; \)

8. Percentage of trucks; and

9. Design speed, work zone speeds (default values provided).

QUEWZ-98 allows for adding the excess emissions estimates to the road user cost output option.

It should be noted that no compensation for grade is called for in this software. However, based on field observations, it appears that truck traffic has a greater effect in decreasing capacity on a positive grade than on a negative grade. The designer should consider the potential effect of grade on projects by calling for shorter lane closures in areas of high truck volumes on single-lane uphill grades than would otherwise be specified.

The Intermediate Output provided by this program is expected capacity in vehicles per hour of day.

The program’s Final Output provides:

1. Length of queue by hour of day. This is not used for ODOT queue calculation; ODOT’s spreadsheet is used instead.

2. Cost of delay to the traveling public as a result of the traffic queue caused by a reduction in the number of traffic lanes. Since this is not relevant to the calculation of queue length, it is used only to determine an appropriate disincentive (see Section 640-24).

The capacity calculation provided by the QUEWZ92 or QUEWZ98 program as an Intermediate Output is used in the spreadsheet program to calculate the expected queue length. This spreadsheet program can be obtained by contacting the OTE Traffic Control Section. This volume is entered as both the free-flow work zone capacity and the queued work zone capacity.

The number of lanes of queued vehicles must also be entered. The designer should take into consideration the need for including the lane being closed in queue development. Observations have found locations in which there was very little volume stored in the lane being closed. At other locations the queue in the closed lane was the same length as the queue in the open lanes. In other cases, the closed lane carried only a fraction of the volume carried by the open lanes. The designer must determine individually how to account for the volume carried by the closed lane of a specific project.
640-14 Considering Holidays and Special Events

The designer should, in conjunction with the District Work Zone Traffic Manager, investigate the use of lane closure restrictions on Interstates and other freeways during holiday and other significant events.

The plan shall require the contractor to have all existing lanes (a number of traffic lanes equal to the existing highway) open to traffic during specifically designated periods. These requirements are in addition to the requirements identified in the Permitted Lane Closure Schedules discussed in Section 630-4 and the requirements identified in ODOT Policy 516-003(P) (Section 1511).

Lane closure restriction schedules for urban locations may differ from schedules for rural locations. Where rural location would be expected to carry high traffic volumes during holiday weekends, some urban routes, such as radial freeway segments leading to a central business district, may be found to carry less traffic during holiday weekends. An analysis of traffic patterns shall be made to determine whether or not it is appropriate to restrict lane closures for designated periods including holiday weekends.

The designated “lane closure restriction” periods shall be identified in the plan and may include, but are not limited to:

1. National holidays and holiday weekends:
   - New Years,
   - Memorial Day,
   - Fourth of July,
   - Labor Day,
   - Thanksgiving, and
   - Christmas.

2. Weekends with greater than normal travel:
   - Easter,
   - Mother's Day, and
   - Other weekends, or periods, when regional travel is significant.

3. Periods involving local events having attendance greater than 75,000 persons per day or event, or a lesser attendance for events producing mass arrivals or departures, such as football games.

4. Periods when snow accumulation is probable. During these periods daily isolated lane closures may be used during non-peak hours, weather permitting.

A “holiday weekend,” for traffic maintenance purposes, begins at noon on the last normal weekday preceding the weekend. Traditionally, the “holiday weekend” has been considered to end at noon on the first normal weekday following the holiday; however, the designer should review the traffic patterns at the specific location. Traffic data shows that at many locations, the traffic on the following weekday morning is not significantly different from a typical weekday morning. In such cases it is suggested that the holiday weekend be considered to end at 6:00 AM or earlier to allow the contractor a full day of normal operation. A day between the holiday and Saturday or Sunday is considered part of the weekend.

Section 630-4 contains information regarding Permitted Lane-Closure Schedules (PLCSs) which are intended for use in the scheduling of part-time lane closures.

640-15 Project Length Restrictions

Although ODOT has no written policy limiting the length of lane closures, consideration should be given to potential effects on traffic flow, and the potential negative public reaction to closures of
extensive length. These factors are of concern primarily where only a single lane remains open in each direction of travel. In rolling to hilly terrain where underpowered vehicles tend to slow traffic flow, the length of one-lane operations should be minimized. In flat terrain, the length of reduced-lane operations is less critical; however, the designer should give consideration to the type of activities to be performed, and what effect these activities might have on traffic movement. Access to accident sites by tow trucks and emergency vehicles on one-lane operations may become especially difficult if concrete barrier is present on both sides of the lane. Sections of open roadway between adjacent lane closures should meet the lengths suggested in Section 640-4.

The public reacts negatively to seeing lane closures in areas of no activity. To avoid such situations on projects of considerable length, it may be desirable to concentrate activity in one section of the project at a time, and to minimize the lengths of lane closures accordingly. On multi-year projects, concentrating work in a portion of the project each construction season may allow an added benefit of opening the entire highway during the inactive winter months.

The designer should not overlook the advantage of scheduling adjacent corridor improvements simultaneously, if this would minimize the time period for inconveniencing motor vehicle traffic. For example, two adjacent projects, requiring only one season each to construct, could be constructed in the same construction season (rather than in consecutive seasons) to minimize the inconvenience to one season rather than two.

640-16 Work on Detour and Alternate Routes

Work along designated detours and alternate routes is strongly discouraged. These routes carry volumes which may be significantly increased over the volumes carried under normal conditions. The potential for traffic queue development would be greater than if the work were performed prior to implementation, or following elimination, of the detour or alternate route.

Work along a designated detour or alternate route can also create a negative public response. Under such conditions the road user would be directed around one construction project, only to be directed through another one. See Section 640-17 regarding project coordination.

640-17 Coordination With Adjacent Projects

Coordination of signing between adjacent projects is recommended in order to minimize presenting misleading information to the road user. If proper location of advance signing for one project results in this signing being located within the limits of another construction project, then consideration should be given to treating the two projects as one project for the purpose of signing.

For more information about coordinating speed reductions and increased fines policies, see Section 600-2 and 640-18.2.5.

640-18 Speeds in Work Zones

640-18.1 Design and Advisory Speeds

The design speed for maintaining traffic through a construction zone should remain the posted legal speed limit, except as indicated in Section 640-18.2. If necessary, reductions in design speed should be accomplished gradually, in increments of 10 miles per hour or less. Sudden changes in design speed and the related geometrics should be avoided.

Advisory speed signing should be provided in accordance with OMUTCD Sections 2C.08 and 6F.52 and TEM Chapter 641.

Where design speed becomes an issue on ramps in relation to maintenance of traffic in work zones, a reduced speed limit can be used as provided in L&D Manual Volume 1 Figure 503-
1. Speeds used from this table shall be limited to those classified as Upper Range speeds.

640-18.2 Speed Limit Reductions

640-18.2.1 General

As noted in Section 1203-2.9, research has shown that regardless of Speed Limit signs, the speed of drivers within work zones will decrease from the speed upstream from the work zone. Although speed zoning might be an effective tool in reducing speeds in work zones in some situations, there are also other work zone speed control methods available, such as Advisory Speed signs, dynamic signs, and design geometrics that should be considered. Unnecessarily reducing the speed limit can introduce additional, and undesirable, speed variance into the traffic flow through the work zone.

If it is determined that a speed limit reduction is needed in a temporary traffic control zone, research also indicates that a 10-mph reduction is likely to provide the best results (maximize compliance and minimize speed variances), rather than a 5-, 15- or 20-mph reduction. However, circumstances may occasionally require an overall reduction greater than 10 mph. A 20-mph reduction should only be accomplished using 10-mph increments; however, for a 15-mph reduction, a direct reduction of 15 miles per hour is allowed.

640-18.2.2 Process

The overall process for Speed Zoning is addressed in Chapter 1203. Section 1203-2.9, Figure 1298-1 and Table 1297-7 address the specific process, guidelines and forms used for review and approval of a Work Zone Speed Zone (WZSZ).

All ODOT construction projects (and all operations/maintenance work projected to take more than 3 hours to complete) involving high-speed (≥55 mph) multi-lane highways should be reviewed for possibly using a speed limit reduction. Requests for work zone speed zones may also be initiated during the construction phase if the need for one was not determined during the design phase or if additional, or new, conditions have been identified that subsequently warrant their implementation (see Figure 1298-1b).

When a WZSZ is required, Plan Note 642-24 (Section 642-24) shall be included in the plans. The Plan Note shall document the WZSZ Revision Number and indicate the locations and applicable conditions and factors (from Table 1297-7) that warrant the indicated WZSZ. The Note shall also require that the revised Speed Limit signs be erected or uncovered no earlier than four hours prior to the actual start of work causing the warranting condition(s) to occur, and removed or covered no later than four hours following removal of the warranting condition(s).

When the need for the Work Zone Speed Zone has ended, it shall be withdrawn in accordance with the procedures described in Section 1203-4 for Speed Zones.

640-18.2.3 Guidelines

Table 1297-7 provides guidelines for determining if a work zone speed zone might be warranted. Form 1296-16, WSZS Justification Report is used to document background information needed about the project/work, and Form 1296-17, WZSZ Evaluation Sheet for High-Speed (≥55 mph) Multi-lane Highways is used to calculate the recommended speed limit for a WZSZ. Sections 1203-2.9.5 through 1203-2.9.7 describe how to complete the forms.

Whenever a speed reduction is to be used, the design speed for maintenance of traffic (MOT) items shall remain at the original posted speed limit on approaches to the work zone. Within the work zone, the design speed should match whichever speed limit is in
effect at the time and location. If the zone will have the work zone speed limit signs put up and taken down intermittently, then the MOT elements shall either be adjusted each time to accommodate the different speed limits, or the more conservative design speed parameters must be used (i.e. higher speed for taper rates, buffers, clear zone, etc and the lower speed for device spacing, etc.)

The speed limit reduction shall be limited to only the portion of the project and the work that warranted the work zone speed limit reduction. When the warranting conditions are no longer present, the speed limit shall return to the original posted speed, and the temporary Speed Limit signs shall be removed or covered no later than four hours following the time in which the warranting conditions resolve. Temporary WZSZ Speed Limit signs may be re-erected or uncovered no earlier than four hours prior to resumption of warranting conditions.

When the work that justified the work zone speed zone is complete, the Speed Limit signs shall be removed and the related speed limit reduction shall be withdrawn (see Section 1203-4).

The two directions of a divided highway are considered separate highway sections (see CMS Item 614.02(B)). Therefore, if the work on a multi-lane divided highway is limited to only one direction, a speed reduction in the direction of the work does not automatically constitute a speed reduction in the opposite direction. A speed limit reduction in the opposite direction, in such case, is appropriate only if conditions are expected to have an impact of the directional traffic flow.

640-18.2.4 Signing

The work zone speed zone is not in affect and enforceable until the existing conflicting Speed Limit signs are removed or covered and the reduced Speed Limit signs are in place, and the signs should only be in place during the time of the activity or condition that warranted the speed limit reduction.

For divided highways, the first dual-mounted Work Zone Speed Limit sign (R2-1) shall be placed approximately 500 feet in advance of the lane reduction or shift taper or other roadway or shoulder restriction that warranted the work zone speed zone. On undivided highways, the sign shall be mounted on the right side approximately 250 feet in advance of such restrictions. The sign(s) shall be repeated every 1 mile for 55 mph zones, and every one-half mile for 50 or 45 mph zones. These signs shall also be erected immediately after each open entrance ramp (or intersection) within the zone. See Plan Note 642-24 in Chapter 642 for additional information on locating Work Zone Speed Limit signs.

Work Zone Speed Limit signs shall be mounted on two Item 630, Ground Mounted Supports, No. 3 posts, unless mounted on a temporary sign support per SCD MT 105.10.

Work Zone Speed Limit and related sign sizes, placement, supports, etc shall be per the OMUTCD, with two exceptions: 1) expressway size Speed Limit signs may be used on freeways and expressways, if necessary; 2) the height of signs mounted on portable supports should be the height required for ground-mounted signs but shall not be more than 1 foot lower than the height required by the OMUTCD, or as directed by the engineer. Portable supports should not be used for a duration of more than 3 days.

The Speed Reduction sign (W3-5) shall be placed in advance of the beginning point of the work zone speed zone; approximately 1,250 feet in advance of the first Work Zone Speed Limit sign on freeways and expressways and at 500 feet on other high-speed (≥55 mph) multi-lane highways. On divided highways, Speed Reduction signs should be dual-mounted.
A Speed Limit sign indicating resumption of the original posted speed limit (applicable R2-1, R2-H2a, etc.) shall be erected at the end of the work zone speed zone.

640-18.2.5 Adjacent Projects and Speed Zones

Whenever a lowered speed limit is to be used within a section that has more than one original posted speed, the areas should be evaluated as separate sections. If there is not enough room (lengthwise) to implement the separate speed zones, consideration may be given to lowering consecutive work zone speed zones to the lower approved work zone speed limit.

Where adjacent projects exist, any speed reductions should be coordinated. The project engineer, or other responsible ODOT representative, shall resolve potential differences between the zones implemented on the individual projects to ensure: they match each other to form one continuous zone; are separated by enough distance to function as separate zones (e.g., more than 1 mile); or are otherwise signed appropriately to step from one zone to the next.

640-18.3 Work Zone Increased Penalty Signs (R11-H5a)

The Work Zone Increased Penalty sign can be used to address speeding concerns on projects independent of reduced work zone speed zones. See Section 605-4.3 for details on the use of these signs. When these signs are used on a project Plan Note 642-27 (Section 642-27) shall be included.

640-19 Law Enforcement Officers (LEOs)

640-19.1 Law Enforcement Officers (LEOs) for Assistance During Construction Operations

Law enforcement officers (LEOs) with patrol cars are effective for slowing traffic speed through work zones. Their use shall be specifically identified in the construction plans. Their primary purpose is to ensure the safe, efficient and orderly movement of traffic. They are not to be used for the convenience of the contractor at project cost.

In general, LEOs should be positioned to direct traffic at the point of lane restriction or road closure and to manually control traffic movements through intersections in work zones.

For lane closures, the use of LEOs should be required during initial set up periods, tear down periods, substantial shifts of a closure point or when new lane closure arrangements are initiated. LEOs should also be required when construction vehicles are entering/exiting the zone directly from/to an open lane of traffic. If a lane has been closed to provide an acceleration/deceleration lane for the vehicles, then the LEO is not required. Use of LEOs is required during the entire advance preparation and closure sequence where complete blockage of traffic is required, and during traffic signal installation when impacting the normal function of the signal or the flow of traffic or when traffic needs to be directed through an energized traffic signal contrary to the signal display. LEOs should not be used where the OMUTCD intends that flaggers be used.

Use of LEOs by contractors other than the uses specified above shall not be permitted at project cost. LEOs may be used to circulate through the work area, with flashing lights off, to provide a general slowing of traffic.

State Highway Patrol Officers may be specified on rural Interstate projects.

For additional information, see Plan Note 642-55 in Chapter 642.

640-19.2 Law Enforcement Officers (LEOs) for Enforcement in Work Zones

Excessive speeds in roadway work zones adversely affect the safety of the traveling motorists and the roadway construction workers. The use of law enforcement officers (LEOs) in work zones is effective in reducing speeds through the work area. Law enforcement officers can be used in the form of:

- Stationary patrol car.
- Circulating patrol car.
- Air enforcement in combination with ground patrol car.

On construction projects that meet the criteria set forth, the need, ability and method of law enforcement shall be resolved early in the Project Development Process (PDP).

The following is the procedure to follow when incorporating law enforcement hours for enforcement purposes into projects:

1. Designer shall evaluate projects (Preliminary Engineering Phase of PDP Paths 3, 4, or 5) to determine which will require additional law enforcement efforts during construction. (Is the project over $20 million in construction costs, or have a complex work zone configuration?)

2. Office of Traffic Engineering (OTE) in coordination with the District shall review the proposal and modify, approve and/or disapprove.

3. Designer shall note the needed additional enforcement during plan development (Environmental Engineering Phase of PDP Paths 3, 4, or 5) and determine the type of enforcement (circulating, stationary, air, etc.), location of enforcement, amount of enforcement, and when the enforcement should be used. All shall be shown or noted in the plans. Aggressive enforcement should be used during the opening days of the project and following major changes in work zone conditions. This will include determining need for enforcement pullout areas, air enforcement striping, etc.

   a. When considering air enforcement, check with nearby airport restrictions.

   b. Enforcement pullout areas should be spaced throughout long work zones. The pullout areas need to be approximately 0.25 miles long.

4. OTE in coordination with the District shall review the plans and modify, approve and/or disapprove. OTE will send the plans to the Ohio Traffic Safety Office (a Division of ODPS).

5. Ohio Traffic Safety Office (a Division of ODPS) will provide back to OTE, within three weeks, any law enforcement agency comments. They will take the lead in determining the appropriate law enforcement agencies to review each set of plans they receive. These comments will assist in development of the enforcement plan and provide input on the type, amount, location, etc. of enforcement.

6. Designer shall finalize plans and incorporate comments received (Final Engineering Phase of PDP Paths 3, 4 or 5).

7. OTE shall compile pre work zone crash statistics and update the work zone crash tracking database. Prior to the beginning of the project – meet with project personnel and law enforcement agencies and provide work zone safety and mobility training on a project specific level.
8. OTE, the District, and law enforcement agencies will monitor/collect work zone crashes, speeds, etc. and implement countermeasures to improve the safety for motorists and workers as needed.

These guidelines are intended for long-term contractual type projects and are not to take the place of the “Law Enforcement Officers (LEOs) for Assistance During Construction Operations” described in Subsection 640-19.1.

For additional information, see Plan Note 642-56 in Chapter 642.

640-20 Temporary Traffic Control Devices

The design and application of standard traffic control devices for temporary traffic control zones are addressed in OMUTCD Part 6, Chapters 605, 607, 641 and 642, in the Traffic SCDs and in CMS 614.04.

640-21 Removal of Logo Signs

The Ohio Business Logo Sign Program established by ODOT, also known as the Specific Service Sign Program, permits eligible businesses which provide fuel, food, lodging, camping or attraction services to road users to have their Logo Sign Panels placed on Specific Service Signs. Mainline Logo Sign Panels are placed in advance of eligible interchanges, and directional Logo Sign Panels are placed along the exit ramps. The Logo Sign Program is operated by a private company (Program Manager) under contract with ODOT.

Information regarding removal and temporary re-erection of Logo Signs due to construction activity is addressed in Sections 207-2.

640-22 Temporary Lighting

For guidance in the use of temporary lighting for crossovers, see SCD MT-100.00 and Plan Note 642-35 (Section 642-35 in Chapter 642). For floodlighting see Plan Note 642-29 in Chapter 642. Part 11 of the Manual provides additional guidance for general lighting design principles.

See Plan Note 642-39 in Chapter 642 for when temporary traffic signals are provided for closing one lane of a two-lane highway.

If a project requires illumination for special situations, the Office of Traffic Engineering should be contacted for design guidance.

On contract work, the contractor is responsible for obtaining power for temporary lighting. Power shall not be obtained from an existing nearby highway lighting system.

640-23 Reserved for Future Information

The information in this Section has been incorporated into other Sections; however, the number has been reserved for future use.

640-24 Disincentives

640-24.1 Requirements/Guidelines

Disincentives may be assessed against the contractor for failure to complete his work on schedule. They may also be assessed for failing to reopen a closed lane within an allowable timeframe. The disincentives should be based upon costs incurred by the public as a result of the contractor’s delay in completing the project. Various methodologies are available for analyzing the cost incurred by the public depending on the specific circumstances.
640-24.2 Calculating Costs of Delay (QUEWZ Software)

One methodology, which is frequently used on Interstate and other freeway reconstruction projects where the number of existing traffic lanes is reduced for maintenance of traffic purposes during construction, is to determine the cost of the additional delay to the road user as a result of the reduction in the number of available traffic lanes. As an aid, several computer programs known as QUEWZ-92 or QUEWZ-98 (see Section 640-13.2), can be used to calculate queue lengths in work zones and the associated costs of delay attributed to the reduction in available lanes. QUEWZ-98 (see Section 640-13.2) is the program that is most commonly used by ODOT personnel.

The cost of delay calculated by the QUEWZ program, or some lesser amount, may be used as the disincentive. Also, Section 642-6 contains a table of acceptable disincentive amounts that may be applied to lane closures on Interstates and Interstate look-alikes.

640-24.3 Other Considerations

Additional methods available to encourage the contractor to complete his work on schedule include Lane Rental, Incentive/Disincentives, and A + B Bidding. Guidelines on use of these concepts is presented in the Compendium of Traffic Control Options in Section 630-2 and Tables 697-1a through 697-1f.

The Lane Rental concept calls for the contractor to be charged for keeping a lane closed longer than called for in the plans.

The incentive/disincentive concept is typically applied to the completion of a phase of a project.

With A + B Bidding, the contractor bids on the cost of the project and on the time required to complete the project.

The Innovative Contracting Manual contains additional information on all of these methods. This manual is maintained by the Office of Construction Administration and is available for viewing online from their homepage at http://www.dot.state.oh.us/Divisions/ConstructionMgt/Admin/Pages/default.aspx.

640-25 Pedestrian Considerations

Planning and design for maintaining pedestrian traffic should consider both the characteristics of that traffic and the type of construction activities. An analysis of trip origins, destinations and travel paths is useful for providing adequate temporary facilities. Also see O MUTCD Chapter 6D for additional information about accommodating pedestrians in temporary traffic control zones.

Pedestrian accommodations within work zones should be provided: where sidewalks existed prior to construction; where the work zone is located along a route to a school or park; where there is evidence of pedestrian usage (where well-worn paths exist, for example); or where existing land use generates pedestrian traffic.

In residential and commercial areas, adequate pedestrian access should be provided to properties abutting a work zone.

Use of increased pedestrian crossing times at signalized intersections (based on a walking speed of 3 feet per second) may be necessary, particularly in locations where the percentage of elderly pedestrians is expected to be significant. See Section 603-2 for additional information on pedestrian issues that should be considered.

The following general principles should be followed when designing pedestrian facilities:
1. If a sidewalk or bridge that carries pedestrians is closed, provide a temporary walkway (concrete or asphalt) around the work area or direct the pedestrians to an alternate route. Do not force pedestrians to walk through the work area or into traveled lanes.

2. Passageways for pedestrians, especially elderly and disabled, should be well defined and safe for use by these groups. Ramps should be provided for access to streets.

3. All signs or devices should be set up so that they do not cause a hazard for pedestrians. All signs mounted near or over sidewalks should have a minimum 7 foot vertical clearance.

4. Minimum width of walkway shall be 5 feet. Wider walkways are required in areas of high pedestrian activity.

5. Pedestrian walkways shall be free of any obstructions or hazards (holes, debris, mud, etc.). It is especially important to cover or repair any holes and to have broken or damaged sidewalks repaired quickly.

6. Lighting should be provided for temporary walkways if the existing facility was lighted.

7. Fixed walkway and canopy-type pedestrian protection should be provided in the case of long-duration building projects involving construction, demolition and repair activities located close to the street.

8. The design of a temporary pedestrian structure shall be approved by the Office of Structural Engineering. The following criteria shall be used:
   a. Live Loading - 85 psf
      Maximum Allowable Live Load Deflection - 1/800 of the span with no allowable increase for temporary structure.
   b. Minimum Width - 5 feet face to face of railing.
      Railing - 5 feet high with chain link fence fabric.

SCD MT-110.10 provides detail for maintaining or detouring pedestrian traffic. However, it is the responsibility of the designer to provide site-specific detail when necessary. For example, although MT-110.10 (in Note 5B) calls for a maximum grade of 5 percent and a maximum cross slope of 2 percent for temporary walkways, there could be specific locations where the profile of the existing street and sidewalk are at 5 percent or greater. In such a case, the designer should specify in the plans the appropriate criteria to be applied at the specific site. It is suggested that under conditions where pedestrians are detoured into the curb lane, the elevation of the temporary walkway be raised to that of the sidewalk in order to eliminate the need for ramps between the sidewalk and the roadway elevations.

640-26 Advance Work Zone Information Signs

Advance work zone information signs may be required as part of the maintenance of traffic plan for major construction projects. Their need is usually determined by the Corridor Traffic Management Team during their review of the project. These signs are fixed message types and advise the road user of alternate routes, possible delays, etc. The signs are generally located at extreme distances from the work area.

To ensure uniformity in the design and application of these signs, the following guidelines will apply:

1. These signs shall be shown in the plans whether supplied by the contractor or by others. This choice shall be clearly indicated in the plans. The normal procedure is for the contractor to provide the signs.
2. The location of the signs shall be field checked by the designer to ensure that there are no conflicts with existing features or other signs in the area. The designer will assure that signs are not blocked by being too close to other signs and that the motorist has sufficient time to read, understand and act on the information provided by all the signs.

3. The plans shall indicate the legend, level and size of the signs. The signs shall be considered Supplemental Guide Signs as described in the OMUTCD Section 2E.35 and Tables 2E-2 and 2E-4.

4. The signs shall be black on orange, including a black border. The layout shall conform to the OMUTCD and SDM Appendix C.

5. Where appropriate, advance work zone information signs shall make use of the same exit numbers, route numbers, directions and destinations as shown on the permanent Guide Signs.

6. In some instances, instead of providing separate installations, it may be desirable to modify existing overhead Guide Signs. These changes are accomplished by providing black-on-orange overlays to cover portions of the existing signs. Letter size on these overlays should be the same as on the existing signs. When lane arrows are to be covered, a blank overlay should be placed over each of the affected arrows. When a ramp is being closed, rather than using a blank overlay to cover the entire sign, the legend “EXIT CLOSED” should be used on a diagonal overlay (lower left to upper right) on the sign. The size of lettering on overlays and the size of the overlay shall be indicated in the plans. The minimum letter size for the diagonal “EXIT CLOSED” overlay shall be 12” C.

7. When regulatory information is provided, it shall be displayed separately as a standard black-on-white sign. Mixing of black-on-white regulatory information on a black-on-orange information sign is prohibited.

8. If the road user is being detoured or if an alternate route is provided, the route should be signed with assemblies consisting of the appropriate black-on-orange (DETOUR or ALT) marker with a standard Route sign and arrow plate. If more target value is desired, this trail blazer information may be shown on an orange panel, M2-H3 type. See OMUTCD Section 2D.32.

9. Route Sign assemblies shall be sized according to the type of road on which they are located in accordance with the OMUTCD.

10. Supports for sign installations shall conform to all existing standards for permanent signs. These signs should not be attached to existing supports.

11. All advance work zone information sign installations located outside of the project work limits shall be paid for under appropriate CMS 630 items (signs, supports, concrete, breakaway connection, overlay, removal, etc.). This requirement does not apply to advance Warning Signs or to sign installations within the work limits.

640-27 Retiming of Existing Traffic Signals

Modifications to the normal traffic flow often create a need to retime existing traffic signals within the work zone and/or around the work zone along detours, alternate routes, or parallel arterial streets. The plans shall include revised signal timing where necessary. The District will determine whether it will be the responsibility of the consultant to determine the timing or whether the timing will be provided by the District or local agency, to be included in the plans by the consultant.

Where work zones are located on freeways, signal timing revisions may be found necessary in
order to accommodate increased volumes at exit ramps where it is expected that there will be a significant increase in volume due to work on the mainline or due to closure of a ramp at an adjacent interchange.

Where signals are located within a work zone, signal retiming may be found necessary to improve capacity on the legs of the intersection where lane reductions are in effect.

In addition to retiming of signals at exit ramps and within work zones, it may also be necessary to retime additional signals as follows:

1. At nearby signals which are coordinated with the signal at the exit ramp or within the work limits.
2. Along routes which are designated as detour or alternate routes.
3. Along parallel arterial streets which are expected to carry additional volumes due to closure of entrance ramps or due to increased exit ramp volumes.
4. Closed loop systems at locations where a series of entrance ramps is closed to reduce mainline volumes.

It may be necessary to retime the signals with each phase of construction. Where traffic is detoured in only one direction per construction phase, signal timing along detours should be timed to allow progression in the direction of the detoured traffic.

640-28 Freeway/Expressway Termination (“Permanent”)

Occasionally there may be a need for “permanent” termination of a freeway/expressway. Such termination will be located at an interchange, forcing all traffic to exit at that point. This is not a work zone. Such a condition differs from that which is discussed in Section 641-17 in that this termination point would be somewhat “permanent.” Construction of a section of new roadway may have been built and open to traffic while the adjacent section of roadway is not yet built and may not be built for several years, if at all.

If it is expected that the construction of a section of new highway will create such a condition upon completion, it will be the responsibility of the designer to address this condition in the permanent traffic control plans for the project.

The designer may use SCD MT-99.50 as a guide to develop the permanent traffic control plan at such location. Taper rates for lane closures and shifts shall be as shown in MT-99.50. Advance signing shall be by use of extrusheet Guide Signs as shown in MT-99.50. However, the arrow boards and portable changeable message signs shown in MT-99.50 will not be appropriate for use in this or any other permanent traffic control condition.

Use of drums in permanent situations is not appropriate. A section of pavement which is to be permanently closed shall be separated from the open traveled lanes by use of PB. The PB shall be located parallel to and offset approximately 4 feet from, the edge line along the shifting taper. Upstream from the shifting taper, the PB shall be continued at the same taper rate as the shifting taper.

Where the PB is located parallel to and within 5 feet of the traveled lane, object markers shall be provided on the PB at 50 foot spacing.

Any pavement between the edge line and the PB shall be marked with transverse lines at 100 foot spacing. It is recommended that raised pavement markers be provided along the edge line where the PB does not run parallel to the edge line.

The designer should keep in mind that, as this is not a work zone, orange is not generally an
appropriate color for any traffic control devices under such conditions. For example, barricades, under such conditions, shall contain red and white diagonal stripes rather than orange and white.
641 PLAN PREPARATION / PRODUCTION

641-1 General

The **L&D Manual Volume Three** describes ODOT plan preparation and production guidelines and standards. Maintenance of Traffic (MOT) plans are addressed in *Chapter 1306* of that manual. Additional information specific to MOT plans is provided in this Chapter and *Chapter 640*. The detail needed in MOT plans depends on the complexity of the project. Adjustments in the field may be necessary when unforeseen circumstances arise.

The following sections provide information about various components of the Temporary Traffic Control (or MOT) Plan, including detail information about Traffic SCDs and PISs.

641-2 Temporary Traffic Control / Maintenance of Traffic (MOT) Plans

641-2.1 General

As noted in *Section 602-2*, Temporary Traffic Control (or MOT) Plans are used to describe the temporary traffic control measures that are to be used for facilitating the road users through a work zone. These plans play a vital role in assuring a continuity of safe and efficient traffic flow through the work zone.

641-2.2 Plan Sheets

The traffic control plan may include plan sheets for each sequence of operation, to show all temporary signing and pavement marking applicable to the phase. Additionally, removal or covering of non-applicable signs should be indicated on the plan.

641-2.3 Plan Notes

Standard maintenance of traffic Plan Notes are in *Chapter 642*. Additionally, the designer must provide notes to explain any requirements of the contractor which are not covered in the standard notes or elsewhere in the plans or the specifications.

641-2.4 Sequence of Operation Notes

The designer should also provide sequence of operation notes in order to insure that the traffic is maintained as may have been agreed upon by ODOT and the public. For additional information regarding development of a sequence of operation, see *Section 640-3*.

641-2.5 Designer Notes

In addition to the information found throughout this Part of the TEM, Designer Notes specifically related to the Standard Construction Drawings (SCDs) have been included in this Chapter. Designer Notes have also been included with the Plan Notes in *Chapter 642*.

641-2.6 Quantities

As shown in CMS 614 and in the Item Master, many of the traffic control quantities should be itemized, including signing, pavement marking and concrete barriers. (The Item Master and the Summary of Contracts Awarded are both available from the Office of Estimating.) Non-itemized quantities will be paid for as Item 614 Maintaining Traffic.

641-2.7 Plan Reviews

The MOT plan for all projects on Interstates and Interstate Look-alikes with construction cost expected to exceed $10,000,000 shall be submitted to the Multi-Lane Coordinator (MLC) at
each stage of development as per Policy 516-003(P), Section II B1(c). This policy is included in Chapter 1511.

Other MOT plans may be submitted to the Office of Traffic Engineering (OTE) Traffic Control Section for review/advice.

641-2.8 Waiver Approval

Lane closures shall meet the requirements of the permitted lane-closure schedule provided in Section 630-4. Any request for exception to this lane-closure schedule shall be submitted for waiver approval to the MLC. Any waiver request, if not submitted for review and approval during the planning stage, should be submitted as soon as possible during the design stage so that the MOT plan can be developed accordingly.

641-3 Traffic Plan Insert Sheets (PISs)

Traffic PISs are addressed in general in Chapter 104. They are addressed as appropriate throughout the text of this Manual; and this Chapter provides specific information about the application of most of the traffic-related Traffic PISs. Traffic PISs are used in a plan as a plan sheet. They can be used as is or modified as needed. They are available from the OTE website (http://www.dot.state.oh.us/Divisions/Operations/Traf/publications2/PISs/Pages/) and from the Design Reference Resource Center (DRRC) (http://www.dot.state.oh.us/drrc/Pages/).

641-4 Standard Construction Drawings (SCDs)

SCDs are addressed in general in Chapter 103. They are addressed as appropriate throughout the text of this Manual; and this Chapter also provides specific information about the application of most of the traffic-related SCDs. A list of applicable SCDs is to be included on the title sheet. The Traffic SCDs are available from the ODOT website from the Design Reference Resource Center (DRRC) (http://www.dot.state.oh.us/drrc/Pages/default.aspx) and from the OTE website (http://www.dot.state.oh.us/Divisions/Operations/Traf/publications2/SCD/Pages/).

641-5 Closing Right or Left Lane of a Multi-lane Divided Highway (MT-95.30, 95.40 and 95.50)

641-5.1 General

SCD MT-95.30 depicts traffic control for closing the right or left lane of a multi-lane divided highway using drums. MT-95.40 is used when construction procedure or the condition requires that the work area be protected by portable barrier (PB) in accordance with Section 605-14. MT-95.50 incorporates Speed Limit signing and Increased Penalty signing with the lane-reduction signing called for in MT-95.30 and MT-95.40. MT-95.50 also provides additional Advance Warning Sign Groups. These sign groups, when used, are in addition to the advance signing provided in MT-95.30 and MT-95.40.

The designer should check the existing median width to determine if sufficient width exists for erection of the median signs. If not, a smaller size median sign should be specified in CMS 614 Maintaining Traffic.

For some work area locations, it may be desirable to provide additional safety devices such as portable changeable message signs (PCMSs), and truck-mounted or self-contained impact attenuators. When required, these units must be specifically identified in the plans. When included, these items shall have separate notes and/or details as well as separate pay items.

641-5.2 Advance Warning Sign Groups

SCD MT-95.50 allows the designer to require extra Advance Warning Sign Groups (AWSGs)
when traffic is expected to back-up beyond the standard advance Warning Signs. Whenever this SCD is specified in a plan, the designer should analyze the anticipated traffic demand, peaking characteristics, capacity and expected queue lengths, and include this analysis with the preliminary Maintenance of Traffic submission. If the queue is expected to extend beyond the normal ROAD WORK AHEAD sign (W20-1), extra AWSGs should be specified in the Item 614 Maintaining Traffic Plan Note (see Sections 642-2 and 642-33). The first extra AWSG should be located a distance, in whole miles, in advance of the lane taper which is at least equal to the longest anticipated queue length. Additional AWSGs should be located at 1 to 2 mile intervals between the first AWSG and the normal Warning Signs location. AWSGs would typically be specified for 2 miles, 3 miles, 5 miles and 8 miles up to the distance needed to deal with the anticipated queue.

If the construction will extend over a holiday period, or any other anticipated period of unusually high traffic demand, a separate queue length analysis should also be made for that period. This condition may require more AWSGs and Plan Note 642-34 (Section 642-34) would be used.

The Plan Note (Section 642-33 or 642-34) added within Item 614 Maintaining Traffic should specify the distance (in whole miles) on the W16-3a Distance plaque which is placed below the RIGHT/LEFT LANE CLOSED AHEAD sign (W20-5, W20-5a). This sign should be located approximately 1 mile in advance of the calculated end of the queue. The distance shown on the plate should be the distance to the beginning of the lane taper.

641-5.3 Advisory Speed Plaque (W13-1)

Advisory Speed Plaques are described in OMUTCD Sections 2C.08 and 6F.52. The designer may specify the use of the Advisory Speed plaque (W13-1) by a Plan Note in Item 614 Maintaining Traffic. Unless specified, this plaque would only be used when directed by the project engineer. The designer may also specify the speed to be shown. An advisory speed reduction, if any, would normally be 10 miles per hour. If the speed is not specified, the speed is as directed by the project engineer. If the statutory speed limit has been altered by establishment of a lower legal speed limit for the construction activity, the Advisory Speed plaque should not be used.

641-5.4 Pavement Markings

The work zone edge line parallel to the roadway (i.e., beyond the taper edge line) is used only when specified by the plans. The use should be specified in the Item 614 Maintaining Traffic Plan Note with an estimated quantity carried to the General Summary. See the notes on SCD MT-95.30 or MT-95.40, and CMS 614.11 for the type of work zone line to specify. Use of this line should be based on engineering judgment and include consideration of the length of the work, time of the closure, sequence of the work, including any need to remove the line in subsequent phases, encroachment on other lanes or the shoulder, the type of work, the geometrics in the area, and the relative cost of paint and work zone tape.

641-5.5 Illumination

In cases of unusual horizontal/vertical curvature, the designer may want to provide illumination of the taper area(s) depending on traffic volumes, accident history or patterns (particularly those involving crossing of the center line). See Part 11 of this Manual for general lighting design principles. For guidance in unusual situations, the Office of Traffic Engineering should be contacted.

For guidance in use of temporary lighting for crossovers, see SCD MT-100.00 and Plan Note 642-35 in Chapter 642. For floodlighting see Plan Note 642-29 in Chapter 642.
641-5.6  Bid Items

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums, Flashing Arrow Board, Warning Lights and Shadow Vehicle.

The following items will be shown as separate quantities in the plans, when required:

Item 614, Work Zone Edge Line, Class 1 (By Type) Mile
Item 622, Portable Concrete Barrier, ___" Foot
Item 614, Barrier Reflector Each
Item 614, Work Zone Impact Attenuator Each
Item 614, Object marker, _____-way Each

641-6  Closing Right or Left Lane of a Multi-lane Undivided Highway (MT-95.31, 95.32 and 95.41)

641-6.1  General

SCDs MT-95.31 and 95.32 depict traffic control for closing the right and left lane, respectively, of a multi-lane undivided highway using drums. MT-95.41 is used to close the right or left lane on a multi-lane undivided highway when construction procedure or the condition requires that the work area be protected by portable barrier (PB) in accordance with Section 605-14.

The designer should evaluate the possibility or extent of encroachment into open traffic lanes. This evaluation should include consideration of the existing geometrics (including lane and shoulder widths), the type of work being performed during the various construction stages and any additional width required for location of drums or cones and for work zone edge line when used. Depending upon the available lane width of the right lane, for the left-lane closing in SCD MT-95.32, it may be necessary to shift traffic onto the shoulder using drums or cones and/or work zone edge line. In this case, consideration should be given to removal of the existing right edge line.

For the right and left-lane closings shown in SCDs MT-95.31 and 95.32, if the traffic or any of the traffic control devices are expected to encroach on or over the center line, it may be necessary to close the left lane of opposing traffic, in accordance with MT-95.32. For short-term daylight closures, it may be possible to narrow the opposing lanes or shift them onto the shoulder using cones for guidance. Engineering judgment is necessary to determine the best solution. This evaluation should include consideration of the geometrics, traffic volumes and speeds, traffic composition and duration of the work.

For some work area locations, it may be desirable to provide additional safety devices such as portable changeable message signs (PCMSs), and truck-mounted or self-contained impact attenuators. These units when required must be specifically itemized in the plans. When included, these items shall have separate notes and/or details as well as separate pay items.

641-6.2  Advance Warning Sign Groups

Additional Advance Warning Sign Groups (AWSGs) should not normally be required. If an analysis should indicate the need for this group, see Section 641-5.2. In this case, SCD MT-95.50 shall be included in the plan with a reference in the Item 614 Maintaining Traffic Plan Note requiring additional AWSGs as shown on MT-95.50, except that median-mounted signs would not be used.
641-6.3 Advisory Speed Plaque (W13-1)

Advisory Speed plaques are described in OMUTCD Sections 2C.08 and 6F.48. The designer may specify the use of the Advisory Speed plaque (W13-1) by a note in Item 614 Maintaining Traffic (Section 642-2). Unless specified, this plaque would only be used when directed by the project engineer. The designer may also specify the speed shown (see OMUTCD Section 6F.48). An advisory speed reduction, if any, would normally be 10 miles per hour. If the speed is not specified, the speed would be as directed by the project engineer. If the statutory speed limit has been altered by establishment of a lower legal speed limit for the construction activity, the Advisory Speed plaque should not be used.

641-6.4 Pavement Markings

The work zone edge line parallel to the roadway (i.e., beyond the taper edge line) is used only when specified by the plans. The use should be specified in the Item 614 Maintaining Traffic Plan Note (Section 642-2) with an estimated quantity carried to the General Summary. See the notes on SCD MT-95.31, MT-95.32 or MT-95.41, and CMS 614.11 for the type of work zone line to specify. Use of this line should be based on engineering judgment and include consideration of the length of the work, time of the closure, sequence of the work, including any need to remove the line in subsequent phases, encroachment on other lanes or the shoulder, the type of work, the geometrics in the area, and the relative cost of paint and work zone tape.

641-6.5 Bid Items

The following items would normally be included with the lump sum bid for 614 Maintaining Traffic: Signs, Cones, Drums, Flashing Arrow Board, Warning Lights and Shadow Vehicle.

The following items will be shown as separate quantities in the plans, when required:

- Item 614, Work Zone Edge Line, Class 1 (By Type) Miles
- Item 622, Portable Concrete Barrier, _____ Foot
- Item 614, Barrier Reflector Each
- Item 614, Work Zone Impact Attenuator Each
- Item 614, Object marker, _____-way Each

641-7 Closure of a Two-Way Left Turn Lane (MT-95.60)

641-7.1 General

For some work area locations, it may be desirable to provide additional safety devices such as portable changeable message signs (PCMSs), and truck-mounted or self-contained impact attenuators. When required, these units shall have separate notes and/or details as well as separate pay items.

The designer should evaluate the possibility or extent of encroachment into open traffic lanes. This evaluation should include consideration of the existing geometrics (including lane and shoulder widths), the type of work being performed during the various construction stages and any additional width required for the location of drums or cones and temporary edge lines when used. Depending upon the available lane width of the right lane, it may be necessary to shift traffic onto the shoulder using drums or cones and/or a temporary edge line. In this case, consideration should be given to removal of the existing right edge line.

641-7.2 Advance Warning Signs Groups

Additional Advance Warning Sign Groups (AWSGs) should not normally be required. If an analysis indicates the need for this group, it would have to be included in the plan with a reference in Item 614 Maintaining Traffic that the additional AWSG(s) shall be included as
641-7.3 Advisory Speed Plaque (W13-1)

Advisory Speed plaques are described in OMUTCD Sections 2C.08 and 6F.52. The designer may specify the use of the Advisory Speed plaque (W13-1) by a Plan Note in Item 614 Maintaining Traffic. Unless specified, this plaque would only be used when directed by the project engineer. The designer may also specify the speed to be shown (see OMUTCD Section 6F.52). A speed reduction would normally be 10 miles per hour. If the speed is not specified, the speed would be as directed by the project engineer.

641-7.4 Bid Items

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums, Warning Lights and Shadow Vehicles.

641-8 Closure of Right Lane of Three-Lane Section with Two-Way Left-Turn Lane (MT-95.61)

641-8.1 General

For some work area locations, it may be desirable to provide additional safety devices such as portable changeable message signs (PCMSs), and truck-mounted or self-contained impact attenuators. When required, these units shall have separate notes and/or details as well as separate pay items.

The designer should evaluate the possibility or extent of encroachment into open traffic lanes. This evaluation should include consideration of the existing geometrics, including lane and shoulder widths, the type of work being performed during the various construction stages, and any additional width required for the location of drums or cones and work zone edge lines, when used. Depending upon the available lane width of the lane, it may be necessary to shift traffic onto the shoulder using drums or cones and/or work zone edge line. In this case, consideration should be given to removal of the existing right edge line.

641-8.2 Advance Warning Signs Groups

Additional Advance Warning Sign Groups (AWSGs) should not normally be required. If an analysis indicates the need for this group, it would have to be included in the plan with a reference in 614 Maintaining Traffic that the additional AWSG(s) shall be included as part of the signing required for SCD MT-95.61 (see Section 641-5.2).

641-8.3 Advisory Speed Plaque (W13-1)

Advisory Speed Plaques are described in OMUTCD Sections 2C.08 and 6F.52. The designer may specify the use of the Advisory Speed plaque (W13-1) by a Plan Note in 614 Maintaining Traffic. Unless specified, this plaque would only be used when directed by the project engineer. The designer may also specify the speed to be shown (see OMUTCD Section 6F.52). A speed reduction would normally be 10 miles per hour. If the speed is not specified, the speed would be as directed by the project engineer.

641-8.4 Pavement Markings

The work zone edge line parallel to the roadway (i.e., beyond the taper edge line) is used only when specified by the plans. The use should be specified in the Item 614 Maintaining Traffic Plan Note with an estimated quality carried to the General Summary. See the notes in SCD MT 95.61 and CMS 614.11 for the type of work zone line to specify. Use of this line should be based on engineering judgment and include consideration of the length of the work, time of the closure, sequence of the work, including any need to remove the line in
subsequent phases, encroachment on other lanes or the shoulder, type of work, geometrics in the area, and the relative cost of paint and work zone tape.

641-8.5 Bid Items

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums, Warning Lights and Shadow Vehicle.

The following item will be shown as a separate quantity in the plans, when required:

Item 614, Work Zone Edge Line, Class I (By Type) Mile

641-9 Median Crossover Operation (MT-95.70, 95.71, 95.82 and 100.00; PIS 209572 and 209573)

641-9.1 General

Median crossover operation using continuous PB, as shown in SCDs MT-95.70 and MT-95.71 and PISs 209572 and 209573, is a relatively sophisticated method of traffic control which is only suited to certain types of construction activities. Median crossovers shall be lighted, either by an existing lighting system or by provision of a temporary lighting system (MT-100.00). SCD MT-95.82 also provides additional information for this operation. These traffic control and lighting drawings supplement the temporary roadway plans for the crossovers.

Portable barrier (PB) details shall be included in the plan by reference to SCDs RM 4.1 and RM-4.2.

Median crossover operations shall be designed with the number of lanes necessary to provide adequate traffic capacity in each direction.

MT-95.70 presents the appropriate design for a single-lane crossover; and MT-95.71 presents the appropriate design for a multi-lane crossover. These designs are basically identical except that along single-lane operations greater than 3 miles in length the SINGLE LANE (W6-H3b) sign is to be erected at 1 mile intervals to keep the road users informed as to the distance remaining to the point where multi-lane operation will be resumed. Additionally, MT 95.70 provides for lane reduction prior to the crossover by closing the left lane. ODOT’s practice is to close the left lane when a lane reduction is necessary in advance of a crossover. MT-95.71 assumes that there is no lane reduction; however, if a lane reduction is provided in advance of a multi-lane crossover, both drawings should be included in the plans.

PISs 209572 and 209573 present a hybrid design, where one lane is detoured across the median while the remaining lanes are maintained to the right of the median through an area of part-width construction. This method of traffic control may have limited uses, but may be appropriate where bridge widths are not adequate to provide the minimum capacity by implementing standard part-width or standard crossover traffic control. As shown in PIS 209573, if exit ramps are located within a section of highway where the hybrid design is in use, it will be necessary to include appropriate signing in the plans to provide adequate guidance to these exit ramps. If no exit ramps are located within the highway section, the signing shown in PIS 209572 should be provided.

Operations which are forced to include a ramp or other complicating factor should usually result in the use of a Plan Insert Sheet specifically modified to show the individual situation.

Normally, the need for a median crossover operation will be determined from the Maintenance of Traffic Alternative Analysis (MOTAA).
641-9.2 Crossover Design

The design of crossover roadways is addressed in Sections 606-16 and 640-12. Careful choice of crossover locations is extremely important to the safe and efficient operation of this system. They should be located in tangent, level sections with both roadways on about the same profile elevations. They should avoid bridges, other structures and should be well spaced from interchanges, rest areas or other ramps. Existing signs in the area may have to be relocated, covered or overlayed. All crossover sites should be field checked to the extent that crossovers, tapers and advance signing are approximately located in the field.

Crossovers are normally located as a pair to facilitate their use on adjacent construction sections, but they may be separated in order to provide improved operational locations. Consideration should be given at this time to the extent of backups expected and any extra advanced warning which may be necessary due to queues of slow moving traffic.

641-9.3 Advisory Speed Plaque (W13-1)

Advisory Speed plaques are described in OMUTCD Sections 2C.08 and 6F.52. The Advisory Speed plaques (W13-1) shown in SCD MT-95.70 and PISs 209572 and 209573 will not normally be used on a project. Current practices, as discussed in Section 640-18, make a strong effort to assure that the design (i.e., speed of the crossover) is comparable to the statutory or revised legal speed of the highway. Careful choice of crossover locations, as discussed in Subsection 641-9.2, should eliminate any need to display the W13-1. However, in exceptional cases, where a local speed reduction may become necessary, Advisory Speed plaques may be added to the W1-4, W1-4b or W1-4c sign to warn the road users of the appropriate travel speed for the local conditions.

641-9.4 Pavement Markings

Notes in the drawing address the need to maintain appropriate pavement markings and eliminate conflicting ones. See Sections 605-11.10 and 605-11.11 and CMS Item 614.11 for additional information on work zone pavement markings. Also, see Section 605-11.12 and CMS Item 614.115 for information about work zone raised pavement markers.

641-9.5 Illumination

SCD MT-100.00 is intended for use to provide a lighting system for work zone median crossovers. The system is designed to light the entire width of the divided highway, from outside edge to outside edge of the permanent pavement, including the median in the vicinity of the temporary crossover.

SCD MT-100.00 provides for non-breakaway poles to be located beyond the clear zone, preferably 40 feet from the edge of pavement. This is acceptable only if fill slopes do not exceed 8:1, which they do not on most Interstate and other divided highways. If side slopes of greater than 8:1 are encountered without existing guardrail, see L&D Manual Volume One for increased setback.

The designer shall review the probable location of crossover lighting units in the field to assure reasonable placement with respect to ditches or other features. A work zone crossover lighting system shall be provided when an existing lighting system is not present. When a work zone crossover lighting system is to be provided, Plan Note 642-35 (Section 642-35) should be used.

The designer may develop a site-specific lighting plan for the crossover; however, the lighting plan must be approved by the Office of Traffic Engineering (OTE).
641-9.6 Provisions for Reverse Flow and Use of the Shoulder

The reverse traffic flow will be exposed to obstacles which do not affect the normal traffic flow direction (see SCD MT-95.82). Downstream bridge parapet ends, guardrail ends, etc. must be treated. Normally, additional lengths of temporary guardrail, turn-down anchors and appropriate guardrail to bridge parapet connections will be needed and should be provided separately in the plans. Normally temporary guardrail of this type will be removed to minimize future guardrail maintenance costs. Keep in mind that some existing guardrail-to-bridge parapet connections which are suitable for normal traffic flow direction are unsafe when traffic flow is reversed. The new approach end of the guardrail needs to be refit with an approved end treatment. Turn-down end treatments are not allowed in the clear zone.

Where traffic flow is reversed, additional Type 3 Object Markers (OM-3) and barrier reflectors should be provided to guide this traffic. Type 3 Object Markers, also known as Bridge End Markers, are addressed in OMFUTCD Section 2C.63; and barrier reflectors are addressed in more detail in Chapter 307, Section 605-19 and CMS 626 and 720.04.

The designer shall field review the section of road since traffic will be flowing in the opposite direction from normal, and if a paved shoulder will be used as a traffic lane, the review should determine:

1. If any bridge parapets, safety curbs, etc. restrict the width available for the lane throughout the remainder. If this construction would bring the available lane width to less than 10 feet, the shoulder should not normally be used. Even if 10-foot or more lanes are still provided, the obstruction should be well delineated. Bridge End Markers (OM-3) and barrier reflectors on guardrail or parapets will usually be desirable and may be reduced to 25 foot spacing when very close to the traffic lane. When old style safety curbs are encountered, they should be painted (retroreflective curb markings) on the approach ends and trailing ends, and barrier reflectors should be applied to the top of the curb to delineate it.

2. If existing signs need to be moved. Existing signs within 12 feet of the temporary lane should be reviewed.
   a. Signs behind guardrail: Those at least 4 feet behind face of guardrail will not be a problem, and probably as little as 2 feet behind rail will be acceptable. Signs closer than 1 or 2 feet to face of rail and less than 6 feet from the temporary lane are likely to be damaged and, if possible, should be moved further from the road.
   b. Signs not behind guardrail: Major signs on breakaway supports (not behind guardrail) are usually located 30 feet or more from the edge of the through lane and will not normally be a problem. Any major sign which is closer than 12 feet to a temporary lane should be considered for moving back to 30 feet or more from the permanent lane if conditions permit. Since moving signs back enhances overall safety, this work should not be considered incidental to maintaining traffic but should be defined with normal permanent sign plan requirements (elevation views, bid items, removal of sign, removal of support, (new) sign support, signs, breakaway connections, etc.).
   c. Major signs in the median: Major signs on breakaway supports located in the median will not function properly if struck by counter-flow traffic. When these signs are within 30 feet of traffic lanes and not otherwise shielded from counter-flow traffic the following steps should be considered:
      i. In many cases, the legend may not be considered essential during construction (County or City Limit signs, etc.) and the sign can be removed, safely stored and later re-erected
      ii. Some breakaways can be modified by replacing the hinge plates with additional
fuse plates (fuse plates on both sides of beam).

d. Minor signs (on drive posts) are normally located 6 feet from edge of shoulder and this is considered adequate. Any found to be less than 6 feet from the paved shoulder should be considered for relocation.

In some cases, signs can be relocated longitudinally to put them behind guardrail provided for other purposes.

3. If the shoulders are adequate. Shoulders which will be used for traffic flow should be checked to determine if they will support the anticipated loads without becoming too rough to be serviceable. Overlays, and possibly full-depth shoulder replacement, may be needed.

When two lanes will be provided in one direction by using the shoulder, the line separating them will be coincidental with the permanent edge line. Rather than require a contractor to remove parts of an existing white edge line to convert it to a standard dashed lane line, it is permissible to allow it to remain as a solid white lane line (OMUTCD Section 3B.04).

**641-9.7  Bid Items**

It is intended that separate bid items be included for the following items:

| Item 614, Object Marker, _____-way | Each |
| Item 614, Work Zone Pavement Markings (by type) | Foot |
| Item 614, Work Zone Raised Pavement Marker | Each |
| Item 614, Temporary Impact Attenuator | Each |
| Item 622, Portable Concrete Barrier, ____" | Foot |
| Item 622, Portable Concrete Barrier, with Glare Shield or 50" high | Foot |
| Item 614, Work Zone Crossover Lighting System | Each |
| Item 614, Barrier Reflectors (by type) | Each |
| Item 630, Signs (Permanent) | |
| Item 630, Supports (Permanent) | |

The lump sum for **Item 614 Maintaining Traffic** will cover all other work needed to place, maintain and remove the TLTWO including the following items:

- Temporary Signs and Supports
- Drums and other channelizing devices
- Flashers and lights on signs
- Flashing arrow boards
- Removal and replacement of raised pavement marker reflectors
- Removal of conflicting existing or work zone pavement markings (this is specifically incidental to **Item 614 Work Zone Pavement Markings**)
- Temporary Guardrail, Type 5
- Temporary Bridge Terminal Assemblies

**641-10  Signalized Closing, One-Lane of a Two-Lane Highway (MT-96.11, 96.20 and 96.26)**

**641-10.1  General**

This standard drawing is to be used where it is necessary to close one lane of a two-lane highway and where the longer length of time of the closure would not lend itself to the use of a flagger. Hazards under these conditions are typically protected by concrete barrier as shown in the drawing. A typical application of this drawing would be part-width bridge construction. However, if the work does not result in the development of significant drop-offs or other significant hazards to the workers or the road users, the designer may consider...
calling for drums to be used.

The end of a concrete barrier, if not treated properly, can represent the most hazardous part of the installation. Therefore, wherever practical, the exposed end of the PB should be terminated outside the clear zone. When the design speed is greater than 40 miles per hour and the barrier is located within the clear zone, consideration should be given to terminating the barrier with a work zone impact attenuator.

Where PB is located beyond the edge of the paved shoulder, the cross slope within the clear zone, including the surface on which the PB is place, shall be graded at 10:1 or flatter. If the cross slope is steeper than 10:1, the PB shall be terminated on the paved or graded surface rather than on the cross slope. The PB shall be extended along the paved or graded surface as necessary to satisfy the length of need (see L&D Manual Volume One, Section 602.1.2), and then terminated using an impact attenuator.

In the majority of the cases, it will be necessary to construct temporary pavement or rebuild the shoulders to maintain a minimum desirable lane width. This lane width should be the width of the approach lane, but in no case less than 10 feet. Wherever possible the lane width shall be in addition to a 1 foot offset (preferably 2 feet) from any guardrail or concrete barrier. A separate sheet will be required in the plan to show the details necessary to construct the temporary pavement, as well as the actual width of the pavement to be closed.

These signalized closing treatments provide high visibility of one side of the single lane (PB with reflective panels, barrier reflectors and object markers, or retroreflectorized drums). However, similar night visibility is not assured for the roadside away from the work. If a hazard beyond the shoulder, or a constriction such as a bridge parapet or guardrail, exists on that side, additional devices (retroreflective panels, barrier reflectors, etc.) should also be specified on that side to provide a more balanced outline of the maintained lane.

If adequate room is not available to set up the zone because of driveways or intersections, revision will be required as a separate Maintenance of Traffic Plan Sheet, with the provisions of the SCD being adhered to wherever possible.

Where pedestrians are likely to try to pass through the construction area, reasonable provision shall be made for them. If pedestrian traffic is significant, a designated path may be necessary. See Sections 603-2 and 640-25 for further information on accommodating pedestrians.

Simple, two-phase traffic signal systems shall not be used for situations where traffic, including contractors’ vehicles, will be entering the traffic stream, from the work site, between signals. Such intermediate access points shall be kept to a minimum, or avoided completely if possible. If traffic must enter the traffic stream at intermediate locations, an additional signal shall be located at each such location. Each such signal shall be traffic actuated.

The traffic signal system may either be constructed of standard signal components conforming to SCDs MT-96.11, 96.20 and 96.26, or it may be a portable traffic signal (PTS) which is essentially self-contained and mounted on trailers (see Section 605-13.3).

641-10.2 Duration of Work

As noted in Section 605-13.2 for temporary traffic signals which will be in continuous operation for seventy-two hours or less, pavement marking shall be as shown in SCD MT-96.11 (see Section 641-10) with the following exceptions:

1. Temporary pavement markings are not required.

2. Removal of existing conflicting pavement markings is not required if drums (or cones during daylight hours only) provide continuous positive guidance for vehicles.
641-10.3 Capacity and Flow Rates

The maximum length of one-lane operation for one-way traffic signal control is determined by the capacity required to handle the peak-hour demand. Table 697-2 summarizes these conditions.

The hourly rate of flow figures shown in Table 697-2 may not be readily available during the initial analysis of signal timing. In those cases, ADT data from readily available reports published by the Office of Innovation, Partnerships and Energy may be used to develop hourly rates of flow. Two factors should be used in this conversion: the peak hour factor (PHF) and “K.”

The peak hour factor (PHF) relates the average peak hourly flow to the peak 15-minute flow during the peak hour. If other information is not available, PHF= .90 may be assumed.

“K” relates the peak hour volume to the average daily traffic. If other information is not available, K=0.10 may be assumed.

Using these factors, an approximate hourly rate flow can be determined:

Approximate Hourly Rate of Flow = ADT x K/PHF

EXAMPLE: 9000 (ADT) x 0.1(k)/0.9 (PHF) = 1000 vehicles per hour

This flow rate can then be used in Table 697-2 by finding the approximate hourly rate of flow in the proper column which defines the length of the one-lane operation (from Stop Line to Stop Line). Moving to the left in the table, the total signal cycle length is determined. If the cycle length is considered acceptable, it can be used to help determine the individual signal interval times.

A more accurate method of determining hourly rates of flow is necessary when the closure length is long or traffic volumes are high. When the estimated traffic ADT and closure length exceeds that shown in Table 697-8, collection of more detailed traffic data and more refined analysis of signal timing is recommended.

In these cases, actual current traffic counts should be obtained and analyzed to identify various peak periods for weekdays and weekends, noting particularly any directional imbalances occurring during the peaks. Where traffic patterns are determined to be repetitious and there is significant disparity between peak and off-peak traffic, or there are major differences between various peak periods, then a signal controller capable of adjusting timing to suit the anticipated traffic flows should be selected.

This can be accomplished in either of two ways:

1. Use of a multi-plan, time-of-day (TOD) controller and time clock to provide preselected timing patterns to suit the various peaks and off-peak times. As compared to the following alternate, this system is less expensive in terms of hardware and installation, but it requires more accurate (and expensive) traffic data collection and analysis to choose appropriate timing patterns and their hours of operation. One, or perhaps two weeks of hourly, directional counts may be needed to develop reasonably reliable timing plans. Once implemented, this system will usually be relatively maintenance free, but if traffic patterns change during construction, additional data collection and retiming may be necessary. The District should be prepared to monitor the system operation and provide data collection and timing changes when warranted.

2. A traffic-actuated controller with detectors in advance of each end of the work zone will also compensate for changing traffic patterns. Fully traffic-actuated operation is normally employed once carefully selected controller timing is implemented. The units should
adapt to most changes in traffic volume and provide good operation. When compared to
the first alternate above, the hardware and installation costs for detection will increase
initial installation costs. Also, detectors can be expected to fail or require readjustment
during construction, thus increasing maintenance costs. On the other hand, unexpected
changes in peak-period demand or timing will usually be accommodated automatically,
thus negating the need for signal retiming. The District should still be prepared to
monitor the signal operation for failure or inappropriate timing.

Where analysis of the traffic data shows that peak periods are not predictable in terms of
magnitude, predominant direction of flow or time of occurrence, actuated operation will be the
most appropriate choice.

Any existing traffic signals within one-half mile must be taken into account when determining
the effect of signal operation. Coordination, or modification of the existing signal, may be
appropriate in cases where queues from one signal may interfere with the operation of the
other.

Analysis of signal timing and traffic capacity should assure that the anticipated traffic can be
accommodated, or signalized operation of this sort should not be included in the project.

Plan Notes 642-36 and 642-37 (Sections 642-36 and 642-37) should be included in the
plans to obtain multi-plan, time-of-day or an actuated controller when appropriate.

641-10.4 Traffic Signal Details

SCDs MT-96.20 and 96.26 will be required when MT- 96.11 is used. Supplemental
Specification 961 and Supplement 1050 for portable traffic signals will also be required.

Under light traffic the signal will normally operate in a pretimed mode using a simple pretimed
controller, or using an actuated control in a pretimed mode (no detectors, recalls on). However, under certain conditions it may be desirable/necessary to use actuated control with
detection or to require a multi-plan pretimed control (see SCD MT-96.20).

The plan shall show necessary signal timing (see Tables 697-3 and 697-5).

Sheet 2 of MT-96.11 provides information regarding signalization of intermediate side-road
approaches located within the limits of the two-way operation of the single lane. Two
locations are shown for the side-approach signal heads; a near-side location “A,” and a far-
side location “B”; the far-side location being the preferred location. At least one of the signal
heads per side approach shall be located as per OMUTCD Figure 4D-4. The stop line shall
be located accordingly.

The detection on the side approach should be set in the lock mode. For the mainline
approaches to the single-lane operation, consideration should be given to setting these
approaches on recall.

At special locations, such as where an intersection is located immediately in advance of the
lane reduction, as shown at the left side on Sheet 2 of MT-96.11, a special site-specific detail
should be provided in the plans. A conventional simple span might be appropriate at such
locations. It is the responsibility of the designer to design an appropriate signal for such sight-
specific locations.

641-10.5 Pavement Markings

Work Zone pavement markings are required in all cases, except as noted otherwise in
Section 641-10.2, as follows:

1. Work Zone Stop Lines, Class I: at each end of the work.
2. Work Zone Center Lines, Class I: double solid for 150 feet from each Stop Line.

3. Work Zone Edge Lines, Class I: 740.06, Type I tape, white, along the merge tapers.

4. Work Zone Edge Lines, Class I, white, along the single-lane, two-way operation. Paint may be used if not on the final surface course. Type I tape, 740.06, shall be used if on the final surface course.

The requirements for work zone pavement markings are contained in CMS 614.11.

641-10.6 Driveways and Side Roads

Driveways and side roads intersecting within or close to the one-lane portion of the temporary traffic control zone should be considered and treated uniformly. The following alternatives should be considered, with the earlier being considered more desirable than those later on the list:

1. If the drive or street is very close to one end of the one-lane, two-way segment, determine if the signals and Stop Line can be relocated sufficiently to place the intersection outside of the one-lane area.

2. Where drives or streets have low to moderate traffic volumes, consider erecting signs (a STOP sign plus a No Left/Right Turn sign) to allow traffic to only turn away from the central area of the work zone. This treatment is only feasible if cross-corner sight distance in both directions is good and if the near-end of the one-lane segment can be easily seen.

3. Where a residential drive or minor commercial drive is involved, if the work length is very short (perhaps less than 200 feet) and a driver stopped on the drive has good visibility to both ends of the work and both approaches, it may be reasonable to impose only stop control on the drive traffic.

4. Where a public road or alley is involved, consider closing that approach to the intersection, or possibly making it one way away from the work area. This will require discussion with the local agency responsible for the side road. Provisions shall be made for additional ROAD CLOSED signs, Detour signs, ONE WAY signs, DO NOT ENTER signs and other Regulatory Signs.

5. If a driveway serves a business, group or property which also has another usable drive, close the drive in question, after informing owners and tenants of the intended action. Minor widening or improvement of the alternate drive may be considered to provide similar access and to avoid major complaints or litigation.

6. Provide a temporary driveway or minor relocation of the side street to move the entering traffic away from the one-lane segment.

7. If less intrusive methods are not feasible, consider providing another actuated signal phase, complete with at least two signal heads, for the side street or drive. Prior to approval of this method, the designer must obtain projected hourly traffic data for a typical weekday (and weekend if traffic is critical) in order to perform capacity analysis for critical periods. Capacity analysis resulting in poor levels or service will normally preclude use of this treatment.

8. Provision of flagger or control by law enforcement officers.

641-10.7 Lighting

Typically lighting will not be required for signalized closings 1 lane or a 2-lane highway.
However there may be some locations where the designer may find a special need to provide lighting. Examples of need for such lighting might be the existence of an intersection at the point of the lane closure, or poor geometrics or poor sight distance at the point of the lane closure.

The Plan Note for Work Zones Lighting System, found in Section 642-39, shall be included in the plans when lighting is required at the points of lane closure.

When lighting is called for, it shall be paid for as Work Zone Lighting System. Quantities shall be provided in the sub-summary for each phase of maintenance of traffic. If it is expected that lighting will be of the conventional type, the lighting shall be paid for per Each.

**641-10.8 Field Reviews**

A field review, by the designer, is required to verify the proposed locations of PB, drums, pavement markings, signal heads, signs and other features for each phase of the project. Each element shall be tentatively located according to the requirements of the SCD and plans to assure adequate visibility and to assure that the controls will be effective. Signal heads shall be visible no less than 215 feet in advance for 25 mile per hour approaches, 325 feet for 35 mile per hour; 460 feet for 45 mile per hour and 625 feet for 55 mile per hour approaches. Signs shall be visible at least 250 feet in advance. Reviews should consider the effects of summer foliage. Any existing traffic controls or other physical features which will detract from safe and efficient operation should be dealt with in the plans. The field check shall also verify that there will be adequate room to perform construction behind barriers or channelizing devices, and that available pavement widths will be sufficient to maintain traffic. The need for temporary pavement or pavement strengthening to carry maintained traffic shall be considered. Changes deemed necessary as a result of this field check shall be incorporated into the MOT Plans by providing details or descriptive notes in the plans. These may include revised locations for signs, signals, pavement markings, PB or other devices. They may also include requirements to use overhead-mounted signals or additional signals or other control devices and could include requirements to remove foliage on the right-of-way.

When actuated signals are necessary, Plan Note 642-37 (Section 642-37) should be included in the plans.

When overhead-mounted signals are necessary, Plan Note 642-38 (Section 642-38) should be included in the plans.

**641-10.9 Bid Items**

In an effort to obtain consistency in the bidding procedure the following pay items should be used, as required:

Item 615, Pavement for Maintaining Traffic, Class _____  Sq. Yd.
Item 614, Work Zone Edge Line, Class I   Mile
Item 614, Work Zone Center Line, Class I   Mile
Item 614, Work Zone Stop Line, Class I   Foot
Item 622, Portable Concrete Barrier, _____”   Foot
Item 614, Barrier Reflector   Each
Item 614, Object Marker, _____-way   Each
Item 614, Work Zone Lighting System   Each

All other items will be included in Item 614 Maintaining Traffic.

**641-11 Flagger Closing One Lane of a Two-Lane Highway (MT-97.10, 97.11 and 97.12)**

SCD MT-97.10 depicts a typical application using a flagger to close one lane of a two-lane highway for a stationary operation. The distance (“A”) provided from the Flagger Ahead sign
(W20-7a) to the flagger assumes light to moderate traffic with no substantial back-up, thus the distance allows for a typical back-up of cars plus adequate distance to slow from the approach speed to a stop at the end of the queue. Other locations with heavier traffic or a longer work area will increase the queue length build-up just before traffic is released. The designer should increase distance $\Delta A$ by Plan Note when calculations show the need. Further, MT-97.10, allows the project engineer to increase sign spacing based on expected or actual field conditions at any time.

SCDs MT-97.11 and 97.12 were developed specifically for use during a paving operation on a two-lane road. Therefore, one shall be included with each two-lane resurfacing plan. SCD MT-97.11 should be used with all non-Federal two-lane resurfacing projects. MT-97.12 shall be used with all Federal two-lane resurfacing projects.

MT-97.11 and 97.12 provide guidance for traffic going through a paving operation by the use of flaggers and traffic cones. They provide for the use of cones placed laterally across the lane being paved at roads intersecting the closure, and attempt to keep the work area length to a minimum and keep the advance signing and the flagger grouped together.

All items shown on these drawings will be included in the lump sum bid for Item 614 Maintaining Traffic.

641-12 Lane Closure at Entrance Ramp (MT-98.10 and 98.11)

SCDs MT-98.10 and 98.11 generally address lane closures in the vicinity of entrance ramps. SCD MT-98.10 applies primarily to major reconstruction work, where the work extends beyond the acceleration lane, upstream and downstream on the main line and upstream on the ramp. SCD MT-98.11 applies to isolated work areas located primarily on the mainline, in the through lane adjacent to the acceleration lane of the entrance ramp.

Each of these SCDs includes separate details drawings. Work location determines which detail is used.

SCD MT-95.30, which pertains to lane closures on the mainline, shall be used as a companion drawing whenever MT-98.10 or 98.11 is used. Figure 698-5 should be consulted to ensure that adequate acceleration length and merge taper length are provided.

The designer should exercise care when using SCD MT-95.30 in the area of an entrance ramp. The placement of signs for closing the right lane contained in MT-95.30 may overlap an upstream ramp and confuse road users as to whether the ramp is open or closed. When this condition exists, the designer shall provide positive guidance for the road user. This may involve showing the exact placement of all signs and tapers noted in MT-95.30 within both interchanges on a separate drawing, rather than relying on the SCD.

If the paved shoulder must be used to achieve minimum lane width, it may require that the shoulder be reconstructed or strengthened to accommodate the additional load. A separate sheet would be required in the plan detailing the shoulder work.

In order to work on an entire entrance-ramp, it will be necessary to use both detail drawings from the applicable SCD. Traffic operation under the detail shown on the second page of each of these drawings may be significantly restricted, and poorer operation can be anticipated. Therefore, the design and project implementation should attempt to do as much of the work as possible using the detail shown on the first page of each of these SCDs. This should minimize the time and traffic restrictions involved when the work area is as shown in the detail on the second page of the drawing. Consideration should be given to providing temporary pavement to locate the merge/shift area in the first detail shown at a point downstream, which will then allow for adequate acceleration distance to be provided when the work area shifts and the second detail is used.
Adequate decision sight distance should be provided where possible. See Section 607-15, Table 697-10 and Figure 698-5. If adequate decision sight distance cannot be provided, this should be documented, explaining the reason for non-compliance. Consideration should also be given to closing the ramp.

Quantities for work zone pavement markings shall be provided in the plans. If the markings are to remain for three days or longer, all Item 614 Class I markings shall be provided. If the markings are to remain for less than three days, consideration may be given to eliminating edge lines if the lines are represented by drums or other acceptable forms of channelization. Additional reduced marking at specific locations may also be appropriate. See OMUTCD Section 6F.78 and TEM Subsection 605-11.11.

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums and Warning Lights.

The following items shall be shown as separate quantities in the plans, when required:

- Item 614, Work Zone Edge Line, Class I (By Type) Mile
- Item 614, Work Zone Lane Line, Class I (By Type) Mile
- Item 614, Work Zone Dotted Line, Class I (By Type) Feet

641-13 Lane Closure at Exit Ramp (MT-98.20 and 98.21)

SCDs MT-98.20 and 98.21 generally address lane closures in the vicinity of exit ramps. SCD MT-98.20 addresses lane closures using drums. SCD MT-98.21 addresses lane closures using portable barrier (PB). SCD MT-98.21 also addresses the use of impact attenuators in the exit gore. Otherwise, both drawings are basically the same.

Each of these SCDs includes separate details drawings. Work location determines which detail is used.

Where the impact attenuator is intended to apply to two barriers within the gore, one from the mainline and one from the ramp, the two barriers shall be joined to form one unit using a PCB “Y” connector segment. See the Office of Roadway Engineering’s Plan Insert Sheet for details on this PCB “Y” connector segment. This insert sheet shall be provided in the plans. When using steel barrier, a double wide attenuator shall be used instead of a “Y” connector.

SCDs MT-95.30 and 95.40, which pertain to lane closures on the mainline, shall be used as companion drawings to SCD MT-98.20 or 98.21, respectively.

The designer should exercise care when using SCD MT-95.30 or MT-95.40 in the area of an interchange immediately upstream of the work site. The placement of signs shown in MT 95.30 or MT-95.40 for closing the right lane may overlap an upstream ramp and confuse road users as to whether the ramp is open or closed. When this condition exists, the designer shall provide positive guidance for the exiting road user. This may include showing the exact placement of all signs and tapers noted in MT-95.30 or MT-95.40 within both interchanges on a separate drawing, rather than relying on the SCD.

Advisory Exit or Ramp Speed signs may exist at interchanges along the deceleration lanes or across from the exit gores. The designer should check the speed of any proposed Advisory Exit or Ramp Speed signs to avoid contradictory speed postings with existing signs. Where conflicts exist, the existing signs should be covered or removed. The proposed signs, when compared to the existing signs, should always provide a lower or equal advisory speed.

The opening to the ramp shall have a minimum length of 200 feet. Within this space, the exiting vehicle must shift laterally to enter the exit ramp. Based on the 1985 Highway Capacity Manual, maximum capacity, regardless of design speed, occurs at a speed of 30 to 35 miles per hour. Below this speed, the freeway/expressway will experience unstable flow and capacity will
Therefore, to avoid premature unstable flow and keep the facility at maximum capacity, all design elements on the freeway/expressway must meet or exceed an operating speed of 30 to 35 miles per hour. Consideration should be given to providing temporary pavement at the upstream end of the deceleration lane for use in the second detail of each of these SCDs if necessary in order to provide adequate ramp openings.

SCDs MT-98.20 and 98.21 show an opening of 390 feet each, which is associated with a 65 miles per hour exiting speed. Openings longer than 390 feet should be used whenever conditions permit. When conditions will not allow a 390 foot opening, shorter values (but not less than 200 feet) may be used. When shorter openings (associated with a speed at least 10 miles per hour less than the posted speed) are used, Advisory Speed signs (W13-1) shall be provided. See OMUTCD Section 6C.08 and Section 602-5 for a discussion of taper rates.

If the paved shoulder must be used to achieve minimum lane width on the ramp, as noted in SCDs MT-98.20 and 98.21, it may be necessary to reconstruct or strengthen the shoulder to accommodate the additional load. A separate sheet would be required in the plan detailing this shoulder work.

Quantities for work zone pavement markings shall be provided in the plans. If the markings are to remain for three days or longer, all Item 614 Class I markings shall be provided. If the markings are to remain for less than three days, consideration may be given to eliminating edge lines if the lines are represented by drums or other acceptable forms of channelization. Additional reduced marking at specific locations may also be appropriate. See OMUTCD Section 6F.78 and TEM Subsection 605-11.11.

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums and Warning Lights.

The following items shall be shown as separate quantities in the plans, when required:

Item 614, Work Zone Edge Line, Class I (By Type) Mile
Item 614, Work Zone Channelizing Line, Class I (By Type) Foot
Item 614, Work Zone Dotted Line, Class I (By Type) Foot

**641-14 Lane Closure in Deceleration Lane (MT-98.22)**

SCD MT-98.22 addresses closure of the deceleration lane, with an opening located near the gore to provide access from the freeway/expressway to the ramp.

The opening to the ramp shall have a minimum length of 200 feet. Within this space, the exiting vehicle must shift laterally to enter the exit ramp. Based on the 1985 Highway Capacity Manual, maximum capacity, regardless of design speed, occurs at a speed of 30 to 35 miles per hour. Below this speed, the freeway/expressway will experience unstable flow and capacity will decrease. Therefore, to avoid premature unstable flow and keep the facility at maximum capacity, all design elements on the freeway/expressway must meet or exceed an operating speed of 30 to 35 miles per hour.

SCD MT-98.22 shows an opening of 390 feet each, which is associated with a 65 miles per hour exiting speed. Openings longer than 390 feet should be used whenever conditions permit. When conditions will not allow a 390 foot opening, shorter values (but not less than 200 feet) may be used. When shorter openings (associated with a speed at least 10 miles per hour less than the posted speed) are used, Advisory Speed signs (W13-1) shall be provided. See OMUTCD Section 6C.08 and Section 602-5 for a discussion of taper rates.

Advisory Exit or Ramp Speed signs may exist at interchanges along the deceleration lanes or across from the exit gores. The designer should check the speed of any proposed advisory Exit or Ramp Speed signs to avoid contradictory speed postings with existing signs. Where conflicts exist, the existing signs should be covered or removed. The proposed signs, when compared to
the existing signs, should always provide a lower or equal advisory speed.

Advance Warning Signs should be placed in locations that provide adequate sight distance for the existing vertical and horizontal roadway alignment. Use OMUTCD Table 6C-1 to determine dimensions A, B and C.

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums and Warning Lights.

Quantities for work zone pavement markings shall be provided in the plans. If the markings are to remain for three days or longer, all Item 614 Class I markings shall be provided. If the markings are to remain for less than three days, consideration may be given to eliminating edge lines if the lines are represented by drums or other acceptable forms of channelization. Additional reduced marking at specific locations may also be appropriate. See OMUTCD Section 6F.78 and TEM Subsection 605-11.11.

The following items shall be shown as separate quantities in the plans, when required:

Item 614, Work Zone Edge Line, Class I (By Type) Mile
Item 614, Work Zone Dotted Line, Class I (By Type) Foot

641-15 Typical Lane Closures for Ramps (MT-98.28 and 98.29)

SCD MT-98.28 shall be used when work along an exit ramp leaves at least one lane open to ramp traffic.

The SCD includes two separate details drawings. Work location determines which detail is used. The first is intended for use when the work is in the inside portion of the ramp curve, with traffic to be routed along the outside portion of the curve. The second is intended for use when the work is in the outside portion of the ramp curve, with traffic to be routed along the inside portion of the curve.

SCD MT-98.29 shall be used when work requires that the exit ramp be entirely closed.

Advisory Exit or Ramp Speed signs may exist at interchanges along the deceleration lanes or across from the exit gores. When the ramp will remain open, the designer should check the speed of any proposed advisory exit or ramp speed signs to avoid contradictory speed posting with existing signs. Where conflicts exist, the existing signs should be covered or removed. The proposed signs, when compared to the existing signs, should always provide a lower or equal advisory speed.

When SCD MT-98.29 is included in plans, treatment of the permanent Guide Signs in accordance with the guidelines for Advance Work Zone Information Signs shall be considered. The need for a detour and related signing must also be addressed.

Advance Warning Signs should be placed in such locations that provide adequate sight distance for the existing vertical and horizontal roadway alignment. Use OMUTCD Table 6C-1 to determine dimensions A, B and C.

The following items would normally be included with the lump sum bid for Item 614 Maintaining Traffic: Signs, Cones, Drums and Warning Lights.

Quantities for work zone pavement markings shall be provided in the plans. If the markings are to remain for three days or longer, all Item 614 Class I markings shall be provided. If the markings are to remain for less than three days, consideration may be given to eliminating edge lines if the lines are represented by drums or other acceptable forms of channelization. Additional reduced marking at specific locations may also be appropriate. See OMUTCD Section 6F.78 and TEM Subsection 605-11.11.
The following items shall be shown as separate quantities in the plans, when required:

Item 614, Work Zone Edge Line, Class I, (By Type) Mile
Item 614, Work Zone Dotted Line, Class I (By Type) Foot

641-16 Traffic Control for Long Line Pavement Marking Operations (MT-99.20)

SCD MT-99.20 is applicable to all projects with long line markings (center, edge or lane line except in the following situations:

1. Where the markings will be applied while the area is closed to traffic for other reasons;
2. Where the work area is so short (+/- one-half mile) that the required sequence of vehicles cannot be assembled while the marking vehicle travels the length of the project; or
3. Where the plans require another form of protection.

Also see CMS 614.11 for additional traffic control requirements for long line pavement marking operations.

If the work will require a lane closure as designated in the table on SCD MT-99.20, the plans should include the appropriate lane closure details.

The 18-inch cones are permissible only to protect a wet painted line. The larger, 28-inch cones shall be provided if they will be used to close off a lane (in daylight), either in the closure transition or through the work area.

641-17 Freeway/Expressway Closure in Work Zones (MT-99.50)

641-17.1 General

SCD MT-99.50 is intended for use where a freeway or expressway is closed within a work zone or in an emergency. It is not intended for use in conjunction with “permanent” closures which remain upon completion of the contract. For “permanent” closures see Section 640-28.

MT-99.50 may be appropriate for “weekend” closures, particularly at diamond interchanges for painting or other work within an interchange. In such situations, all traffic will be required to exit at the exit ramp and then re-enter at the entrance ramp. The cross highway shall be closed in order to allow continuous movement from the exit ramp to the entrance ramp. Appropriate signing and channelization shall be provided in order to maintain traffic flow along the ramps and to designate a detour for the cross-highway traffic. This additional traffic control should be detailed in the plans.

MT-99.50 may also be appropriate for emergency situations. Additional site-specific message boards may be appropriate in order to provide detour signing, directing traffic back to the freeway/expressway.

641-17.2 Signing

Signing used for this type of work will typically consist of flatsheet Warning Signs and arrow boards. Use of existing extrusheet major Guide Signs, with overlays, in lieu of the flatsheet signing may be used. The designer shall specify which type of signing is to be used. If existing extrusheet Guide Signs are to be overlaid, the designer shall locate these signs in the field and show the signs in the plans accordingly.

If existing supports are not available, breakaway supports or supports behind guardrail shall be individually designed.
Portable Changeable Message Signs (PCMSs) may also be used to supplement the flatsheet or extrusheet signs. If PCMSs are to be used, the designer shall specify the quantity of signs and provide the appropriate legends to be displayed.

641-17.3 Channelization Devices

Typically, the closure is identified by use of drums; however, PB is shown in MT-99.50 for use when called for in the plans. A drop-off condition is an example of a situation that might constitute a need for PB (see Subsection 605-5.13 and MT-101.90). The designer shall determine whether or not the additional protection provided by PB is necessary and shall provide the appropriate quantity.

Taper rates of drums shall be as called for in Table II in MT-99.50. These taper rates are intended to be similar to those shown in OMUTCD Figure 6H-32.

The flare rate of the PB shall also be as called for in Table II of MT-99.50. The flare rate may be applied at the exit gore; however, if the contractor will be working in the vicinity of the provided shift taper, the designer should consider specifying in the plans that the PB shall be located parallel to the edge line.

The drum/PB combination is intended to be similar to that shown in MT-95.40 and in OMUTCD Figure 6H-34.

641-17.4 Multiple Lane Closures

If a freeway/expressway has three or more directional lanes and it is necessary to close more than one lane, insert a tangent section (equal in length to twice the taper) between the end of the first lane closure and the beginning of the second. Dual ground-mounted W4-2-28 signs (W9-H4-144 signs if using extrusheet signing) shall be placed along the tangent, in advance of the taper for the second lane closure, at approximately a distance equal to the length of the taper (also see OMUTCD Figure 6H-37). If additional lanes are closed, the same process shall be repeated.

If the signs shown as dashed at the ramps do not exist, the designer may require them or similar signs as a part of the work.

641-17.5 Portable Barriers and Impact Attenuators

1. The impact attenuator treatment will typically not require any additional grading of the median; however, foreslopes of 10:1 or flatter from the edge of the shoulder to the PB shall be required. This may require drainage changes.

2. The impact attenuator treatment should typically be more economical.

3. The offset “E” to the beginning of the PB may not always be sufficient (see L&D Manual Volume One, Section 307). If the roadway curves to the right, and the curvature exceeds 2.5 degrees (radius is less than 4100 feet), the offset shall be increased in accordance with Table 697-9.

The length of PB beyond the shoulder shall also be increased proportionately to maintain the flare rate relative to the edge of pavement, per Table II.

The designer, not the contractor, must determine when to use each type of end treatment and note this in the MOT Plan.

641-17.6 Bid Items

For SCD MT-99.50, all items will be included for payment under Item 614 Maintaining.
Traffic, except the following:

- Item 630, Sign, Extrusheet
- Item 630, Sign, Overlay
- Item 630, Ground Mounted Supports, _______ Beam
- Item 630, Breakaway Beam Connection
- Item 630, Ground Mounted Beam Support Foundation
- Item 614, Work Zone Edge Line, Class I (By Type)
- Item 614, Work Zone Raised Pavement Marker
- Item 622, Portable Concrete Barrier, _____”

641-18 Road Closure Using Type III Barricades (MT-101.60)

The type of closure shown in SCD MT-101.60 will typically be used in two different situations:

1. The closure seals off a road from which through traffic has been detoured upstream. In this case, only local traffic is expected on the approach to the closure, although this traffic might still be appreciable if the detour begins some distance upstream. Any traffic approaching the closure must be adequately warned and given ample opportunity to stop. The minimum advance warning treatment is three signs. They are supplemented with Type A flasher warning lights. The signs will be dual installations on a four-lane divided road and the designer may insert a Plan Note requiring dual installations on other roads.

2. The closure is accompanied by some form of a runaround, directing traffic away from the barricade closure. The runaround may be any one of several types: it may be a true runaround as provided in OMUTCD Figure 6H-7; it may be a median crossover as provided in SCD MT-95.70; or, it may be a complete closure of a limited-access highway, requiring all of the traffic to exit upstream of the barricade closure, such as is shown on SCD MT-99.50.

All elements of the barricade closure, including any advance Warning Signs, will be included in the lump sum of Item 614 Maintaining Traffic.

641-19 Portable Barrier and Impact Attenuator Delineation (MT-101.70)

SCD MT-101.70 shall be used when PB is specified in the plans. The drawing presents several methods for delineating PB as well as an impact attenuator nose cone delineation detail. Typically, PB is delineated using object markers and barrier reflectors at 50 foot intervals, with the object markers and the barrier reflectors offset at 25 feet. This method of delineation is applicable to 32-inch PB as well as to 50-inch PB. Plan Note 642-26 (Section 642-26) shall be included in the plans when this method of delineation is to be provided. (See Sections 605-14.5 and 605-19 for more information on PB delineation.)

Where glare screen is provided, the use of object markers is not practical. In such cases, the traditional method for delineating the glare screen is to provide reflective sheeting stripes on glare screen panels. The stripes shall be placed in sets of three, on consecutive glare screen panels, at 50 foot intervals, center-to-center.

The delineation methods typically used are presented in the upper half of the detail drawing. In the bottom half of the drawing, two alternative delineation methods are presented for the purpose of providing an increased level of delineation of the side of the PB. For the top of the PB, only the typical methods of delineation, as discussed above, are presented.

One alternative delineation method is to provide linear delineation panels (3M™ Scotchlite™ Linear Delineation System (LDS) or approved equal). The linear delineation panels shall be provided in 6 x 34 inch sections, with one panel section centered on each PB section.

Another alternative is to provide the barrier reflectors at intervals of 50 foot spacing as is the normal practice, except that the barrier reflectors are to be stacked vertically in sets of three,
rather than singly.

Either the linear delineation panel or the triple stack method of delineation shall be used within freeway and expressway work zones on all concrete barrier, permanent or temporary, located within 5 feet of the edge of the traveled lane under either of the following conditions:

- Along tapers and transition areas;
- Along curves (outside only) with degree of curvature greater than or equal to 3 degrees.

Plan Note 642-50 (Section 642-50) shall be included in the plans where such conditions exist.

These alternative methods of increased delineation may also be specified in the plans for additional use.

The nose cones of impact attenuators shall have a retroreflective surface as specified in SCD MT-101.70.

**641-20 Drop-Offs in Work Zones (MT-101.90)**

Where drop-offs occur in work zones, adequate protection shall be provided to protect the road user. Typically the method of protection to be used will be specified in the plans in accordance with Section 605-14. However, occasionally drop-offs that are not addressed in the plans will develop in the field. The purpose of this drawing is to provide instruction to the contractor regarding appropriate methods for protection from drop-offs within work zones where specific instructions have not been provided in the plans.

This drawing is intended primarily for use with work on freeways and expressways, as described under Conditions I and II; however, Conditions I and II may also be applied to other multi-lane highways with speed limits of 45 miles per hour or greater with minimal driveways. Methods of drop-off protection provided in the table for Condition II are to be considered as minimums.

Use of portable barrier (PB) may be appropriate in locations where Table II calls for a lesser form of drop-off protection, as the PB serves not only as protection from drop-offs, but also provides protections from the contractor’s activities and from fixed objects such as utility poles and stored equipment. The designer may want to consider the expected duration of the maintenance of traffic stage as an additional factor in determining the need for providing a higher level of protection.

Also included in the drawing is Condition III, which is applicable to locations behind curb where the legal speed is 40 miles per hour or less. At such speeds, curbs of adequate height, typically 6 inches, have an effect on the lateral placement of moving vehicles. Therefore, the need for channelizing devices to protect the road user from the drop-off is reduced (see the table in the drawing under Condition III). Also see Location and Design Manual Sections 305.3.1 and 601.1.4.

For conditions other than those described in this drawing, engineering judgment shall be used to determine the appropriate method of drop-off protection to be provided. Examples of such conditions are highways where driveway access is a major concern, or low-speed highways where curb is not provided (see the Location and Design Manual Section 601.1.4). The time period during which such drop-offs remain in existence should be minimized. Consideration should be given to providing fill material at the end of the work day to create a desirable foreslope of 3:1 or flatter, with 2:1 as maximum. However, if engineering judgment indicates that use of PB is appropriate, then the maintenance of traffic should be designed based on use of PB.

**641-21 Transition Plans for Use of Shoulder (MT-102.10, 102.20 and 102.30)**

When the work involves closing a lane(s) and a capacity analysis indicated that it is necessary to maintain more lanes of traffic than would remain after closing the lane(s), this drawing provides
for use of the shoulder to maintain traffic. If the encroachment into the traveled lane is 2 feet or less, use a lane width reduction.

Lane use cross sections should be shown in the plan indicating the number of lanes and the width of each. Normally, all lanes should be shifted.

To help keep the traffic in the proper lanes, Work Zone Solid Lane Lines are used through the transition area, and extended 300 feet in each direction beyond the transition area. Dashed lines may be provided within the tangent sections beyond these points if the length of dashed line would be 600 feet or greater. However if the length of the dashed line section would be less than 600 feet in length, the solid lane line shall be continued through the tangent section. Pavement marking and delineation details shall be provided in the plans (see SCD MT-99.30 and Section 641-25).

SCD MT-102.10 addresses the use of this shoulder transition to maintain traffic when portable barrier (PB) is used, and SCD MT-102.20 addresses the use of this traffic control when drums are used to close off the work area. The choice between using PB or drums should be based on the drop-off policy as well as consideration of traffic volumes, truck volumes, speed, duration of work and consideration of the degree of hazard. SCD MT-102.30 incorporates Speed Limit signing and Increased Penalty signing with the shift signing called for in MT-102.10 and MT-102.20.

The transition should be designed to maintain the legal speed or reduced speed as discussed in Section 640-18. However in exceptional cases, where a local speed reduction may become necessary, advisory speed plaques should be added to the W1-4, W1-4b or W1-4c sign to warn the road users of the appropriate travel speed for the local conditions.

The existing shoulders must be checked for smoothness, structural adequacy and clearance to structures. Reconstruction may be necessary to assure that they are adequate for the traffic. Plans should provide details of the shoulder work needed. Appropriate bid items shall be included in the plan.

Truck lane-use signs R4-5 and R4-H5a are shown in the SCD MT-102 series. As indicated in the notes for MT-102.10, 102.20 and 102.30, use of these signs should not be automatic. The stability of the shoulder on the specific project should be reviewed to determine whether it is adequate to carry the truck loads which travel on the specific roadway segment. If the shoulder stability is adequate, it should be clearly specified in the plans that the signs are not required. It should be general practice to keep signing to a minimum, as over-signing may create clutter. Use of these signs may be appropriate during one Maintenance of Traffic phase, but may not be appropriate in another phase of the job. For example, such might be the case where a rather unstable existing shoulder is used to carry traffic in Phase 1 while a stable new shoulder is used to carry traffic in Phase 2.

It is intended that separate bid items be included for the following items:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>614</td>
<td>Work Zone Solid Lane Lines, Class I, (By Type)</td>
<td>Mile</td>
</tr>
<tr>
<td>614</td>
<td>Work Zone Edge Lines, Class I, (By Type)</td>
<td>Mile</td>
</tr>
<tr>
<td>622</td>
<td>Portable Concrete Barrier, _____&quot;,</td>
<td>Foot</td>
</tr>
<tr>
<td>614</td>
<td>Work Zone Lighting System</td>
<td>Each</td>
</tr>
<tr>
<td>614</td>
<td>Barrier Reflector (By Type)</td>
<td>Each</td>
</tr>
<tr>
<td>614</td>
<td>Work Zone Curb Marking</td>
<td></td>
</tr>
<tr>
<td>614</td>
<td>Object Marker</td>
<td>Each</td>
</tr>
</tbody>
</table>

The lump sum for Item 614 Maintaining Traffic will cover all other work needed to place, maintain and remove the shoulder transitions including:

- Temporary signs and supports
- Drum and other channelizing devices
- Flashers and lights on signs
- Removal and replacement of raised pavement marker reflectors
- Removal of conflicting existing or work zone pavement markings
  (this is specifically incidental to Item 614 Work Zone Pavement Markings)

When traffic will be on a shoulder near structure parapets or guardrail, plan quantities may also be needed for Bridge End Markers and additional barrier reflectors (spacings of 25 feet when traffic is close to these barriers).

641-22 Temporary Sign Support (MT-105.10)

SCD MT-105.10 provides requirements for temporary sign supports. This drawing shall be used on all projects.

Normally, all temporary sign support items will be incidental to the lump sum bid for Item 614 Maintaining Traffic.

The designer should field check proposed sign locations which may be required to implement the various traffic control schemes shown in the plans. The check should determine if the site will be adequate for an appropriate temporary support and should consider any potential conflicts with existing signs. The plans may require the removal, covering or modification of the legend of existing signs, particularly overhead signs which establish lane use.

641-23 Detour of Pedestrians (MT-110.10)

Pedestrian considerations are addressed in Section 603-2 and 640-25. When it has been determined that a detour should be provided for pedestrian traffic, SCD MT-110.10 shall be used.

SCD MT-110.10 provides detail for maintaining or detouring pedestrian traffic. However, it is the responsibility of the designer to provide site-specific detail when necessary. For example, although MT-110.10 (in Note 5B on Sheet 2 of 2) calls for a maximum grade of 5 percent and a maximum cross slope of 2 percent for temporary walkways, there could be specific locations where the profile of the existing street and sidewalk are at 5 percent or greater. In such a case, the designer should specify in the plans the appropriate criteria to be applied at the specific site. It is suggested that under such conditions where pedestrians are detoured into the curb lane, that the elevation of the temporary walkway be raised to that of the sidewalk in order to eliminate the need for ramps between the sidewalk and the roadway elevations.

641-24 New or Revised Traffic Control Signals (MT-120.00)

Prior to activating a new traffic signal, the public shall be given advance notice of the activation by use of special signing. This signing is shown in SCD MT-120.00. MT-120.00 is to be provided in all plans which require the activation of a new traffic signal.

641-25 Work Zone Delineation (MT-99.30)

641-25.1 General

SCD MT-99.30 addresses ODOT’s procedures for providing raised pavement marking in work zones located on freeway and expressway projects. Although this standard drawing is intended for maintenance of traffic schemes expected to remain in place for at least thirty days, consideration should also be given to including this drawing for all long-term work (greater than three days). MT-99.30 specifies the use of raised pavement markings as appropriate for a specific surface type, asphalt or concrete.

Specifications are provided for delineation within transition areas and also for delineation beyond transition areas (within tangent areas). Transition areas are applicable to lane-shifts tapers of ≥ 4 feet and to median crossovers. Lane-shifts of less than 4 feet shall be treated as
The transition area for a lane shift is generally considered to begin 300 feet in advance of the beginning of the shift taper and to end 300 feet beyond the termination of the shift taper. The transition area for a crossover is generally considered to begin 300 feet in advance of the beginning of the crossover geometrics and to end 300 feet beyond the termination of the crossover geometrics. If it is necessary to revise the lengths of these approach distances, the revisions shall be specified in the plans. If the approach distances vary among the several approach distances within the plans, the limits of each transition area within the plans shall be specified individually.

Raised pavement markers used in work zones shall conform to CMS 614 or to CMS 621 as specified in Sections 641-25.2 and 641-25.3. As specified in Sections 641-25.2 and 641-25.3, use of Work Zone Raised Pavement Markers conforming to CMS 614 is not permitted during the snow-plowing season. The limits of the snow-plowing season at the project site should be determined by the District and specified in the Plans. If dates are not specified, the default dates of snow-plowing season shall be as per CMS 614.115C (October 15 to April 1) regarding installation of WZRPMs.

641-25.2 Asphalt Surfaces

Within transition areas, the plans shall call for Raised Pavement Markers (RPMs) to be provided along edge lines and channelizing lines. Spacing shall be at 20-foot increments. Beyond transition areas, the plans shall call for RPMs to be provided along the lane lines at 120-foot spacing. The plans should specify that RPMs intended to be in place during the snow-plowing season shall conform to CMS 621. During other times of the year, the contractor should be permitted to provide RPMs which conform to either CMS 621 or CMS 614. Plan Note 642-48 or 642-49 shall be included in the plans.

Upon removal of RPMs complying with CMS 621, the resulting holes shall be filled as per CMS 621.08. Prior to application of the surface course on the project, the existing pavement within the transition area shall be removed to a depth equivalent to a depth necessary to reach the level of the intermediate course of the proposed pavement, as determined by the Engineer. Resurfacing of the transition area shall be performed at the time that the surface course is being applied to the entire project.

The following bid items should be included in the plans:

| Item 254 Pavement Planing, Asphalt Concrete | Square Yards |
| Item 614 Work Zone Raised Pavement Marker, as per plan | Each |

The appropriate quantity of surface course material for resurfacing the transition area should also be provided.

Temporary work zone marking (edge lines, lane lines, etc.) shall be paid for under the appropriate Item 614 pavement marking item.

| Item 614 Work Zone Solid Lane Lines, Class I, (By Type) | Mile |
| Item 614 Work Zone Edge Lines, Class I, (By Type) | Mile |

641-25.3 Concrete Surfaces

RPMs applied to concrete surfaces shall conform to CMS 614. The plans shall specify that PRMs shall not be provided during the snow-plowing season. During other times of the year, the contractor shall provide Item 614 Work Zone Raised Pavement Markers. Within transition areas, RPMs shall be provided along edge lines and channelizing lines. Spacing shall be at 20-foot increments. Beyond transition areas, RPMs shall be provided along the lane lines at 120-foot spacing. The appropriate Plan Note from Chapter 642, for installation of RPMs in
work zones on concrete surfaces, shall be included in the plans.

Work Zone Raised Pavement Marking shall be paid for as follows:

Item 614  Work Zone Raised Pavement Marker  Each

Temporary work zone marking (edge lines, lane lines, etc.) shall be paid for under the appropriate Item 614 pavement marking item.

Item 614  Work Zone Solid Lane Lines, Class I, (By Type)  Mile
Item 614  Work Zone Edge Lines, Class I, (By Type)  Mile

641-26 Longitudinal Channelizer (PIS 2010180)

The design of the longitudinal channelizer may vary from manufacturer to manufacturer. It shall consist of two main components: a base component consisting of interlocking units and a vertical reboundable marker/channelizer component. The shape of the vertical component may vary from manufacturer to manufacturer. The width shall be approximately 8 to 9 inches for elliptical designs and 4 to 6 inches for round (tubular) designs. The height of the vertical component shall be within the range of 36 inches minimum to 48 inches maximum.

The vertical component shall be equipped with retroreflective sheeting or with retroreflective stripes. Where stripes are used, the stripes shall consist of two 3-inch wide bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. The base component shall be equipped with reflectors.

The longitudinal channelizer may be useful at entrance ramp merges, either to help direct traffic into its designated lane(s) around curves, or to maximize sight distance at the merge. Use of the longitudinal channelizer in a set of plans should be determined, based on engineering judgment, during the design stage of project development. However, occasionally the need for implementing the longitudinal channelizer may be determined in the field during construction. In such a case, it may be appropriate to add the longitudinal channelizer to the plans by change order.

When the longitudinal channelizer is to be used PIS 2010180 and Plan Note 642-53 shall be included in the plans.

Where the longitudinal channelizer is used, its use should be monitored to determine whether there is significant damage from errant vehicles.
Intentionally blank.
642 PLAN NOTES

642-1 General

Typical Plan Notes have been consolidated here for convenience in preparing plans. The number used for the Plan Note will be the same as the Section number. When a Plan Note revises the material or contractor requirements from that which is specified in the CMS, both the note and the bid items will be “as per plan.” Where there are design instructions pertaining to a specific note, they are listed at the end of the note. These notes may be modified to further define the conditions of a project or maintaining agency. Each note is accompanied by a “Designer Note” in an attempt to give some guidance as to when the note should be used.

In keeping with the traditional format of Plan Notes, various format changes are used here that are not typical throughout the TEM, e.g., the terms Contractor and Engineer are capitalized.

642-2 Item 614, Maintaining Traffic

The text of this note will depend on specifics of the project.

Designer Note: Most traffic control plans should include an “Item 614, Maintaining Traffic note that contains the following:

1. A description of how traffic will be maintained throughout the construction life of the project, including any limitations or restrictions.
2. Descriptions of all items that are to be performed under CMS Item 614.
3. A closing paragraph indicating the method of payment (see Plan Note 642-12).

642-3 Item 614, Maintaining Traffic (At All Times)

A minimum of ___ lane(s) of traffic in each direction shall be maintained at all times by use of the existing pavement, the completed pavement, Item 502 Structure for Maintaining Traffic, Item 505 Pavement for Maintaining Traffic, Item 615 Roads for Maintaining Traffic, and temporary surfaces using Items 410 and 614.

Designer Note: This note should be edited to include only items pertinent to each specific project.

642-4 Item 614, Maintaining Traffic (Time Limitation on a Detour)

A minimum of one lane of traffic in each direction shall be maintained at all times, except for a period not to exceed ______ consecutive calendar days, when through traffic may be detoured as shown on sheet ______. A disincentive shall be assessed in the amount of $ ______ per day for each calendar day the roadway remains closed to traffic beyond the specified limit.

Designer Note: This note shall be used if there is a time limitation placed on the detour. The dollar amount of the disincentive shall be calculated as directed by the Innovative Contracting Manual. The Innovative Contracting Manual is available for download at: http://www.dot.state.oh.us/Divisions/ConstructionMgt/Admin/Pages/default.aspx. The official detour route should be used in the calculation of road user costs.

642-5 Item 614, Maintaining Traffic (Winter Time Limitations)

All existing lanes shall be open to traffic between November _____ and April ______. November _____ shall be considered to constitute an interim completion date and liquidated
damages shall be assessed in accordance with CMS 108.07 for each calendar day that all lanes are not open and available to traffic.

**Designer Note:** This note shall be used when winter traffic limitations are required.

### 642-6  Item 614, Maintaining Traffic (Lanes Open During Holidays or Special Events)

No work shall be performed and all existing lanes shall be open to traffic during the following designated holidays or events:

- Christmas
- New Years
- Memorial Day
- Thanksgiving
- (Other Holiday or Event)

The period of time that the lanes are to be open depends on the day of the week on which the holiday or event falls. The following schedule shall be used to determine this period:

<table>
<thead>
<tr>
<th>Day of holiday or event</th>
<th>Time all lanes must be open to traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>12:00N Friday through (6:00 AM or 12:00N) Monday</td>
</tr>
<tr>
<td>Monday</td>
<td>12:00N Friday through (6:00 AM or 12:00N) Tuesday</td>
</tr>
<tr>
<td>Tuesday</td>
<td>12:00N Monday through (6:00 AM or 12:00N) Wednesday</td>
</tr>
<tr>
<td>Wednesday</td>
<td>12:00N Tuesday through (6:00 AM or 12:00N) Thursday</td>
</tr>
<tr>
<td>Thursday</td>
<td>12:00N Wednesday through (6:00 AM or 12:00N) Friday</td>
</tr>
<tr>
<td>Thursday (Thanksgiving only)</td>
<td>12:00N Wednesday through (6:00 AM or 12:00N) Friday</td>
</tr>
<tr>
<td>Friday</td>
<td>12:00N Thursday through (6:00 AM or 12:00N) Monday</td>
</tr>
<tr>
<td>Saturday</td>
<td>12:00N Friday through (6:00 AM or 12:00N) Monday</td>
</tr>
</tbody>
</table>

No extensions of time shall be granted for delays in material deliveries, unless such delays are industry-wide, or for labor strikes, unless such strikes are area-wide.

Should the Contractor fail to meet any of these requirements, the Contractor shall be assessed a disincentive in the amount of $_______ for each minute the above described lane closure restrictions are violated.

**Designer Note:** This note shall be used when lanes must be open to traffic during holidays or special events. The dollar amount of the disincentive should be based on the hourly rates specified in the below table:

<table>
<thead>
<tr>
<th>ADT in most heavily traveled segment of project</th>
<th>$50/min</th>
<th>$75/min</th>
<th>$100/min</th>
<th>$125/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-50,000</td>
<td>50,000-</td>
<td>75,000-</td>
<td>75,000-</td>
<td>&gt;100,000</td>
</tr>
<tr>
<td></td>
<td>75,000</td>
<td>100,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If a larger disincentive is desired, written documentation of the reason and justification for the disincentive shall be submitted to OTE’s Traffic Control Section.

### 642-7  Item 614, Maintaining Traffic (Lane Closure/Reduction Required)

Length and duration of lane closures and restrictions shall be at the approval of the Engineer. It is the intent to minimize the impact to the traveling public. Lane closures or restrictions over segments of the project in which no work is anticipated within a reasonable time frame, as determined by the Engineer, shall not be permitted. The level of utilization of maintenance of traffic devices shall be commensurate with the work in progress.

**Designer Note:** This note shall be added to the Item 614 Maintaining Traffic note (Section 642-2) if lane closures, or restrictions are required.
642-8 Item 614, Maintaining Traffic (Notice of Closure Sign)

Notice of Closure signs, as detailed in these plans, shall be erected by the Contractor at least one week in advance of the scheduled road or ramp closure. The signs shall be erected on the right-hand side of the road/ramp facing traffic. They shall be placed so as not to interfere with the visibility of any other traffic control signs. On roadways, they should be erected at the point of closure. The signs may be erected anywhere on ramps as long as they are visible to the motorists using the ramp. On entrance ramps, the sign shall be erected well in advance of the merge area to avoid distracting motorists.

**Designer Note:** The use of Notice of Closure signs in the plan and this note is at the discretion of the designer. Details of these closure signs must be in conformance with the OMTUCD and be included in the plans. The last line of the sign shall list a phone number which a motorist may call for additional information. This is to be a specific office within the District (or municipality) rather than the general switch board number. The person answering this phone should have a one-page summary of critical project data, and possibly a portion of a map showing the closure and planned detour route. Information shown would normally include such information as: contract identification, scheduled completion, type of improvement, why the closure is necessary, other closures or lane reductions planned as a part of the project and their timing and other data which would help a motorist deal with the construction period.

642-9 Item 614, Maintaining Traffic (Estimated Quantities)

The following estimated quantities have been included in the General Summary for use as determined by the Engineer for the maintenance of traffic.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 410, Traffic Compacted Surface, Type A or B</td>
<td>Cu. Yd.</td>
<td></td>
</tr>
<tr>
<td>Item 410, Traffic Compacted Surface, Type C</td>
<td>Cu. Yd.</td>
<td></td>
</tr>
<tr>
<td>Item 614, Asphalt Concrete for Maintaining Traffic</td>
<td>Cu. Yd.</td>
<td></td>
</tr>
<tr>
<td>Item 616, Water</td>
<td>M. Gal.</td>
<td></td>
</tr>
</tbody>
</table>

**Designer Note:** This note shall be used when quantities of CMS Items 410, 614, 616, or other items, are added to the plan to be used as directed by the Engineer. Such estimated quantities for maintaining traffic are normally required when through or local traffic is being maintained on a facility during construction. Quantities of CMS Item 614 Asphalt Concrete or CMS Item 410 will depend on the number of drives and pavement cuts required because of drainage or utilities. Generally, every 50 cubic yards of CMS Item 410 will require 1 M. Gal. of CMS Item 616, Water (minimum of 50 M. Gal.).

642-10 Item 614, Maintaining Traffic (ROAD CLOSED Sign)

The Contractor shall provide, erect and maintain standard 48 x 30 inch ROAD CLOSED signs, sign supports, barricades and lights, as detailed in SCD MT-101.60 at the following locations during periods in which the affected roads are closed to traffic.

(List locations, example - Loyal Road just west of SR 1000 intersection.)

**Designer Note:** Unless shown in a detail elsewhere in the plan, this note should be included in the Item 614 Maintaining Traffic note (Section 642-2) on projects where ROAD CLOSED signs are to be used on major relocation projects in rural areas where crossroads are located an appreciable distance from the project. Normally, these signs are positioned at the first crossroad on each side of the relocation.
642-11 **Item 614, Maintaining Traffic (Signs and Barricades)**

The Contractor shall provide, erect and maintain signs and sign supports, as detailed in the Ohio Manual of Uniform Traffic Control Devices, and Type III barricades of the type and location as follows:

(List the type and locations.)

**Designer Note:** Unless shown in a detail elsewhere in the plan, this note should be included in the **Item 614 Maintaining Traffic** note *(Section 642-2)* on projects where signs and barricades are to be provided.

642-12 **Item 614, Maintaining Traffic (Closing Paragraph for Note)**

All work and traffic control devices shall be in accordance with CMS 614 and other applicable portions of the specifications, as well as the Ohio Manual of Uniform Traffic Control Devices. Payment for all labor, equipment and materials shall be included in the lump sum contract price for Item 614, Maintaining Traffic, unless separately itemized in the plan.

**Designer Note:** This note should be used as a closing for the **Item 614 Maintaining Traffic** note *(Section 642-2)*.

642-13 **Placement of Asphalt Concrete**

Two-way traffic shall be maintained at all times except that one-way traffic will be permitted for minimum periods of time consistent with the requirements of the specifications for protection of completed asphalt concrete courses.

**Designer Note:** This note shall be used on projects involving resurfacing while traffic is maintained.

642-14 **Trench for Widening**

Trench excavation for base widening shall be only on one side of the pavement at a time. The open trench shall be adequately maintained and protected with drums or barricades at all times. Placement of proposed subbase and base material shall follow as closely as possible behind excavation operations. The length of widening trench which is open at any one time shall be held to a minimum and shall at all times be subject to approval of the Engineer.

**Designer Note:** This note shall be used on widening projects where traffic is maintained. The designer should refer to **SCD MT-101.90**, Drop-offs in Work Zones, to determine the necessary treatment or protection to be specified in the plan.

642-15 **Overnight Trench Closing**

The base widening shall be completed to a depth of no more than _____ inches below the existing pavement by the end of each work day. No trench shall be left open overnight except for a short length (25 feet or less) of a work section at the end of the trench. In case work must be suspended because of inclement weather or other reasons, the trench for the uncompleted base widening shall be backfilled at the direction of the Engineer.

**Designer Note:** This note shall be used for projects involving base widening where traffic is maintained. The allowable depth is calculated to the bottom of the first surfacing course. The designer should refer to **SCD MT-101.90**, Drop-offs in Work Zones, to determine the necessary treatment or protection to be specified in the plan.
642-16 Concrete Median Barrier Replacement

Removing, grading and installing the replacement barrier in a continuous operation shall be limited to _____ linear feet and shall at all times be subject to the approval of the Engineer. The Engineer shall be satisfied that all installations will afford maximum protection for traffic.

**Designer Note:** This note shall be used when replacing existing concrete median barrier. The length of this operation should be decided in conjunction with the District Highway Management Administrator.

642-17 Drum Requirements

In addition to the requirements of the plans, specification and proposal, drums furnished by the Contractor shall be new and unused at the time of arrival on the project. Any drums brought on the project, which have previously been used elsewhere, will not be accepted.

Payment for drums shall be included in the lump sum price bid for maintaining traffic unless separately itemized.

**Designer Note:** This note may be included in the plans for multi-year projects on Interstate and Interstate Look-alike projects at the discretion of the District. The note shall not be used on other projects. The intent of this note is to minimize the need to replace drums within the duration of the project.

Payment for drums called for in this note shall be included in the lump sum price bid for maintaining traffic.

When included in the plans, this note shall be in addition to Plan Note 642-23, Replacement Drums.

642-18 Reserved for Future Information

See Plan Notes 642-55 and 642-56 (Sections 642-55 and 642-56) for information regarding Law Enforcement Officers (LEOs) used in work zones (formerly addressed in this Section).

642-19 Dust Control

The Contractor shall furnish and apply water for dust control as directed by the Engineer. The following estimated quantities have been included for dust control purposes:

Item 616, Water = ______ M. Gal.

**Designer Note:** For every cubic yard of earthwork (embankment plus excavation), use between 0.002 M. Gallon and 0.004 M. Gal of water. The lower rate should be used for small and/or rural projects and the larger rate should be used for large and/or urban projects.

642-20 Work Zone Markings and Signs

The following estimated quantities have been carried to the General Summary for use at locations identified by the Engineer for work zone pavement markings and signs per the requirements of CMS 614.04 and 614.11.

**Designer Note:** A breakdown of the various types of signs and pavement markings should be included (examples: Item 614, Work Zone Marking Sign; Item 614, Work Zone Lane Line, Class _____, _____; Item 614, Work Zone Stop line, Class _____, _____, etc.).
642-21 Item 622, Portable Concrete Barrier, 50", As Per Plan

This work shall consist of furnishing, maintaining, and subsequently removing a 50-inch Portable Concrete Barrier (PCB) at the locations shown on the plans. For details, see SCD RM-4.1. Please note that SCD RM-4.1 was updated 10-20-06 to provide a PCB which is compatible with NCHRP 350 criteria.

Portable steel barrier is an approved alternative to PCB. For information on approved vendors, see the Approved Products List maintained by Roadway Standards.

Portable Concrete Barrier, 32 inches high with an 18-inch minimum height glare screen may be used at the option of the Contractor. The glare screen shall be constructed using one of the screens provided on the approved list, available on the Office of Materials Management web page.

Paddle or intermittent type glare screens shall be designed using a 20 degree cut-off angle based on tangent alignment. That spacing shall be used throughout the barrier length without regard to barrier curvature.

The glare screen system shall be securely fastened to the 32-inch Portable Concrete Barrier using the hardware and procedures specified by the manufacturer.

For directions on how to install the glare screen and the barrier, see the manufacturer’s instructions.

Payment shall include all labor, material, and equipment necessary to perform the work and shall be paid for at the contract price per foot for Item 622, Portable Concrete Barrier, 50 inch, as per plan.

**Designer Note:** A plan detail will be required for this item.

642-22 Item 614, Replacement Sign

Flatsheet signs furnished by the Contractor in accordance with the requirements of the plans, specifications and proposal which become damaged by traffic for reasons beyond the control of the Contractor shall be replaced in kind when ordered by the Engineer. Replacement signs shall be new. Other materials may be in used, but good, condition subject to approval by the Engineer.

Payment for the new signs shall be made at the contract price per Each for Item 614, Replacement Sign, and shall include the cost of removing and disposing of damaged signs, hardware and supports, and providing the necessary replacement hardware, supports, etc.

An estimated quantity of _____ Each has been provided in the General Summary.

**Designer Note:** This note shall be used on all four-lane, high-speed projects which will last longer than six months, and on other projects where there is a high probability that a number of signs will be damaged during construction.

642-23 Item 614, Replacement Drum

Drums furnished by the Contractor in accordance with the requirements of the plans, specifications and proposal which become damaged by traffic for reasons beyond the control of the Contractor shall be replaced in kind when ordered by the Engineer. Replacement drums shall be new.
Payment for the new drums shall be made at the contract price per each for Item 614, Replacement Drum, and shall include the cost of removing and disposing of the damaged drum, and providing and maintaining the replacement drum in accordance with the contract requirements for the original drum.

An estimated quantity of _____ each has been provided in the General Summary.

**Designer Note:** This note shall be used on all four-lane high-speed projects which will last longer than six months, and on other projects where there is a high probability that a number of drums will be damaged during construction.

**642-24 Item 614, Work Zone Speed Limit Sign**

The Contractor shall furnish, install, maintain, cover during suspension of work, and subsequently remove Work Zone Speed Limit (R2-1) (_____ speed limit) signs and supports within the work limits in accordance with the following requirements:

The Contractor shall cover or remove any existing Speed Limit signs within the reduced Speed Zone(s). These signs shall be restored during suspension or termination of the reduced speed limit. The expense of covering or removal and restoration of existing Speed Limit or Minimum Speed Limit signs shall be included in the pay item for the Work Zone Speed Limit signs.

The Work Zone Speed Limit signs may be erected or uncovered no more than four hours before the actual start of work that causes the warranting condition(s) to occur. The signs shall be removed or covered no later than four hours following removal of the warranting condition(s), or sooner as directed by the Engineer. Temporary sign covering and uncovering due to temporary removal of warranting condition(s) shall be guided by the four-hour limitations stated above.

Construction and Material Specifications Item 614, Paragraph 614.02(B), indicates that the two directions of a divided highway are considered separate highway sections. Therefore, if the work on a multi-lane divided highway is limited to only one direction, a speed reduction in the direction of the work does not automatically constitute a speed reduction in the opposite direction. A speed limit reduction in the opposite direction, in such case, is appropriate only if conditions are expected to have an impact on the directional traffic flow, as directed by the Engineer.

The Contractor shall erect a Work Zone Speed Limit sign in advance of the warranting condition, as detailed in the plans or as directed by the Engineer. The sign shall be mounted on both sides of a directional roadway of divided highways. The first Work Zone Speed Limit sign shall be placed approximately 500 feet in advance of the lane reduction, shift taper, or other roadway or shoulder restriction that warranted the work zone speed zone. On undivided highways the sign shall be mounted on the right side, approximately 250 feet in advance of such restrictions. The sign shall be repeated every 1 mile for 55 mph zones and every one-half mile for 50 mph and 45 mph zones. These signs shall also be erected immediately after each open entrance ramp within the zone.

The speed limit reduction shall be limited to only the portion of the project and the work that warranted the work zone speed limit reduction.

Speed Reduction (Speed Zone Ahead symbol) signs (W3-5) shall be erected in advance of the speed reduction, approximately 1250 feet on multi-lane highways and 500 feet on two-lane highways.

A sign(s) to indicate the resumption of the statutory speed limit shall be erected at the end of any reduced Speed Zone. The Contractor may use signs and supports in used, but good
condition, provided the signs meet current ODOT specifications. Sign faces shall be retroreflectorized with Type G sheeting complying with the requirements of CMS 730.19.

Work Zone Speed Limit signs shall be mounted on two Item 630, Ground Mounted Supports, No. 3 posts, unless mounted on a temporary sign support per SCD MT 105.10.

Work Zone Speed Limit and related sign sizes, placement, supports, etc shall be per the OMUTCD, with two exceptions: 1) expressway size Speed Limit signs may be used on freeways and expressways, if necessary; 2) the height of signs mounted on portable supports should be the height required for ground-mounted signs but shall not be more than 1 foot lower than the height required by the OMUTCD, or as directed by the Engineer. Portable supports should not be used for a duration of more than 3 days.

Work Zone Speed Limit signs and supports will be measured as the number of sign installations, including the signs and necessary supports. If a sign and support combination is removed and reerected at another location within the project due to changes in the Speed Zone as detailed in the plans or as directed by the Engineer, it shall be considered another unit.

Payment for accepted quantities, complete in place, will be made at the contract unit price. Payment shall be full compensation for all materials, labor, incidentals and equipment for furnishing, erecting, maintaining, covering during suspension of work, and removing the signs and supports. Speed limit signing for the point of resumption of the statutory speed limit shall be paid for as Work Zone Speed Limit signs. The following estimated quantity has been carried to the General Summary.

Item 614, Work Zone Speed Limit Sign ______ Each
Item 614, Speed Zone Ahead symbol sign ______ Each

The following table provides details on Work Zone Speed Zones approved for use on this project:

<table>
<thead>
<tr>
<th>WZSZ Revision Number</th>
<th>County &amp; Route</th>
<th>SLM Phase/Part &amp; Direction</th>
<th>Approved Speed Limit (mph)</th>
<th>Specific Warranting Conditions and Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>WZ-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WZ-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WZ-</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>WZ-</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>WZ-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Designer Note:** This note shall be included in projects where speed limits are reduced in accordance with Section 640-18.2.

Sufficient numbers of the Work Zone Speed Limit signs shall be included to cover all approved work zone speed zones within the entire project at the spacing required by the note plus the sign(s) for each entrance ramp, for each applicable direction as well as the necessary quantity of signs for posting the resumption of the statutory speed limit at the end of the posted work zone speed zone. For example, for a 2.33 mile work zone speed zone (EB only; reduced to 55 mph) on a 6 mile project on an Interstate freeway with 2 open entrance ramps, what is the number of signs needed for this approved speed zone?

Spacing = 1.0 miles
2.33/1.0 = 2.33 signs or 3 signs
Both sides of roadway (dual mounted) = 3 x 2 = 6 signs
One direction of roadway (e.g. EB only) = 6 x 1 = 6 signs
Plus two open entrance ramps (assuming dual mounted necessary) = 6 + 4 = 10 signs
Plus sign for resumption of statutory speed limit = 10 + 1 = 11 signs
Number of Work Zone Speed Limit signs for this work zone speed zone = 11

Repeat for each approved work zone speed zone to calculate a total number of Work Zone Speed Limit signs needed for the project.

642-25 Designated Local Detour Route

In addition to the official, signed Detour Route, a local route has been determined to be the secondary, unsigned Detour Route or “designated local Detour Route.” This route is shown on Sheet No. ____. During the time that traffic is detoured, the Contractor shall maintain this route in a condition which is reasonably smooth and free from holes, ruts, ridges, bumps, dust and standing water. Once the detour is removed and traffic returned to its normal pattern, the designated local Detour Route shall be restored to a condition that is equivalent to that which existed prior to its use for this purpose. All such work shall be performed when and as determined by the Engineer.

The following estimated quantities are provided for use as determined by the Engineer to maintain and subsequently restore the designated local Detour Route.

Item 301, Asphalt Concrete Base, PG 64-22 ______ Cu. Yd.
Item 304, Aggregate Base ______ Cu. Yd.
Item 448, Asphalt Concrete Surface Course, Type 1, PG 64-22 ______ Cu. Yd.
Item 407, Tack Coat ______ Gal.
Item 408, Prime Coat ______ Gal.
Item 614, Asphalt Concrete for Maintaining Traffic ______ Cu. Yd.
Item 616, Water ______ M. Gal.
Item 617, Compacted Aggregate, Type A ______ Cu. Yd.
Item 617, Water ______ M. Gal.
Item 642, Center Line ______ Mile

Designer Notes:

1. Procedures relative to Detours and designated local Detour Routes are set forth in SOP OPS-103, Detours and SOP OPS-104, Maintenance & Repair of Local Roads and Streets Used as Official Detour Routes, Designated Local Detour Routes, or Haul Roads. These documents are available on the Maintenance Administration website via the Intranet.

2. The list of payment items is included for example purposes only. It is not meant to be all-inclusive of the Items that might be required. The designer must provide items for each individual project as may be appropriate for the work involved.

3. All pay items listed in the above note should be carried to the General Summary under the Maintenance of Traffic heading.

642-26 Item 614, Barrier Reflectors And/Or Object Markers

Barrier Reflectors and/or Object Markers shall be installed on all Portable Barrier (PB) used for traffic control. Barrier Reflectors, Object Markers and their installation shall conform to CMS 626, except that the spacing shall be 50 feet. An estimated quantity of _____ each of Item 614 Barrier Reflector, Type B and _____ each of Item 614 Object Marker, ____-way have been provided and carried to the General Summary.

Designer Note: This note shall be added when Item 614, Barrier Reflectors and/or Object Markers are specified on portable barrier. Each time portable barrier is moved to a new location a new quantity of barrier reflectors and/or object markers shall be provided in the plans.
642-27 Work Zone Increased Penalties Sign (R11-H5a)

R11-H5a-48 signs shall be furnished, erected, and maintained in good condition and/or replaced as necessary and subsequently removed by the Contractor. Signs shall be mounted at the appropriate offsets and elevations as prescribed by the Ohio Manual of Uniform Traffic Control Devices. They shall be maintained on supports meeting current safety criteria.

The signs may be erected or uncovered no more than four hours before the actual start of work. The signs shall be removed or covered no later than four hours following restoration of all lanes to traffic with no restrictions, or sooner as directed by the Engineer. Temporary sign covering and uncovering due to temporary lane restorations shall be guided by the four-hour limitations stated above. Such lane restorations should be expected to remain in effect for 30 or more consecutive calendar days, such as during winter shut-downs.

(The signs on the mainline shall be dual mounted unless not physically possible. The first sign shall be placed between the ROAD WORK AHEAD (W20-1) sign and the next sign in the sequence. Signs shall be erected on each entrance ramp and every 2 miles through the construction work limits. Signs on the mainline shall be R11-H5a-48. Signs used on the ramps shall be R11-H5a-24. R11-H5a-24 signs may be used in the median in lieu of R11-H5a-48 signs if it is not physically possible to provide R11-H5a-48 signs in the median.)

The Contractor may use signs and supports in used, but good, condition provided the signs meet current ODOT specifications. Sign faces shall be retroreflectorized with Type G sheeting complying with the requirements of CMS 730.19.

Work Zone Increased Penalties signs and supports will be measured as the number of sign installations, including the sign and necessary supports. If a sign and support combination is removed and reerected at another location as directed by the Engineer, it shall be considered another unit.

Payment for accepted quantities, complete, in place will be made at the contract unit price. Payment shall be full compensation for all materials, labor, incidentals and equipment for furnishing, erecting, maintaining, covering during suspension of work, and removal of the sign and support.

Item 614, Work Zone Increased Penalties Sign ______ Each

Work Zone Increased Penalties signs will be placed at the following locations:

**Designer Note:** As noted in *Section 605-4.3*, this sign shall be used for construction zones on multi-lane divided highways where the work is expected to last thirty days or more, the work length is at least 0.50 miles, and the work is stationary. See *Section 605-4.3* for other information about the use of this signing.

The third paragraph shall only be used when the sign locations are not itemized in note.

642-28 Earthwork for Maintaining Traffic

The following quantities have been included in the plan for information only.

<table>
<thead>
<tr>
<th>Work Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation for Maintaining Traffic</td>
<td>______ Cu. Yd.</td>
</tr>
<tr>
<td>Embankment for Maintaining Traffic</td>
<td>______ Cu. Yd.</td>
</tr>
</tbody>
</table>

When undercuts are necessary for mainline pavement or embankment construction, evaluate the need for temporary road undercuts if within a close proximity to the mainline undercuts. A geotechnical evaluation should be considered to determine if the existing soil conditions are adequate to support the temporary road. Additional soil borings along the temporary road are not normally required.
**Designer Note:** This note should be used in conjunction with CMS Item 615, Roads for Maintaining Traffic. The calculations for the above quantities may be shown on the cross-sections or on a separate letter-size sheet that is attached to the LD-4 form.

### 642-29 Floodlighting

Floodlighting of the work site for operations conducted during nighttime periods shall be accomplished so that the lights do not cause glare to the drivers on the roadway. To ensure the adequacy of the floodlight placement, the Contractor and the Engineer shall drive through the work site each night when the lighting is in place and operative prior to commencing any work. If glare is detected, the light placement and shielding shall be adjusted to the satisfaction of the Engineer before work proceeds.

Payment for all labor, equipment and materials shall be included in the lump sum contract price for Item 614, Maintaining Traffic *(Section 642-2)*.

**Designer Note:** The note shall be used on projects that will have work performed during the nighttime hours.

### 642-30 Item 614, Work Zone Impact Attenuator for 24" Wide Hazards (Unidirectional or Bidirectional)

This item shall consist of furnishing and installing a non-gating impact attenuator. Furnish an impact attenuator from the Office of Roadway Engineering approved list for Work Zone Impact Attenuators. The approved list is available at the “Roadway Standards: Proprietary Roadside Safety Devices” web page on the Office of Roadway Engineering website.

Installation shall be at the locations specified in the plans in accordance with the manufacturer’s specifications.

The Contractor shall repair or replace a damaged unit within 24 hours of a damaging impact.

When bidirectional designs are specified, the Contractor shall supply appropriate transitions.

When gating impact attenuators are desired, the Contractor shall submit documentation to the Engineer for acceptance.

The cost for the additional barrier required for a gating impact attenuator shall be included in the cost of the gating impact attenuator.

Payment for the above work shall be made at the unit price bid and shall include all labor, tools, equipment and materials necessary to construct and maintain a complete and functional impact attenuator system, including all related backups, transitions, leveling pads, hardware and grading, not separately specified, as required by the manufacturer.

**Designer Notes:**

1. This note should be used for temporary protection of Type 5 Barrier Design Guardrail, Concrete Median Barrier, Temporary Traffic Barrier and other narrow hazards (24 inches or less in width) When a work zone impact attenuator is needed to protect wider hazards, the designer should specify Item 614 Work Zone Impact Attenuator for Hazards Over 24" and Less Than 36" Wide, (Unidirectional or Bidirectional) and add the corresponding note to the plans *(see Section 642-31)*.

2. A minimum 75 x 20 foot recovery area shall be provided behind each impact attenuator. The recovery area shall be free of workers or any other hazards. Additional work area
may be required beyond the recovery area. The designer should refer to PIS 2010175, Impact Attenuator Placement for further guidance.

3. The length of need point is at the nose of the system; therefore, the entire length of the non-gating impact attenuator can be deducted from the calculated length of need for the barrier.

4. Any of the attenuators can be installed on a concrete pad or asphalt pavement. Consult the manufacturer's specifications for minimum pavement thicknesses and anchoring requirements.

5. Pre-approved shop drawings are reviewed and kept on file. Contact the Office of Roadway Engineering for the current Drawing/Revision.

6. If cross slopes are steeper than 8 percent (12:1), or if the cross slope varies by more than 2 percent (1 degree) over the length of the unit, a leveling pad may be used.

7. Provisions shall be made for the rear fender panels to slide 30 inches rearward upon impact.

8. Bidirectional impact attenuators should be specified for locations where traffic is expected to be in opposing directions on either side of the attenuator. Unidirectional shall be specified when traffic is expected in the same direction on both sides of the attenuator.

9. For gating impact attenuators, the following shall apply:
   a. The recovery area described in note 2 shall be provided from the start of the temporary traffic barrier. The area behind the gating impact attenuator shall be an extension of the recovery area.
   b. The length of need for a gating impact attenuator is at the back of the attenuator; therefore, the impact attenuator shall not be included as part of the calculated length of need.
   c. Gating impact attenuators shall not be used as a bidirectional attenuator.

642-31 Item 614, Work Zone Impact Attenuator for Hazards Over 24" and Less than 36" Wide (Unidirectional or Bidirectional)

This item shall consist of furnishing and installing a non-gating impact attenuator. Furnish an impact attenuator from the Office of Roadway Engineering approved list for Work Zone Impact Attenuators.

Installation shall be at the locations specified in the plans, in accordance with the manufacturer's specifications.

The Contractor shall repair or replace a damaged unit within 24 hours of a damaging impact.

When bidirectional designs are specified, the Contractor shall supply appropriate transitions.

Payment for the above work shall be made at the unit price bid and shall include all labor, tools, equipment and materials necessary to construct and maintain a complete and functional impact attenuator system, including all related backups, transitions, leveling pads, hardware and grading, not separately specified, as required by the manufacturer.

Designer Notes:

1. This note should be used for temporary protection of Type 5 Barrier Design Guardrail, Concrete Median Barrier, Temporary Traffic Barrier, and other fixed objects located in
work zones where hazards are wider than 24 inches, but less than 36 inches.

2. The designer should refer to PIS 2010175, Impact Attenuator Placement for further guidance.

3. The length of need point is at the nose of the system; therefore, the entire length of the unit can be deducted from the calculated length of need for the barrier.

4. Any of the attenuators can be installed on a concrete pad or asphalt pavement. Consult the manufacturer’s specifications for the minimum pavement thicknesses.

5. Pre-approved shop drawings are reviewed and kept on file. Contact the Office of Roadway Engineering for the current Drawing/Revision.

6. If cross slopes are steeper than 8 percent (12:1), or if the cross slope varies by more than 2 percent (1 degree) over the length of the unit, a leveling pad may be used.

7. Provisions shall be made for the rear fender panels to slide 30 inches rearward upon impact.

8. Bidirectional should be specified for locations where traffic is expected to be in opposing directions on either side of the attenuator. Unidirectional shall be specified when traffic is expected to move in the same direction on both sides of the attenuator.

642-32 Reserved for Future Information.

This Plan Note has been deleted; however, the Section (and Plan Note) number has been reserved for future information.

642-33 Extra Advance Warning Signs (Note A)

An Extra Advance Warning Sign Group consists of two W20-1 (ROAD WORK AHEAD) signs, two W20-5 (RIGHT /LEFT LANE CLOSED AHEAD) signs with W16-3a Distance plates, and two W3-H7 (WATCH FOR STOPPED TRAFFIC) signs and required warning lights.

The Contractor shall provide, erect, maintain and remove Extra Advance Warning Sign Groups as shown on SCD MT-95.50 at the following distances in advance of the lane tapers with the appropriate W16-3a distance plates:

1) Lane Taper No. _______, Station ________, Phases ______ & _______; provide sign groups at ______ miles ______ miles and ______ miles.

2) Lane Taper No. _______, Station ________, Phases ______ & _______; provide sign groups at ______ miles, ______ miles, ______ miles, and ______ miles.

(Optional paragraph - The Contractor shall have an additional Extra Advance Warning Sign Group (6 signs and 2 distance plates) available for use when directed by the Engineer. The distance plates for this group shall be able to be modified in the field to show appropriate whole miles to the lane taper.)

Payment for providing, erecting, maintaining and removing Extra Advance Warning Sign Groups shall be included in the lump sum bid for Item 614, Maintaining Traffic.

Designer Note: As noted in Section 641-5.2, this note should be used to require extra Advance Warning Sign Groups if the queue resulting from a lane closure on a multi-lane divided highway is expected to extend beyond the normal ROAD WORK AHEAD sign (W20-1). See Section 641-5.2 for further information.
642-34 Extra Advance Warning Signs (Note B)

An Advance Warning Sign Group consists of two W20-1 (Road Work Ahead) signs, two W20-5 (Right/Left Lane Closed Ahead) signs with W16-3a Distance plates, and two W3-H7 (Watch for Stopped Traffic) signs and required flashing lights.

The Contractor shall provide, erect, maintain and remove an Extra Advance Warning Sign Group as shown on SCD MT-95.50. The W16-3 Distance plates shall read "_______ MILES". The Right (Left) Lane Closed Ahead signs shall be located ________ miles from the beginning of the lane taper. Spacing of the other signs shall be as shown on SCD MT-95.40.

The Contractor shall provide, erect, maintain and remove an additional Extra Advance Warning Sign Group to provide additional warning for the anticipated traffic increase during the following national holidays: (appropriate holidays to be filled in as defined by policy and the specific needs of the project). These signs shall be erected no later than 1:00 p.m. the third day preceding the holiday or holiday weekend and not removed before 9:00 a.m. the third day subsequent to the holiday or holiday weekend. The signs shall be removed during the periods between holidays. The W16-3a Distance plates shall read "_______ MILES" with the W20-5 signs located ______ miles from the beginning of the lane taper. Spacing of the other signs shall be as shown on SCD MT 95.30 or 95.40.

(Optional paragraph - The contractor shall have a third Extra Advance Warning Sign Group (6 signs and 2 distance plates) available for use when directed by the Engineer. The distance plates for this group shall read "_______ MILES.")

Payment for providing, erecting, maintaining and removing Extra Advance Warning Sign Groups shall be included in the lump sum bid for Item 614, Maintaining Traffic.

Designer Note: As noted in Section 641-5.2, this note should be used to require extra Advance Warning Sign Groups in situations involving work that will extend over a holiday or any other anticipated period of unusually high traffic demand, if the queue resulting from a lane closure on a multi-lane divided highway is expected to extend beyond the normal ROAD WORK AHEAD sign. See Section 641-5.2 for further information.

642-35 Item 614, Work Zone Crossover Lighting System

This work shall consist of furnishing, erecting, operating, maintaining and removing a work zone lighting system for a single crossover, or overlapping a pair of crossovers. The system shall be as shown on SCD MT-100.00. The Contractor shall arrange for and pay for power. All materials and construction shall comply with applicable portions of 625 and 725 except: The Performance test of 625.19F, and certified drawing requirement of 625.04, are waived and used materials in good condition are acceptable.

Poles which are not protected by guardrail or portable barrier shall be located outside the clear zone, and should be located at least 30 ft (preferably 40 ft) from the edge of pavement when possible. Additional pole lines, cables and appurtenances necessary to furnish power to the lighting system shall be included in this item. Service poles shall be positioned with the same constraints as the lighting poles as a minimum.

Payment will be made at the unit price per each for Item 614, Work Zone Crossover Lighting System throughout all phases of work when the crossover roadways are used.

Designer Note: As noted in Section 641-9.5, this note should be included in the plan when a work zone crossover lighting system is provided.

642-36 Multi-Plan, Time-of-Day Operation of Work Zone Signal

The work zone signal control required for this project and shown on sheets __________ and
SCDs MT-96.11, 96.20, and 96.26 shall be capable of providing multiple timing patterns chosen on a time-of-day basis.

Traffic control equipment shall be capable of time-of-day/day-of-week programming; with a minimum of three-dial, three offsets and three splits, or a minimum of fifteen separate timing plans.

### Timing Plan (Seconds)

<table>
<thead>
<tr>
<th>Approach</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound Green</td>
<td>31.0*</td>
<td>41.0</td>
<td>16.0*</td>
</tr>
<tr>
<td>Northbound Yellow</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Northbound All Red (Internal Clearance)</td>
<td>18.0</td>
<td>18.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Southbound Green</td>
<td>30.0</td>
<td>20.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Southbound Yellow</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Southbound All Red (Internal Clearance)</td>
<td>19.0</td>
<td>19.0</td>
<td>19.0</td>
</tr>
</tbody>
</table>

* Provide Timing Appropriate for the Signal Location Under Consideration

### Time of Day

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>SUN</th>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>THUR</th>
<th>FRI</th>
<th>SAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midnight - 7:00 a.m.</td>
<td>C*</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C*</td>
</tr>
<tr>
<td>7:00 a.m. - 9:00 a.m.</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>9:00 a.m. - 4:00 p.m.</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<td>C</td>
</tr>
<tr>
<td>4:00 p.m. - 6:00 p.m.</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>6:00 p.m. - Midnight</td>
<td>C*</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C*</td>
</tr>
</tbody>
</table>

Payment is incidental to the lump sum bid for Item 614, Maintaining Traffic.

**Designer Note:** This note should be included in the plan when a signalized one-lane, two-way closing is used.

### 642-37 Fully-Actuated Operation of Work Zone Traffic Signal

The work zone signal control required for this project and shown on sheets __________ and SCDs MT- 96.11, 96.20 and 96.26 shall be fully traffic-actuated and operate in a manner similar to that described in Section 733.02 of the Construction and Material Specifications.

The initial controller timing shall be as follows:

<table>
<thead>
<tr>
<th>Phase *</th>
<th>1 (All Red) Dummy Phase</th>
<th>2 Mainline (direction)¹</th>
<th>3 (All Red) Dummy Phase</th>
<th>4 Mainline (direction)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Green</td>
<td>$T_{IC1} - 6+/-$</td>
<td>10</td>
<td>$T_{IC3} - 6+/-$</td>
<td>10</td>
</tr>
<tr>
<td>Extension</td>
<td>n/a</td>
<td>4</td>
<td>n/a</td>
<td>4</td>
</tr>
<tr>
<td>Max. Green</td>
<td>$T_{IC1} - 5+/-$</td>
<td>30</td>
<td>$T_{IC3} - 5+/-$</td>
<td>30</td>
</tr>
<tr>
<td>Yellow</td>
<td>3</td>
<td>3.5</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>All Red</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Recall</td>
<td>Max.</td>
<td>Min.</td>
<td>Max.</td>
<td>Min.</td>
</tr>
</tbody>
</table>

*Phases as shown on **SCD MT-96.20** for Actuated Control. Add more phases as needed to accommodate side streets, driveways, etc.

+/- Provide timing for the signal location under consideration.
$T_{IC1}$ is the desired Internal Clearance time for phase 1. $T_{IC3}$ is the desired Internal Clearance time for phase 3. Usually, $T_{IC1} = T_{IC3}$.

Indicate direction of green.

The Contractor shall also design, furnish, install and maintain a traffic detector on each traffic approach which will reliably detect all legal traffic approaching (but not leaving) the signal as it passes or waits in the designated detector zone shown in the plans. Detector designs which do not provide reliable detection, free from false calls, shall be immediately replaced by the Contractor.

**Designer Note:** This note should be included in the plan when a signalized one-lane, two-way closing is used.

**642-38 Overhead-Mounted Work Zone Signals**

Signals shall be overhead mounted in accordance with the details shown on SCD MT-96.20.

**Designer Note:** This note shall be provided if there is a reason to prohibit side-mounted signal heads.

**642-39 Lighting**

Lighting shall be provided at each end of the lane closure for the closing of one lane of a two-lane highway.

Lighting shall be by conventional methods, with luminaire arms attached to the signal supports. Area illumination shall be provided by using 150 watt minimum high pressure sodium luminaries or 250 watt minimum mercury luminaries. The minimum height of the luminaire shall be 27 ft from the ground surface.

Payment for lighting shall include delivery, erection, maintenance and removal as called for in the plans. Payment shall be per Each.

**Designer Note:** This note may be included in the plans if the designer finds that there is a special need for the lighting at the project location. Examples of need for such lighting might be the existence of an intersection at the point of the lane closure, or poor geometrics or poor sight distance at the point of the lane closure.

Item 614 Work Zone Lighting System Each

**642-40 Maintenance of Canoe Traffic**

Canoe traffic shall be maintained throughout construction of the project either through existing river channel or through portage trail approved by the Engineer.

Adequate signing both upstream and downstream shall be installed and maintained by the Contractor. The following type signs are considered to be minimum treatment:

1. Approximately one-quarter mile upstream, advanced warning type signs on both banks;

2. Approximately 300 feet upstream, signs specifying actions required of canoeist on both banks;

3. Approximately one-quarter mile downstream, advance warning type signs on both banks; and

4. Approximately 300 feet downstream, signs specifying actions required of canoeist of both banks.
The above signing shall be mounted in such a way as to be a minimum of 4 feet above the water level, unobstructed by tree branches, and properly angled for maximum visibility from the main clear channel. The method of supporting the signs shall be approved by the engineer prior to installation. Upon completion of the project, the signs and support systems shall be completely removed from the river channel. The Contractor shall notify local canoe liveries using this portion of the river at least 10 days prior to any changes affecting canoe traffic.

Portage trails if used shall be constructed and maintained by the Contractor with the least possible disturbance to the surrounding area. The trail shall be adequately marked in both directions. The Contractor shall be responsible for obtaining the right-of-way for the portage trails if required.

In the event pipes are used to divert or carry river water, both the inlet and outlet ends shall be adequately protected by grates or fence so that people or canoes are not drawn through or held by them.

642-41 Item 614, Portable Changeable Message Signs, As Per Plan

The Contractor shall furnish, install, maintain and remove, when no longer needed, a changeable message sign. The sign shall be of a type shown on a list of approved PCMS units available on the Office of Materials Management web page. The list contains Class A and B units with minimum legibility distances of 650 feet and 475 feet, respectively.

Each sign shall be trailer-mounted and equipped with a functional dimming mechanism, to dim the sign during darkness, and a tamper and vandal proof enclosure. Each sign shall be provided with appropriate training and operation instructions to enable on-site personnel to operate and troubleshoot the unit. The sign shall also be capable of being powered by an electrical service drop from a local utility company. The PCMS shall be delineated in accordance with CMS 614.03.

The probable PCMS locations and work limits for those locations are shown on sheet(s) of the plan. Placement, operation, maintenance and all activation of the signs by the Contractor shall be as directed by the Engineer. The PCMS shall be located in a highly visible position yet protected from traffic. The Contractor shall, at the direction of the Engineer, relocate the PCMS to improve visibility or accommodate changed conditions. When not in use, the PCMS shall be turned off. Additionally, when not in use for extended periods of time, the PCMS shall be turned away from all traffic.

The Engineer shall be provided access to each sign unit and shall be provided with appropriate training and operation instructions to enable ODOT personnel to operate and troubleshoot the unit, and to revise sign messages, if necessary.

(The Contractor shall implement a system whereby changeable messages will be implemented within ______ hours following telephone notification from the Project Engineer to a designated phone.)

All messages to be displayed on the sign will be provided by the Engineer. A list of all required pre-programmed messages will be given to the Contractor at the project preconstruction conference. The sign shall have the capability to store up to 99 messages. Message memory or pre-programmed displays shall not be lost as a result of power failures to the on-board computer. The sign legend shall be capable of being changed in the field. Three-line presentation formats with up to six message phases shall be supported. PCMS format shall permit the complete message for each phase to be read at least twice.
The PCMS shall contain an accurate clock and programming logic which will allow the sign to be activated, deactivated or messages changed automatically at different times of the day for different days of the week.

(The PCMS shall contain a cellular telephone data link which will (in active cellular phone areas) allow remote sign activation, message changes, message additions and revisions to time of day programs. The system shall also permit verification of current and programmed messages. One remote data input device (laptop computer plus modem or equivalent) shall be furnished for use by the District Traffic Engineer, or equivalent, and shall be insured against theft.)

The PCMS unit shall be maintained in good working order by the Contractor in accordance with the provisions of CMS 614.07. The Contractor shall, prior to activating the unit, make arrangements, with an authorized service agent for the PCMS, to assure prompt service in the event of failure. Any failure shall not result in the sign being out of service for more than 12 hours, including weekends. Failure to comply may result in an order to stop work and open all traffic lanes and/or in the Department taking appropriate action to safely control traffic. The entire cost to control traffic, accrued by the Department due to the Contractor’s noncompliance, will be deducted from moneys due, or to become due the Contractor on his contract.

The Contractor shall be responsible for 24-hour-per-day operation and maintenance of these signs on the project for the duration of the phases when the plan requires their use.

Payment for the above described item shall be at the contract unit price. Payment shall include all labor, materials, equipment, fuels, lubricating oils, software, hardware and incidentals to perform the above described work.

Item 614, Portable Changeable Message Sign, as per plan ________ Sign Month

Designer Note: Portable changeable message signs (PCMSs) are trailer-mounted programmable message units which can be utilized to provide advance information about upcoming traffic conditions or diversion routing schemes to road users (see Section 605-9). PCMS units are supplemental information devices and shall not be utilized as alternates to standard fixed signing or flashing arrow boards.

On major construction projects, PCMS units can provide real benefits to road users. These benefits include increased work zone capacity resulting from advance warning of lane closures, and improved corridor capacity resulting from diversion schemes implemented in reduced capacity situations.

PCMSs are intended to have a high impact on the motorist and to convey timely, pertinent, driver oriented information which could not be provided by fixed-message signs. For this reason, if no important message needs to be displayed, the sign shall be turned off. The display of non-priority messages is discouraged as drivers tend to become familiar with these and overlook priority messages displayed later.

The use of PCMS should be reserved for situations where signs must be changed frequently and/or where the next required message cannot be predicted in advance. When a message is known in advance or when it could be determined before there is a need to display it, then a fixed-message sign is appropriate. Certainly, messages such as LEFT/RIGHT LANE CLOSED AHEAD should not be considered for PCMS display because there are standard signs readily available for this purpose and emphasis can be added with flashers or flags at a nominal cost. Similarly, non-standard messages such as ROAD WORK WILL CLOSE TWO (2) LANES BEGINNING APRIL 20, 2012 can normally be determined well in advance of need and included in the plans as fixed-message signs. Even where sign messages must change periodically, a fixed-message sign with flip-up panel may be more appropriate.
Sign messages shall be limited to a maximum of two sequential displays or phases, each consisting of a maximum of three, eight-character lines.

The Approved List of Portable Changeable Message Signs can be found on the Office of Materials Management website. This list contains the PCMS approved for use on ODOT projects. The pre-qualified list currently contains two classes of PCMS, Class A and Class B. The Class A unit, with legibility distance of 650 feet is intended for use on roadways where the speed limit is 45 mph or greater. The Class B unit, with legibility of 475 feet is intended for use on roadways where the speed limit is 40 mph or less.

The fifth paragraph in this Plan Note is optional. This paragraph is to be included in the plans when it is intended that time-of-day/day-of-week programming capability is to be provided. This feature allows for certain messages to be pre-selected for anticipated critical times, and also allows the unit to be automatically turned off when there is no significant message to convey.

The eighth paragraph in this Plan Note is also optional. This paragraph is to be used when it is necessary to require cellular phone data link programming of PCMS operation and messages. This should be included only when potential maintenance of traffic problems justify its use; and only when procedures have been developed to assess travel problems on a current basis and an operating agency (e.g., District Traffic Department, City Traffic Department, OSHP or City Police Department) is prepared to monitor and operate the system on a real-time basis with current information. Further, the cellular phone option should not be invoked unless the designer has assured that cellular phone services are available in the proposed sign area. Generally, PCMS units should be located well in advance of the situation to which they relate. In the case of diversion schemes, the PCMS units should be located well in advance of the upstream interchange where the alternate route begins. The desired location(s) for deployment of PCMS units shall be established by means of a Plan Note listing the specific locations where the contractor is to install, maintain and remove the PCMS units(s) and the duration the PCMS unit is to function. Designers should field review potential sites to find those with good visibility and a level, accessible area, preferably behind existing guardrail. The Plan Note also permits the project engineer to relocate the sign to improve visibility or to accommodate changing conditions.

642-42 Maintenance of Traffic Signal/Flasher Installation

The Contractor shall be responsible for maintaining traffic signal/flasher installations within the project under the following conditions:

1. Existing signal/flasher installations which the plans require the Contractor to adjust, modify, add onto or remove, or which the Contractor actually adjusts, modifies or otherwise disturbs. The Contractor shall be responsible for the entire installation (at an intersection) from the time his operations first disturb the installation until the installation has been subsequently removed or modified and the work is accepted.

2. New or reused signal/flasher installations or devices, installed by the Contractor. The Contractor shall be responsible for maintenance of these from the time of installation until the work is accepted.

The Contractor shall correct as quickly as possible all outages or malfunctions. He shall provide the maintaining agency and the Engineer such addresses and phone numbers where his maintenance forces can be contacted. The Contractor shall provide one or more persons to receive all calls and dispatch the necessary maintenance forces to correct outages. Such a person or persons may be used to perform other duties as long as prompt attention is given to these calls and a person is readily available continuously 24 hours a day, 7 days a week. All lamp outages, cable outages, electrical failures, equipment malfunctions and misaligned
signal heads shall be corrected to the satisfaction of the Engineer with the signal back to service within four hours after the Contractor has been notified of the outage.

In the event new signals are damaged prior to acceptance, all damaged equipment except poles and control equipment shall be replaced by the Contractor to the satisfaction of the Engineer with the signal back in service within 8 hours after the Contractor's notification of the outage. The Contractor shall arrange for full traffic control until the signal is back in operation.

If poles and/or control equipment are damaged and must be replaced, the Contractor shall make temporary repairs as necessary to bring the signal back into full operation within the allowed 8-hour period, and shall make permanent repairs or replacement as soon thereafter as possible.

None of the above shall be construed as collective or consecutive outage time periods at any one location. That is, where more than one outage occurs at any one location then the allotted time limit shall be for the worst single outage.

Where outages are the direct result of a vehicle accident the response of the Contractor shall be as outlined above. The Contractor shall be responsible for collection of any compensation for this work from those parties responsible for the damage.

Where the Contractor has failed to, or cannot respond to, an outage or signal equipment malfunction, at these locations within his responsibility, within periods as specified above, the Engineer may invoke the provisions of Section 105.15 and any subsequent billings to the State or the City of __________ for Police Services and maintenance services by City forces shall be deducted from monies due or to become due the contractor in accordance with provisions of Section 105.15.

The Contractor shall provide the maintenance service entirely with his forces or he may choose to enter into a cooperative understanding with the local maintaining agency to provide the maintenance. The Contractor shall inform the Engineer, in writing, of the maintenance method selected.

The Contractor shall be responsible for any damage to any traffic signal components required to be handled during the relocation of poles and revisions to the signal system. When a traffic signal must be taken out of service by the Contractor, due to construction procedures, this outage shall not exceed ___ hours and shall not include the hours of ___ to ___. Any signalized intersection, where the signal is out of service due to construction procedures, or due to an outage or malfunction of equipment as described above, shall be protected, by the Contractor, by the installation of temporary "STOP" signs, except for the following intersections which shall be protected by off-duty City of __________ Police, hired by the Contractor:

1.
2.
3.

Any vehicular traffic signal head, either new or existing which will be out of operation shall be covered in the manner described in 632.25.

The Contractor shall maintain complete records of malfunctions including:

1. Time of notification of malfunction;
2. Time of work crews arrival to correct the malfunction;
3. Actions taken to correct the malfunction, including a list of parts repaired or replaced;

4. A diagnosis of reason for the malfunction and probability of reoccurrence;

5. Time of completion of the repair and system restored to full service.

A copy of these records shall be provided to the Engineer within three (3) working days following completion of each repair.

All costs resulting from the above requirements shall be considered to be included in the lump sum price bid for Item 614, Maintaining Traffic.

**Designer Note:** This note may be used when existing signals are to be maintained.

### 642-43 Advance Work Zone Information

Advance work zone information signs, as used in this note, are fixed message types. The signs are to be located at extreme distance from the work area, as shown in the plans.

The signs shall be black on orange (including a black border). The layout shall be in conformance with TEM Section 211.

When regulatory information is provided, it shall be displayed separately as a standard black-on-white sign. Mixing of black-on white regulatory information on a black-on-orange information sign is prohibited.

If the motorist is being detoured or if an alternate route is provided, the route should be signed with assemblies consisting of the appropriate black-on-orange DETOUR or ALT marker with a standard route marker and arrow plate. If more target value is desired, this trail blazer information may be shown on an orange panel (OMUTCD Section 2D.32).

Route Sign assemblies shall be sized according to the type of road on which they are located in accordance with the OMUTCD.

Supports for sign installations shall conform to all existing standards for permanent signs. These signs should not be attached to existing supports.

Where the plans call for an overlay to cover a portion of an existing sign, the overlay shall be black-on-orange. Letter sizes should be the same as on the existing signs. When lane arrows are to be covered, rather than using a blank overlay, the legend “LANE CLOSED” shall be used. When a ramp is being closed, rather than using a blank overlay to cover the entire sign, the legend “CLOSED” shall be used on a diagonal overlay (lower left to upper right) on the sign. The size of lettering on overlays and the size of the overlay are indicated in the plans. The minimum letter size for “LANE CLOSED” shall be 10” E. The minimum letter size for the diagonal “CLOSED” overlay shall be 12” E.

All advance work zone information sign installations located outside of the project work limits shall be paid for under appropriate 630 items (signs, supports, concrete, breakaway connection, overlays, removals, etc.).

**Designer Note:** This note may be used when it is necessary to provide advance information on fixed signs, as discussed in Section 640-26.

### 642-44 Worksite Traffic Supervisor

Subject to approval of the Engineer, the Contractor shall employ and identify (someone other than the superintendent) a certified Worksite Traffic Supervisor (WTS) before starting work in the field. The WTS may be certified from one of the following organizations:
1. American Traffic Safety Service Association (ATSSA), phone number 1-800-272-8772, certified Traffic Control Supervisor (TCS).

2. National Highway Institute, Design and Operation of Work Zone Traffic Control, phone number 1-703-235-0528.

3. The Ohio Contractors Association, Traffic Control Supervisor (OCA/TCS) work zone class, only if taken after May 5, 2004, phone number 1-800-229-1388.


A copy of each WTSs certification and 24-hour contact information shall be provided to the Engineer at the preconstruction conference. If the designated WTS will not be available full time (24/7) the Contractor may designate an alternate WTS to be available when the primary is off duty. Each WTS shall have a current WTS certification (with an expiration date no more than 5 years from the date of issue) from any of the approved organizations.

The WTS position has the responsibility of monitoring traffic control deficiencies for the entire work zone. The duties of the WTS are as follows:

1. Be available on a 24-hour per day basis, and be able to be on site for all emergency traffic control needs within one hour of notification by police or project staff and be prepared to effect corrective measures immediately on existing work zone traffic control devices.

2. Attend preconstruction meeting and all project meetings where traffic control management is discussed.

3. Be available for meetings or discussions with the Engineer upon request or within 36 hours.

4. Be aware of, and coordinate if necessary, all traffic control operations, including those of subcontractors and suppliers.

5. Coordinate project activities with all Law Enforcement Officers (LEOs). A WTS shall also be the main contact person with the LEOs while they are on the project.

6. Coordinate meetings with ODOT personnel, LEOs and other applicable entities before each plan phase switch to discuss work zone traffic control.

7. Ensure compliance with the contract documents for signs, barricades, temporary concrete barrier, pavement markings, portable message signs, and other traffic control devices on a daily basis; and facilitate any corrective action necessary.

8. Notify the Contractor of the need for cleaning and maintenance of all traffic control devices, including the covering and removal of inapplicable signs.

9. Inspect, evaluate, propose necessary modifications to, and document the effectiveness of, the traffic control devices and/or traffic operations on a DAILY BASIS (7 days a week). In addition, a weekly night inspection of the work zone setup for daytime work operations; and one daytime inspection per week for nighttime projects. This shall include (but not be limited to) documentation on the following project events:

a. Initial traffic control setup (day and night review).

b. Daily traffic control setup and removal.
c. When construction staging causes a change in the traffic control setup.

d. Crash occurrences within the construction area.

e. Removal of traffic control devices at the end of a phase or project.

f. All other emergency traffic control needs.

10. Complete the Department approved Long Term Inspection form (CA-D-8) after each inspection as required in # 9 and submit it to the Engineer the following work day. These reports shall include a checklist of all traffic control maintenance items to be reviewed. A copy of the form will be provided at the pre-construction meeting. Any deficiencies observed shall be noted, along with recommended corrective actions and the dates by which such corrections were, or will be, completed. A copy of this document can be found in the Department of Transportation Construction Inspection Forms Manual dated 10/15/06 or current revision.

11. Verify that all flagging operations are being conducted per the Ohio Manual of Uniform Traffic Control Devices.

12. Have copies of the ODOT Temporary Traffic Control Manual and applicable standards and specifications included in the contract documents available at all times on the project.

The Department will not pay the unit price bid for the WTS for any day on which the Contractor fails to perform the duties set forth above. Should the Contractor’s failure to perform any of the duties described above result in a maintenance of traffic safety issue, the Department will deduct the prorated daily amount for Item 614 Maintenance of Traffic from the Contractor’s next scheduled estimate.

If three or more failures to perform the duties set forth above occur, the WTS shall be immediately removed from the work in accordance with C&MS 108.05.

The following estimated quantity has been included for the Worksite Traffic Supervisor:

Item 614  Worksite Traffic Supervisor  _______ Months

**Designer Note:** The Worksite Traffic Supervisor note is intended for use on long-term Interstate or Interstate look-alike projects.

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**642-45 Reserved for Future Information**

Plan Note 642-45, Item 614 - Maintaining Traffic has been deleted; however, the Section (and Plan Note) number has been reserved for future information.

**642-46 SpeedInfo Devices within Project Limits**

The Contractor shall take measures to maintain the proper operation of any SpeedInfo devices within the project limits. The devices are Doppler radar units which look like cylindrical tubes with solar panels attached to them. The sensors are implemented on all Interstates statewide and other major US and State Routes in urban areas, generally spaced between 1 to 2 miles apart, and installed on any existing ODOT infrastructure (typically overhead trusses, cantilevers, ground-mounted sign supports, or light poles). ODOT will coordinate the relocation of any devices that may be affected by the Contractor’s operation. The Contractor shall NOT remove the devices themselves. The Contractor shall notify the Project Engineer a minimum of ten calendar days prior to performing any work which requires device relocation. The Project Engineer shall then notify SpeedInfo, Inc. and the ODOT Office of Traffic Engineering of any devices that require relocation. The Contractor should be aware that since speed data is still desirable to ODOT, the Project Engineer will attempt to inform
SpeedInfo, Inc. of newly available install locations for the sensors to be relocated to, with minimal downtime.

If immediate attention to a SpeedInfo sensor is required, the Contractor may directly contact the regional installer for SpeedInfo, Inc. from the provided contact information. The regional installer would be able to provide the quickest possible attention to the situation. If the regional installer cannot be reached, the list of statewide contacts should be used in the order it is presented. An email informing all parties of the situation should also be sent at the earliest convenience.

(Provide appropriate regional contacts as well as statewide contacts.)

(Optional) The SpeedInfo devices within the project limits are located at the below locations. The Contractor shall be advised that these locations may have changed by the time of construction and shall use the above procedure for any other speed detection devices.

(Provide table with existing locations of SpeedInfo sensors, obtainable from Bryan Comer in the Office of Traffic Engineering (OTE) or the ODOT Office of Traffic Engineering ITS intranet website.)

Designer Note: This note shall be used on any construction project which includes SpeedInfo sensor(s) located within the project limits. The sensors are installed on all Interstates statewide spaced at approximately 1 mile increments within urban areas and 2 mile increments in rural areas, and also implemented on some US and State Routes which are Interstate look-a-likes. A list of existing locations can be found on the ODOT Office of Traffic Engineering ITS intranet website (see Traffic Signals/ITS, ITS, Shared Documents, SpeedInfo). For any questions about the existing or future planned locations, contact Bryan Comer. Regional and statewide contacts are given below. Include the appropriate contacts within the note in the plans.

1. Regional Contacts

   ODOT D01, Western D05, D06, D07, D08 (also Northern KY), D09

   Matt Slusher, Capital Electric
   Office: (937) 531-7518
   Cell: (408) 425-4684
   mslusher@capitalelectric.com

   Joe Hutsell, Capital Electric
   Office: (937) 604-5838
   jhutsell@capitalelectric.com

   ODOT D02, D03, D04, Eastern D05, D10, D11, D12

   Jeff Chase, A+A Safety
   Work: (216) 283-8040
   Cell: (216) 854-6531
   jeffc@aasafetyinc.com

2. Statewide Contacts

   Charlie Armiger, SpeedInfo
   Office: (408) 333-9960
   Cell: (408) 425-4684
   carmiger@speedinfo.com

   Bryan Comer, ODOT
   (614) 387-1253
   bryan.comer@dot.state.oh.us

   John MacAdam, ODOT
   (614) 752-9695
   john.macadam@dot.state.oh.us

   Jason Yeray, ODOT
   (614) 466-2168
   jason.yeray@dot.state.oh.us

642-47 Speed Measurement Markings

The Contractor shall place a series of Speed Measurement markings on the roadway to assist in the enforcement of speed regulations within the work zone. Each Speed Measurement Marking shall consist of one white transverse 24-inch line, 4 foot in length. The markings shall be placed at one-quarter mile intervals over a 1 mile length of roadway, at locations as shown in the plans or as directed by the Engineer. Speed Measurement
Markings shall not be located within 0.5 mile of a taper, shift, crossover, entrance or exit ramp. Speed Measurement Markings are typically located such that they extend 2 feet on either side of the center line or the edge line, or are located entirely on the shoulder; however, in work zones it may be necessary to center these markings within a lane.

The markings shall be laid out by a registered surveyor.

The following quantity has been carried to the General Summary to be used as directed by the Engineer:

Item 614  Special - Air Speed Zone Marking  _______ Each

**Designer Note:** This note shall be used when it is intended that an Air Speed Check Zone be provided within a work zone.

The following procedure should be followed for installing Air Speed Check Zones in work areas:

**ODOT** and the Local **Ohio State Highway Patrol (OSHP) Posts** shall discuss desires for placing Air Speed Check Zones in the work zone. When it has been agreed that there will be an Air Speed Check Zone within the work zone, the **OSHP Aviation Section Headquarters** shall be contacted for their assistance in enforcing the Air Speed Check Zone.

The agreement to assist by the **Aviation Section Headquarters** shall be forwarded to the appropriate **ODOT District Highway Management Administrator**.

Upon termination of the work zone, any Speed Measurement Marking which is not eliminated by pavement removal or resurfacing shall be allowed to wear out.

642-48 **Item 614 - Work Zone Raised Pavement Marker, As Per Plan**

Work Zone Raised Pavement Markers, As Per Plan, and their installation shall conform to CMS 614 or CMS 621 as specified herein.

- Raised Pavement Markers in use during the snow-plowing season shall conform to 621.
- Raised Pavement Markers in use during the non-snow-plow season shall conform to either 614 or to 621.

The snow-plowing season shall run from ________________ through ________________.

If project delays, not the fault of ODOT, cause the work to extend into the snow-plowing season, the contractor shall be responsible for replacing Work Zone Raised Pavement Markers (WZRPMS) conforming to CMS 614, with Raised Pavement Markers conforming to 621, as determined by the Engineer, at the contractor’s expense.

This item shall include purchase, installation and removal of Item 614 Work Zone Raised Pavement Marker, As Per Plan, including filling of any depressions created in the pavement as per CMS 621.08.

Resurfacing of the transition areas shall be performed at the time that the surface course is being applied to the entire project. Prior to application of the surface course on the project, the existing pavement within the transition area shall be removed to a depth necessary to reach the level of the intermediate course of the pavement, as determined by the Engineer.

The following bid items should be included in the plans:
Item 254  Pavement Planing, Asphalt Concrete  Square Yards
Item 614  Work Zone Raised Pavement Marker, as per plan  Each

Payment for resurfacing within the transition area shall be paid for under the appropriate bid items for the work required, as provided for in the plans.

**Designer Note:** This note shall be included in the plans on freeway and expressway projects when raised pavement marking is to be provided on asphalt surfaces in temporary traffic control zones. Snow-plowing season at the project site should be as determined by the **District.** If dates specific to the project site cannot be determined, the default dates of snow-plowing season shall be as per **CMS 614.115C** (October 15 to April 1) regarding installation of WZRPMs.

The appropriate quantity of surface course material for resurfacing the transition area shall also be provided.

**642-49  Item 614 - Work Zone Raised Pavement Markers on Concrete Surfaces**

Raised pavement markers in work zones, installed on concrete surfaces, shall be Item 614 Work Zone Raised Pavement Markers. WZRPMs are intended for use only during the non-snow-plowing season. WZRPMs shall not be provided during the snow-plowing season.

The snow-plowing season shall run from ______________ through ______________.

Where a temporary alignment will remain in use through the winter, the WZRPMs shall be removed prior to the beginning of the snow-plowing season and replaced approximately April 1, or as otherwise determined by the Engineer.

This item shall include purchase, installation and removal of Item 614 Work Zone Raised Pavement Markers

An estimated quantity of ______ Each of Item 614 Work Zone Raised Pavement Marker has been provided and carried to the General Summary.

**Designer Note:** This note shall be included in the plans when raised pavement marking is to be provided on concrete surfaces in temporary traffic control zones. Snow-plowing season at the project site should be as determined by the **District.** If dates specific to the project site cannot be determined, the default dates of snow-plowing season shall be as per **CMS 614.115C** (October 15 to April 1) regarding installation of WZRPMs.

**642-50  Barrier Delineation, As Per Plan**

Increased delineation, as specified herein, shall be installed on all portable barrier and concrete permanent barrier located within 5 feet of the edge of the traveled lane under either of the following conditions:

- Along tapers and transition areas
- Along curves (outside only) with degree of curvature greater than or equal to 3 degrees

The increased delineation shall consist of either linear delineation panels or the triple stacking of work zone barrier reflectors.

The linear delineation panels shall consist of panels of delineation, approximately 34 inches long and 6 inches wide and shall be “crimped.” Panels shall be provided at the rate of one panel every 10 feet on portable barrier and permanent concrete barrier, spaced evenly along the length of the run. The panels shall be mounted such that the tops of the panels are 26 inches above the pavement.
Triple stacked barrier reflectors shall consist of three barrier reflectors stacked vertically in their attachment to portable barrier. There shall be no open space between the adjacent barrier reflectors. The top of the middle barrier reflector shall be located 26 in above the pavement.

Payment shall be full compensation for all material, labor, incidentals and equipment necessary for furnishing, installing, maintaining and removing Linear Delineation. The following estimated quantity has been included in the plans:

614  Linear Delineation  Foot

Along runs of portable barrier where this item is provided, the quantity shall be measured as the entire length of the run being delineated, including the spaces between the individual panels or stacks of barrier reflectors.

**Designer Note:** This note shall be added to freeway and expressway projects when portable barrier or permanent concrete barrier is located within 5 feet of the edge of the traveled lane.

It is intended that either the linear delineation panels or the triple stacking of barrier reflectors be provided, at the Contractor’s discretion.

**642-51 Barrier Delineation**

Barrier reflectors and object markers shall be installed on all permanent concrete barrier located within 5 feet of the edge of the adjacent travel lane. Barrier reflector and object marker spacing shall be as per MT-101.70.

Payment shall be full compensation for all material, labor, incidentals and equipment necessary for furnishing, installing, maintaining and removing barrier reflectors and object markers.

An estimated quantity of foot of Item 614 Linear Delineation and_____ Each of Item 614 Object Marker, _____-way has been provided and carried to the General Summary.

**Designer Note:** This note shall be included in the plans when permanent concrete barrier is located within 5 feet of the edge of the travel lane for projects located on freeways (Interstate and Interstate look-alike) or expressways.

**642-52 Guardrail Delineation**

Object Markers shall be installed on all Guardrail located within 5 feet of the edge of the adjacent travel lane. Guardrail-mounting of Object Markers shall be made by installing the object markers on the extension blocks rather than directly onto the guardrail itself. Object marker spacing shall be approximately 50 feet.

Payment shall be full compensation for all material, labor, incidentals and equipment necessary for furnishing, installing, maintaining and removing Object Markers.

An estimated quantity of _____ each of Item 614 Object Markers, _____-way has been provided and carried to the General Summary.

**Designer Note:** This note shall be included in the plans when guardrail is located within 5 feet of the edge of the travel lane for projects located on freeways (Interstate or Interstate look-alike) or expressways.
642-53  **Item 614, Longitudinal Channelizer**

Longitudinal Channelizers shall be provided as called for in the plans. A Longitudinal Channelizer consists of a combination of vertical components and longitudinal base components, fit together to create a continuous channelizing device, as detailed in PIS 2010180. Use of tubular markers, as identified in the OMUTCD, Figure 6F-7, shall not qualify for use as a longitudinal channelizer.

The vertical component shall be equipped with two 3-inch wide retroreflective bands, placed a maximum of 2 inches from the top, with a maximum of 6 inches between the bands. The longitudinal base components shall be equipped with reflectors.

The Longitudinal Channelizer shall be NCHRP 350 compliant.

For installation procedures, follow the manufacturer’s instructions.

Payment for providing, installing and removing this channelizer will be made at the unit price per foot for:

| Item 614, Longitudinal Channelizer | Foot |

**Designer Note:** This note shall be included in the plans when Longitudinal Channelizer is called for in the plans.

642-54  **Item 614 – Business Entrance (M4-H15) Sign, As Per Plan**

The Business Entrance (M4-H15) sign should be provided at each temporarily relocated commercial Driveway for which the relocation is not obvious to the motorist. The project Engineer shall determine whether or not the driveway relocation is, or is not, obvious and whether or not a sign should be provided. Only one sign per Business shall be permitted. The sign shall be 36 inch X 48 inch in size with Type G or Type H orange retroreflective sheeting. The sign legend shall be placed on both sides of the sign (back to back). The sign shall have the standard M4-H15 legend with the word “BUSINESS” on the top line, except under unusual circumstances where it may not be intuitive that a driveway serves a specific business. In such unusual cases, the actual business name may be substituted for the word “BUSINESS”.

The sign shall be mounted on two #3 posts or on temporary posts in accordance with SCD MT-105.10 and in accordance with the Ohio Manual of Uniform Traffic Control Devices, latest edition. The sign shall be clearly visible and shall clearly identify the location of the driveway. The sign should be positioned at 90° to the direction(s) of traffic. The sign may need to be moved for each Phase of the Maintenance of Traffic operations.

Payment for all costs associated with manufacturing, mounting, relocating, and removing the sign, including all labor, materials and equipment shall be included in the contract price per Each for Item 614-Business Entrance sign.

The following estimated quantity has been carried to the general summary for this item.

| Item 614, Business Entrance Sign | Each |

**Designer Note:** This note may be included in the plans when business entrances are temporarily relocated. It is intended that this note be used on projects where there are isolated business locations.

The sign should be the standard M4-H15 legend with the word “BUSINESS” on the top line. Under unusual circumstances where it may not be intuitive that a driveway serves a specific business, the actual business name may be substituted for the word “BUSINESS.”
642-55 Item 614 - Law Enforcement Officer (With Patrol Car) for Assistance During Construction Operations

Use of Law Enforcement Officers (LEOs) by contractors other than the uses specified below will not be permitted at project cost. LEOs should not be used where the OMUTCD intends that flaggers be used.

In addition to the requirements of CMS 614 and the OMUTCD, a uniformed LEO with an official patrol car (car with top-mounted emergency flashing lights and complete markings of the appropriate law enforcement agency) shall be provided for the following traffic control tasks:

- During the entire advance preparation and closure sequence where complete blockage of traffic is required.
- During a traffic signal installation when impacting the normal function of the signal or the flow of traffic or when traffic needs to be directed through an energized traffic signal contrary to the signal display (e.g., directing motorists through a red light).

In addition to the requirement of CMS 614 and the OMUTCD, a uniformed LEO with an official patrol car (car with top-mounted emergency flashing lights and complete markings of the appropriate law enforcement agency) should be provided for the following traffic control tasks:

- For lane closures: during initial set-up periods, tear down periods, substantial shifts of a closure point or when new lane closure arrangements are initiated for long-term lane closures/shifts (for the first and last day of major changes in traffic control setup). In general, LEOs should be positioned at the point of lane restriction or road closure and to manually control traffic movements through intersections in work zones.
- When construction vehicles are entering/exiting the zone directly from/into an open lane of traffic. If a lane has been closed to provide an acceleration/deceleration lane for the vehicle, the LEO will not be required.

LEOs should not forgo their traffic control responsibilities to apprehend motorists for routine traffic violations. However, if a motorist's actions are considered to be reckless, then pursuit of the motorist is appropriate.

The LEOs work at the direction of the Contractor. The Contractor is responsible for securing the services of the LEOs with the appropriate agencies and communicating the intentions of the plans with respect to duties of the LEOs. The Engineer shall have final control over the LEOs’ duties and placement, and will resolve any issues that may arise between the two parties.

The LEO shall report in to the Contractor prior to the start of the shift, in order to receive instructions regarding specific work assignments during his/her shift. The LEO is expected to stay at the project site for the entire duration of his/her shift. The LEO shall report to the Contractor at the end of his/her shift. Once the LEO has completed the duties described above and still has time remaining on his/her shift, the LEO may be asked to patrol through the work zone (with flashing lights off) or be placed at a location to deter motorists from speeding. Should it be necessary to leave the project site, the LEO shall notify the Engineer. The Contractor shall provide the LEO with a two-way communication device which shall be returned to the Contractor at the end of his/her shift.

LEOs (with patrol car) required by the traffic maintenance tasks above shall be paid for on a unit price (hourly) basis under Item 614, Law Enforcement Officer (With Patrol Car) for Assistance. The following estimated quantities have been carried to the General Summary.
Item 614, Law Enforcement Officer With Patrol Car for Assistance _______ Hours

The hours paid shall include any minimum show-up time required by the law enforcement agency involved.

Any additional costs (administrative or otherwise) incurred by the Contractor to obtain the services of an LEO are included with the bid unit price for Item 614, Law Enforcement Officer With Patrol Car for Assistance.

**Designer Note:** See Section 640-19 for additional information. The plans shall clearly specify when and where the LEO is to be utilized. This note should be edited to conform to the project requirements.

642-56 **Item 614 - Law Enforcement Officer (With Patrol Car) for Enforcement in Work Zones**

When Law Enforcement Officers (LEOs) are used as a speed control measure in stationary work zones, they shall be used as shown in these plans. LEOs can be used in the form of: stationary patrol car, circulating patrol car, and/or air enforcement in combination with ground patrol car.

The LEO works at the direction of the Contractor. The Contractor is responsible for arranging the services of the LEO with an official patrol car (car with top-mounted emergency flashing lights and complete markings of the appropriate law enforcement agency). The Contractor should schedule the LEO a minimum of one week in advance and shall include any minimum show-up time required by the law enforcement agency involved. The Engineer shall resolve any issues that may arise between the two parties.

The LEO shall report to the Contractor prior to the start of the shift, in order to receive instructions regarding specific work assignments as shown in the plans. The LEO is expected to stay at the project site for the entire duration of his/her shift. The LEO shall report to the Contractor at the end if his/her shift. Should it be necessary to leave the project site, the LEO shall notify the Engineer. The Contractor shall provide the LEO with a two-way communications device which shall be returned to the Contractor at the end of his/her shift.

A meeting with district personnel, central office personnel, work zone traffic supervisor (if applicable) and appropriate law enforcement agencies shall take place prior to the beginning of the project. Work Zone Safety and Mobility training specific to the project will take place at this time along with distribution of pre-work zone crash analyses. During this meeting, duties and responsibilities of the LEO will be discussed.

LEOs (with patrol cars) required by these plans shall be paid for on a unit price (hourly) basis under Item 614, Law Enforcement Officer (with Patrol Car) for Enforcement. The following estimated quantities have been carried to the General Summary.

Item 614, Law Enforcement Officer with Patrol Car for Enforcement ________ Hrs

The hours paid shall include any minimum show-up time required by the law enforcement agency involved.

Any additional costs (administrative or otherwise) incurred by the Contractor to obtain the services of a LEO are included with the bid unit price for Item 614, Law Enforcement Officer With Patrol Car for Enforcement.

**Designer Note:** See Section 640-19 for additional information. The plans shall clearly specify when and where the LEO is to be utilized. This note should be edited to conform to the project requirements.
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643 SPECIFICATIONS

ODOT specifications discussed in this Part of the TEM for furnishing and installing temporary traffic control devices and material for work zones are contained in the following CMS sections:

108 Prosecution and Progress
410 Traffic Compacted Surface
614 Maintaining Traffic
615 Roads and Pavements for Maintaining Traffic
622 Concrete Barrier
641 Pavement Marking - General

630 and 730 Traffic Sign and Support Material
631 and 731 Sign Lighting and Electrical Signs

Supplemental Specifications 821 and 921 address arrow boards.
Supplement 1021 addresses the prequalification procedure for arrow boards.

Supplemental Specifications 830 and 930 address automated flagger assistance devices (AFADs).

Supplement 1030 addresses the prequalification procedure for AFADs.

650 CONSTRUCTION

650-1 General

This Chapter is intended to provide additional information on temporary traffic control that would be helpful particularly to construction personnel. However, it may also be useful for maintenance personnel performing the same functions. Inspection procedures for temporary traffic control devices will be addressed in this Chapter. Inspection procedures for other types of traffic control devices are outlined in the other Chapters related to the various types of traffic control devices.

650-2 Removal of Logo or Tourist Oriented Directional Signs (TODS)

Information regarding removal and temporary re-erection of Logo Signs or TODS due to construction activity is addressed in Sections 207-2 and 207-3.

650-3 Quality Standards for Temporary Traffic Control Devices

The ODOT publication Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles (Section 695-4) shall be used to determine the acceptability of work zone traffic control devices. This document may be viewed on-line at: www.dot.state.oh.us/Divisions/Operations/Traffic/publications2/qualityguidelines/Pages/default.aspx.

650-4 Acceptable Delination Methods for Vehicles

The ODOT publication Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles (Section 695-4) addresses acceptable delineation methods for work vehicles and supply vehicles. As noted in Section 650-3, this document may be viewed on-line at: www.dot.state.oh.us/Divisions/Operations/Traffic/publications2/qualityguidelines/Pages/default.aspx.
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660-1 General

The consequence of poor maintenance practices are a reduction in safety to road users and an unnecessarily large exposure to liability claims. District Roadway Services personnel are responsible for establishing and maintaining temporary traffic control zones for District maintenance work and force account operations projects. Additional information is provided separately in this Manual regarding maintenance activities related to signing, markings, traffic signals, lighting and temporary traffic control.

660-2 Work Zone Set-up Reviews (OPIs and QARs)

ODOT has developed a program to review maintenance of traffic set-up in temporary traffic control zones. The program has basically two parts, the Operation Performance Index (OPI) and the Quality Assurance Review (QAR).

The OPI applies to work zones on Interstate and Interstate Look-alike highways. Representatives from the Office of Traffic Engineering will travel the Interstate highway system twice per construction season to evaluate temporary traffic control zone set-ups throughout the State. A representative from the District being evaluated, as well as a representative from FHWA, will be welcome to come along for the field review. It is expected that each District review will require one-half to 1 full day time period. Work zone set-ups along Interstate Look-alikes will also be evaluated at that time. It will be the responsibility of the District to correct any inadequacies reported regarding set-ups in temporary traffic control zones and to determine the cause of the inadequacies, e.g., contractor, designer or management error. Items subject to review include:

1. Fixed signs, condition and usage;
2. Channelizing devices.
3. Portable barrier (PB) and unprotected hazards;
4. Portable changeable message signs and arrow boards;
5. Pavement marking;
6. Tapers; and
7. Entrance and exit ramps.

The QAR applies to work on all highways on the state highway system, other than those covered in the OPI, including two-lane and multi-lane controlled or uncontrolled access. These reviews apply to both contract work and to maintenance work. Sites to be reviewed will be chosen at random. The field trips will include personnel from the Office of Traffic Engineering and personnel from other Districts. Items subject to review will be the same as with the OPI evaluations. If inadequacies persist, the QAR review team will review the situation in further detail to determine the cause of the inadequacies and to recommend solutions.

660-3 Removal of Logo Signs

The Ohio Business Logo Sign Program established by ODOT, also known as the Specific Service Sign Program, permits eligible businesses which provide fuel, food, lodging, camping or attraction services to road users to have their Logo Sign Panels placed on Specific Service Signs. The program is operated by a private company (Program Manager) under contract with ODOT Section 207-2 addresses Logo Signs issues that arise due to maintenance activities.
660-4 Temporary Traffic Control (TTC) for Pothole Patching

660-4.1 General

As noted in Section 600-3, ODOT maintenance work zones shall "comply with the requirements in the OMUTCD and this Manual." While recognizing that the ODOT SCDs and CMS do not necessarily provide the only method to achieve a given objective, Section 600-3 indicates that Districts should "also follow the provisions in applicable SCDs and Construction and Materials Specifications (CMS) sections."

As noted in Section 606-1, the general goal in work zone TTC is "safety with minimum disruption to road users." However, as noted in OMUTCD Section 6A.01 another goal of TTC is to provide for the efficient construction and maintenance of the highway, as well as efficient resolution of traffic incidents that may occur. Judgment is a key factor in balancing these goals, and determining what control is needed/appropriate. OMUTCD Chapter 6B provides a review of the fundamental principles of TTC.

OMUTCD Section 6G.02 and Chapter 606 address work duration as a factor in determining the devices used in TTC zones.

For pothole patching, it may take longer to set up and remove the TTC zone than to perform the work. This can significantly increase the delay for road users and increase workers' exposure to road hazards. Therefore, simplified control procedures may be warranted. The OMUTCD allows a highway agency some discretion in determining the TTC to provide. However, the agency's application of these devices should be consistent and commensurate with the conditions present in order to minimize risk to workers and the traveling public.

Permitted lane closure schedules (PLCS) have been established for Interstates and Interstate look-a-likes as well as other multi-lane roads deemed to be major or important by the District (see Section 630-4). The PLCS designates hours where volumes are low enough that work can be performed in a closed lane and still provide sufficient capacity for the lower traffic volumes. Whenever possible, any work hours should conform to the restrictions of the PLCS. However, it is recognized that this is not always possible (e.g., emergencies).

For pothole patching on ODOT-maintained highways, the TTC procedures described in this Section should be followed to the extent practical.

660-4.2 Incident Management/Emergency Work Zones

Emergencies affecting the health and safety of the traveling public can occur that necessitate action on ODOT's part before all the necessary equipment and personnel can be gathered to establish TTC per the OMUTCD, SCDs and TEM (see OMUTCD Chapter 6I and TEM Chapter 608). Circumstances such as these call for judgment in regards to the initial TTC devices deployed (based on availability) when using less than what is desirable. For emergency pothole patching on ODOT-maintained highways, the TTC procedures described in this Section should be followed to the extent practical.

660-4.3 Pothole Patching on Multi-Lane Facilities that Will Violate the Permitted Lane Closure Schedule (PLCS)

The following procedure is for pothole patching that occupies one location up to an hour (Short Duration per OMUTCD Section 6G.02 and Section 606-3) on multi-lane facilities during times that are in violation of the PLCS.

Below is a hierarchy list of preferred methods for addressing TTC needs while pothole patching under these conditions:
1. Schedule the work to be completed during times that do not violate the PLCS (see Section 660-4.4). All non-emergency work should be scheduled for times that will not violate the PLCS.

2. Dispatch workers and equipment to close the lane in which work will be performed per OMUTCD Figure 6H-33 (and/or the appropriate lane closure SCD).

3. Dispatch workers and equipment to close the lane in which work will be performed per Figure 698-11.

When working in the interior lane(s) of a directional roadway with three or more lanes, multiple lanes should be closed per OMUTCD Figure 6H-37 to remove the unique safety hazards to workers and motorist that are created by an interior-lane only closure. For emergency pothole patching necessitating an interior-lane closure, the District should use the resources available and LEOs to comply with OMUTCD Figure 6H-37 to the extent practical.

Refer to OMUTCD Chapter 6G, OMUTCD Figure 6H-35 and Chapter 606 for other pothole patching work durations such as Mobile, etc., and the associated TTC for these work conditions.

660-4.4 Pothole Patching on Multi-Lane Facilities that Will Not Violate the Permitted Lane Closure Schedule (PLCS)

The following procedure is for pothole patching that occupies one location up to an hour (Short Duration per OMUTCD Section 6G.02 and Section 606-3) on multi-lane facilities during times that are not in violation of the PLCS. For locations where the roadway facility is not addressed by the PLCS, non-emergency pothole patching work should be scheduled to occur during non-peak/lower volume hours.

Below is a hierarchy list of preferred methods for addressing TTC needs while pothole patching under these conditions:

1. Dispatch workers and equipment to close the lane in which work will be performed per OMUTCD Figure 6H-33 (and/or the appropriate lane closure SCD).

2. If the OMUTCD Figure 6H-33 cannot be achieved during emergency pothole patching work, or to close a lane using this application is not practical due to the very short work duration, dispatch workers and equipment to close the lane in which work will be performed per Figure 698-12, Detail A. (This lane closure method is not intended to be used for Mobile Operations (see OMUTCD 6G.02, OMUTCD Figure 6H-35 and Section 606-3). Factors such as volume, terrain or lack of shoulder should be considered when deciding on the use of truck-mounted attenuators and/or the need to request the presence of a law enforcement vehicle with flashing lights.

3. If factors such as volume, terrain or lack of shoulder do not necessitate the need for a shadow vehicle (or the need for a LEO) as in Figure 698-12, Detail A, then dispatch workers and equipment per Figure 698-12, Detail B.

4. On non-interstate multi-lane roads where there are very low volumes, providing sufficient gaps to perform very short duration work, the use of high-intensity rotating, flashing, oscillating or strobe lights only may suffice. The work vehicle would be positioned on the shoulder. This method of TTC is only intended for use on very low-volume multi-lane highways (e.g., rural US 30, Appalachian highways, etc.) where the pothole patching work duration is very short and the roadway geometry and terrain do not necessitate additional measures (shadow vehicle, TMA, LEO, etc.).

When working in the interior lane(s) of a directional roadway with three or more lanes,
multiple lanes should be closed per OMUTCD Figure 6H-37 to remove the unique safety hazards to workers and motorist that are created by an interior-lane only closure. For emergency pothole patching work necessitating an interior-lane closure, the District should use the resources available and LEOs to comply with OMUTCD Figure 6H-37 to the extent practical.

Refer to OMUTCD Chapter 6G, OMUTCD Figure 6H-35 and Chapter 606 for other pothole patching work durations such as Mobile, etc., and the associated TTC for these work conditions.

660-4.5 Pothole Patching on Two-Lane/Other Facilities

The following procedure is for pothole patching that occupies one location up to an hour (Short Duration per OMUTCD Section 6G.02 and TEM Section 606-3) on two-lane/other facilities. Non-emergency pothole patching work should be scheduled to occur during non-peak/lower volume hours.

Below is a hierarchy list of preferred methods for addressing TTC needs while pothole patching under these conditions:

1. Dispatch workers and equipment to close the lane in which work will be performed per OMUTCD Figure 6H-10 (see also OMUTCD Sections 6C.10 and 6G.10, and Section 606-10) OR for low-speed, low-volume facilities per OMUTCD Figure 6H-18 (see also OMUTCD Sections 6C.10 and 6G.10, and Section 606-10).

2. On two-lane/other facilities where there are very low volumes, providing sufficient gaps to perform very short duration work, the use of high-intensity rotating, flashing, oscillating or strobe lights only may suffice. The work vehicle would be positioned on the shoulder or as far off the roadway as possible. This method of TTC is only intended for use on very low-volume two-lane/other facilities where the pothole patching work duration is very short and the roadway geometry and terrain do not necessitate additional measures (shadow vehicle, TMA, LEO, lane closure, etc.).

Refer to OMUTCD Chapter 6G, OMUTCD Figure 6H-17 and Chapter 606 for other pothole patching work durations such as Mobile, etc., and the associated TTC for these work conditions.
670 OTHER CONSIDERATIONS

670-1 General

This Chapter has been reserved for information on other considerations that should be noted, but for various reasons have not been addressed in the other Chapters. For example, it may at times be used to expedite incorporating information that will later be consolidated into other Chapters.

670-2 Bikeways

As noted in Section 606-11, if the temporary traffic control zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided. Additional information on bikeways may be found in OMUTCD Part 9, Part 9 of this Manual, and the Guide to the Development of A Bicycle Facility.

670-3 Waterways

On projects involving construction or major reconstruction of structures over navigable waterways, provisions should be made to inform and/or guide watercraft traffic through the construction area.

Projects that close rivers or streams for construction purposes should provide a safe portage for light watercraft along with appropriate Guide and Warning Signs in each direction.

Projects that do not close rivers or streams, but alter existing portages or create otherwise hazardous conditions for watercraft passage, should provide adequate Guide and Warning Signs and protection, where appropriate, along the waterway.

Additional information on watercraft traffic and navigable waters can be obtained through the Ohio Department of Natural Resources, Division of Watercraft. ODNR’s website for the Division of Watercraft is http://ohiodnr.com/watercraft/Watercraft/tabid/2062/Default.aspx.

670-4 Motorcycles

Motorcycles are more susceptible to variations or obstacles in the road surface than are other vehicles. If a potential hazard cannot be eliminated, it is vital that motorcyclists receive a warning of the hazard well in advance. Warning Signs should be considered for potential hazards, especially for pavements that are heavily grooved (Section 202-12), or contain rumble strips (Section 605-17), loose gravel (OMUTCD Figure 2C-4) or pavement edge drop offs.

670-5 Towing Operations

Towing operations shall be performed in a safe manner. Short-duration towing operations shall follow the guidelines applicable to short-duration maintenance operations (see Section 606-3.5).

All towing vehicles shall display a yellow high-intensity flashing, rotating, oscillating or strobe light, regardless of any other devices that may be mounted on the vehicles.

670-6 Rest Areas

670-6.1 General

When rest areas exist within a temporary traffic control zone, a decision must be made at an early stage as to whether the rest area will remain open or whether it will be closed during the work. Rest area closures will simplify the traffic control plan.
When rest areas remain open during construction, traffic control at the rest area entrance and exit ramps should be implemented as shown in MT-98 series of SCDs.

670-6.2 Rest Area Closures

Rest areas shall not be closed to the public without approval of the District Deputy Director. Approvals of temporary rest area closures called for within construction projects become effective with the District Deputy Director’s signature on the title sheet.

All advance Rest Area signs (D5-1, D5-2, D5-H2a, D5-H6) shall have the action message covered by an overlay bearing the legend “CLOSED.” This panel shall have a black legend on a retroreflective orange background. The overlay for the D5-1 and D5-H2a signs shall be 8 x 1.5 feet. The overlay for the D5-2 and D5-H6 signs shall be 4 x 1.5 feet. Supplemental panels (TELEPHONE, TOURIST INFO, Handicapped symbol, etc.) located under mainline Rest Area signs shall be removed or covered when the rest area is closed. On conventional highways, the overlay panel size shall be 28 x 10 inches.

Distance information provided on the NEXT REST AREA XX MILES sign (D5-H7), located in advance of the upstream rest area, shall be modified to provide the distance to the next open downstream rest area. This modification shall be accomplished by providing a black on orange overlay to cover the distance provided on the sign.

As shown in SCD MT-98.29, the entrance ramp to the rest area shall be closed by use of drums. The exit ramp from the rest area shall be closed in a similar manner. On major standard highways where a median opening may exist to permit access to and from the rest area, this opening shall also be closed in a similar manner.

Where rest area lighting exists, it shall be maintained in proper condition to provide optimum illumination.

670-6.3 Restroom Closures

Rest areas shall not be closed because of restroom failure. If restrooms are closed because of mechanical failure or any other reason except routine maintenance, the REST ROOMS CLOSED sign (D5-H33), black legend on retroreflective orange background, shall be used to inform the road user of the closure. On freeways and expressways the D5-H33, 48 x 48 inches sign shall be installed below the Advance Rest Area sign (D5-1), and may be installed below the (D5-2) and D5-H2a signs; however, it shall not be installed at the D5-H6 gore sign. On conventional highways, the D5-H33-24 sign, 24 x 24 inches, shall be installed below the Advance Rest Area sign (D5-H1) and may be installed below the D5-H2 sign.

670-7 Railroad Crossings

An important design consideration in the development of temporary traffic control plans involving railroad grade crossings is the potential for vehicles queuing onto the railroad tracks. Adjusting the transition area and/or buffer space might be appropriate so that downstream congestion caused by a lane drop, for example, does not reach the railroad crossing.

When the grade crossing is equipped with an active traffic control system, the normal sequence of highway intersection signal indications should be preempted upon approach of trains to avoid entrapment of vehicles on the crossing by conflicting aspects of the highway traffic signals and the grade crossing signals. Temporary traffic control signals near grade crossings should be operated so that vehicles are not required to stop on the tracks. See OMUTCD Part 8 and Part 8 of this Manual for additional information.

Guidance on traffic control near railroad crossings is provided in OMUTCD Part 8, Section 6G.18 and Figure 6H-46 and TEM Section 606-19 and Part 8.
670-8  Transit Considerations

Provision for effective continuity of transit service needs to be incorporated into the temporary traffic control planning process. Oftentimes, public transit buses cannot efficiently be detoured in the same manner as other vehicles (particularly for short-term maintenance projects). On transit routes, the traffic control plan *(Section 602-2)* should provide for features such as temporary bus stops, pull-outs and waiting areas for transit patrons.
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695 REFERENCE RESOURCES

695-1 General
Various reference resources that may be useful have been noted in Chapters 193, 194 and 195.

695-2 Temporary Traffic Control Manual (reprint of OMUTCD Parts 1, 5 and 6)

OMUTCD Parts 1, 5 and 6 have been reprinted as a separate document for use in the field. The book is titled the “Temporary Traffic Control Manual”; however, it is also known as the Construction Manual or the Orange book, since it has an orange cover. This manual is available for purchase from the Office of Contracts or on-line at: http://www.dot.state.oh.us/Divisions/Operations/Traffic/publications2/TTCM/Pages/default.aspx.

695-3 Flagger Handbook

As noted in Section 614-5, the Flagger Handbook published by ATSSA is a pocket-size booklet, intended for use by field staff for easy reference to proper flagging procedures.

695-4 Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles

This document sets standards for acceptability of conditions of temporary traffic control devices. It is intended to provide uniformity in condition of traffic control devices on the public highway system. These standards are intended to address the day-to-day needs of traffic control within a work zone and are not meant to cover needs of emergency situations. This document is directly referenced in CMS 614. This quality standard is available on-line at: http://www.dot.state.oh.us/Divisions/Operations/Traffic/publications2/qualityguidelines/Pages/default.aspx. This document also addresses acceptable delineation methods for work vehicles and supply vehicles.

695-5 Guidelines for the Use of Portable Changeable Message Signs

The ATSSA publication, Guidelines for the Use of Portable Changeable Message Signs, is recommended as guidance for use in determining how to make use of PCMSs to inform road users of traffic conditions due to construction activity.

695-6 Reserved for Future Use

For now, this space and Section number will be reserved for future use.

695-7 Guidelines for Traffic Control in Work Zones

As noted in Section 195-6, the Guidelines for Traffic Control in Work Zones is a pocket-sized consolidation of information regarding temporary traffic control. The information is based on that in the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), but some additional guidelines/handbook information is included. It can be purchased for $2.50 plus tax and shipping (based on the quantity ordered) from the LTAP Office or the Office of Contracts. This publication is available on the OTE website at: http://www.dot.state.oh.us/Divisions/Operations/Traffic/publications2/pocketguide/Pages/default.aspx.
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696-1a Work Zone Constraints

Form 696-1a is submitted as part of the Maintenance of Traffic Alternative Analysis (MOTAA) described in Section 630-5 for projects involving Interstates and Interstate Look-alikes. A paper or electronic (.pdf and Excel formats) copy of this form is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-1b Example of a Completed Work Zone Constraints Form

Form 696-1b is an example of a completed Form 696-1a. A paper or electronic (.pdf and Excel formats) copy of this example is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-2a Bridge Information

Form 696-2a is submitted as part of the MOTAA described in Section 630-5. A paper or electronic (.pdf and Excel formats) copy of this form is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-2b Example of a Completed Bridge Information Form

Form 696-2b is an example of a completed Form 696-2a. A paper or electronic (.pdf and Excel formats) copy of this example is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-3a Ramp Information

Form 696-3a is submitted as part of the MOTAA described in Section 630-5. A paper or electronic (.pdf and Excel formats) copy of this form is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-3b Example of a Completed Ramp Information Form

Form 696-3b is an example of a completed Form 696-3a. A paper or electronic (.pdf and Excel formats) copy of this example is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-4a Cost Comparison

Form 696-4a is submitted as part of the MOTAA described in Section 630-5. A paper or electronic (.pdf and Excel formats) copy of this form is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-4b Example of a Completed Cost Comparison

Form 696-4b is an example of a completed Form 696-4a. A paper or electronic (.pdf and Excel formats) copy of this example is available from OTE upon request. It will also be posted on the OTE Forms web page.

696-5 WTS Daily Inspection Report

Form 696-5 is the daily inspection form noted in item 10 of the list of Worksite Traffic Supervisor duties outlined in Plan Note 642-44 (Section 642-44).
Intentionally blank.
## Work Zone Constraints

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Work Zone Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Part-Width</strong></td>
</tr>
<tr>
<td>Ability to meet Work Zone Policy</td>
<td>Indicate areas where the policy (# lanes, widths of lanes/shoulders, etc.) can and cannot be maintained. Include information on what is needed to meet the policy and associated costs.</td>
</tr>
<tr>
<td>Ability to maintain all accesses</td>
<td>Include a Ramp Table. This table shall include ramp designation, number of lanes, ramp volume, ramp truck volume, decision sight distance, whether the ramp will be closed or open for each phase of construction, duration of closure, and detour for closure. If the ramp operates with more than one lane and this will be reduced in any phases of MOT, include this information as well. If a detour is noted - can ramps being used handle additional traffic or will modifications be needed such as widening on the ramp and/or signal work at ramp termini.</td>
</tr>
<tr>
<td>Ability to provide required on-ramp merge decision sight distance.</td>
<td>Provide the proposed decision sight distance at each entrance ramp for each phase in the ramp table. If it does not meet the required DSD in the TEM, how much does it not meet by or what will it take to meet it? This information should be included in the ramp table described above.</td>
</tr>
<tr>
<td>Right-of-way impacts</td>
<td>Explain the project ramifications of overcoming this constraint (e.g. cost of additional ROW, cost of retaining walls used). Include associated impacts to the schedule.</td>
</tr>
<tr>
<td>Environmental impacts</td>
<td>Indicate areas where additional widening, bridge widening, etc. would cause impacts to streams, rivers, etc. Cost impacts and schedule impacts shall be included.</td>
</tr>
<tr>
<td>Bridge widths</td>
<td>Include a Bridge Table. This table shall include extent of work being completed, length of bridge, type of bridge, existing pier spacing, existing bridge width, bridge width needed for each phase of MOT, future bridge width, and additional cost of width needed for each MOT scheme.</td>
</tr>
<tr>
<td>Significant impacts for construction duration and/or construction costs</td>
<td>Include an estimated time of construction for each alternative. Describe additional costs for each alternative.</td>
</tr>
<tr>
<td>Significant impacts to earthwork, retaining walls, pier clearances, profile differences, etc.</td>
<td>Include information such as amount of retaining wall needed, cost of retaining wall, significant fills or cuts and associated costs, etc.</td>
</tr>
<tr>
<td>Ability to maintain existing drainage and lighting systems</td>
<td>Include information such as removal of median lighting, temporary wedging to allow for drainage, etc. Include any additional costs associated with concerns.</td>
</tr>
<tr>
<td>Constructability; and construction equipment access</td>
<td>Discuss issues and costs associated with contractor access and ability to construct the project. If alternatives vary greatly in cost or time describe why.</td>
</tr>
<tr>
<td>Location of crossovers (e.g., Can crossovers be located near the project?)</td>
<td>How do the locations of the crossovers on each end of the project affect existing ramps? Are bridge structures going to be constraints in areas of crossovers?</td>
</tr>
</tbody>
</table>
Table 696-1a. Work Zone Constraints (Continued)

<table>
<thead>
<tr>
<th>What are the access impacts to important traffic generators such as hospitals, fire departments, industries, sports arenas, etc.</th>
<th>Indicate if any ramp closures impact major traffic generators or emergency services in the area. If so, how may this be handled during closure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>For concrete pavements, the longitudinal joints must be located at the lane lines.</td>
<td></td>
</tr>
<tr>
<td>Exit ramps - Can the existing number of ramp lanes be maintained?</td>
<td>Include a Cost Comparison Table with the major costs differences between the alternatives analyzed. A total cost for each alternative shall also be included.</td>
</tr>
</tbody>
</table>

Note: All constraints that require any additions need to have a cost estimate associated with the alternative.
Form 696-1b. Example of a Completed Work Zone Constraint Form

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Project Data</th>
<th>Traffic Control</th>
<th>Work Zone</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of work zone</td>
<td>Project Name</td>
<td>Description</td>
<td>Duration</td>
<td>Details</td>
</tr>
<tr>
<td>Estimated duration of work zone</td>
<td>Initial Date</td>
<td>Final Date</td>
<td>Activity Details</td>
<td>Additional Notes</td>
</tr>
<tr>
<td>Traffic control measures</td>
<td>Traffic Control Device</td>
<td>Location</td>
<td>Implementation Plan</td>
<td>Safety Considerations</td>
</tr>
<tr>
<td>Work zone boundaries</td>
<td>Work Zone Layout</td>
<td>Purpose</td>
<td>Safety Measures</td>
<td>Environmental Impact</td>
</tr>
</tbody>
</table>

Note: The above table is a sample of a completed Work Zone Constraint Form. It includes key information such as project name, date, traffic control devices, work zone layout, and environmental impact considerations. This form is used to outline the necessary measures and constraints for a work zone to ensure safety and compliance with traffic control regulations.

(July 20, 2012)
### Form 696-1b. Example of a Completed Work Zone Constraint Form (Continued)

#### Temporary Traffic Control

**Traffic Eng. Manual**

*600 TEMPORARY TRAFFIC CONTROL  Traffic Eng. Manual (July 20, 2012)*

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Part Width</th>
<th>Work Zone Alternative</th>
<th>Contra-Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to maintain existing drainage and lighting systems</td>
<td>Existing lighting can be maintained in Phase 1. However, temporary lighting may be necessary in Phase 2 due to median reconstruction. Some drainage structures may need to be replaced.</td>
<td>Existing lighting can be maintained in Phase 1. However, temporary lighting may be necessary in Phase 2 due to median reconstruction. Some drainage structures may need to be replaced.</td>
<td>Existing lighting can be maintained in Phase 1. However, temporary lighting may be necessary in Phase 2 due to median reconstruction. Some drainage structures may need to be replaced.</td>
</tr>
<tr>
<td>Controllability and construction equipment access</td>
<td>As mentioned above, temporary pavement and construction workers will be a major issue.</td>
<td>Construction workers will be a major issue.</td>
<td>Construction workers will be a major issue.</td>
</tr>
<tr>
<td>Location of crossovers</td>
<td>No crossovers needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to important traffic generators such as hospitals, fire departments, schools, etc.</td>
<td>Some crossovers may be necessary for medical traffic or delays following a lengthy or complex detour.</td>
<td>Some crossovers may be necessary for medical traffic or delays following a lengthy or complex detour.</td>
<td>Some crossovers may be necessary for medical traffic or delays following a lengthy or complex detour.</td>
</tr>
</tbody>
</table>

*All constraints that require any additions need to have a cost estimate associated with the alternative.*
## Form 696-2a. Bridge Information

<table>
<thead>
<tr>
<th>Bridge Name</th>
<th>Station</th>
<th>Type of Bridge</th>
<th>Extent of Work</th>
<th>Existing Bridge Width</th>
<th>Existing Pier Spacing</th>
<th>Existing Side-Foot Spacing</th>
<th>Future Bridge Width</th>
<th>Length of Bridge</th>
<th>Cost of Additional Sidewalk</th>
<th>Cost of Present Sidewalk</th>
<th>Cost of Post-Bridge Sidewalk</th>
<th>Cost of Additional Pavement Width</th>
<th>Cost of Additional Pavement Height</th>
<th>Sidewalks Required for Additional Pavement Width</th>
<th>Sidewalks Required for Additional Pavement Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(July 20, 2012)
<table>
<thead>
<tr>
<th>BRIDGE NAME</th>
<th>STATION</th>
<th>EXTENT OF WORK</th>
<th>TYPE OF BRIDGE</th>
<th>LENGTH OF BRIDGE (R)</th>
<th>EXISTING PIER SPACING</th>
<th>EXISTING BRIDGE WIDTH (R)</th>
<th>FUTURE BRIDGE WIDTH (R)</th>
<th>WIDTH NEEDED</th>
<th>COST OF 32' PCB BRIDGE MOUNTED</th>
<th>WIDTH NEEDED</th>
<th>COST OF ADDITIONAL BRIDGE WIDENING</th>
<th>WIDTH NEEDED</th>
<th>COST OF ADDITIONAL BRIDGE MOUNTED</th>
<th>COST OF 32' PCB BRIDGE MOUNTED</th>
<th>COST OF ADDITIONAL BRIDGE WIDENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cincinnati St (L)</td>
<td>299-75</td>
<td>Deck Replacement</td>
<td>Overpass</td>
<td>160</td>
<td>48-64-48</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>$9,944</td>
<td>$520,000</td>
<td>74</td>
<td>$4,672</td>
<td>-</td>
<td>52 / 27</td>
<td>$9,344</td>
</tr>
<tr>
<td>Cincinnati St (R)</td>
<td>299-75</td>
<td>Deck Replacement</td>
<td>Overpass</td>
<td>160</td>
<td>48-64-48</td>
<td>53.5</td>
<td>57</td>
<td>80</td>
<td>$9,944</td>
<td>$530,000</td>
<td>74</td>
<td>$4,672</td>
<td>$240,000</td>
<td>52 / 27</td>
<td>$9,344</td>
</tr>
<tr>
<td>Stewart St (L)</td>
<td>247-25</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>199</td>
<td>44-100-44</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>$11,622</td>
<td>$64,930,220</td>
<td>74</td>
<td>$5,811</td>
<td>-</td>
<td>52 / 27</td>
<td>$11,622</td>
</tr>
<tr>
<td>Stewart St (R)</td>
<td>247-25</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>199</td>
<td>44-100-44</td>
<td>53.5</td>
<td>57</td>
<td>80</td>
<td>$11,622</td>
<td>$659,168</td>
<td>74</td>
<td>$5,811</td>
<td>$509,938</td>
<td>52 / 27</td>
<td>$11,622</td>
</tr>
<tr>
<td>Abandoned RR Crossing (L)</td>
<td>262-25</td>
<td>Eliminated</td>
<td>Overpass</td>
<td>145</td>
<td>44-63-44</td>
<td>84</td>
<td>Bridge Eliminated</td>
<td>80.5</td>
<td>$5,484</td>
<td>50</td>
<td>74</td>
<td>$4,204</td>
<td>-</td>
<td>52 / 27</td>
<td>$8,484</td>
</tr>
<tr>
<td>Abandoned RR Crossing (R)</td>
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<td>Eliminated</td>
<td>Overpass</td>
<td>145</td>
<td>44-63-44</td>
<td>84</td>
<td>Bridge Eliminated</td>
<td>80.5</td>
<td>$5,484</td>
<td>706,875</td>
<td>74</td>
<td>$4,234</td>
<td>$589,063</td>
<td>52 / 27</td>
<td>$8,484</td>
</tr>
<tr>
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<td>264-75</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>125</td>
<td>59-50-35</td>
<td>40</td>
<td>57</td>
<td>69</td>
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<td>$296,875</td>
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<td>-</td>
<td>41 / 16</td>
<td>$7,300</td>
</tr>
<tr>
<td>Albany St (R)</td>
<td>264-75</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>125</td>
<td>59-50-35</td>
<td>40</td>
<td>57</td>
<td>69</td>
<td>$7,300</td>
<td>$296,875</td>
<td>52</td>
<td>$3,650</td>
<td>$187,500</td>
<td>41 / 16</td>
<td>$7,300</td>
</tr>
<tr>
<td>US 50 (L)</td>
<td>278-35</td>
<td>Replace superstructure</td>
<td>Overpass</td>
<td>97</td>
<td>48-48-48</td>
<td>50</td>
<td>54.5</td>
<td>69</td>
<td>$5,685</td>
<td>$56,882</td>
<td>52</td>
<td>$2,832</td>
<td>-</td>
<td>41 / 16</td>
<td>$6,665</td>
</tr>
<tr>
<td>US 50 (R)</td>
<td>278-35</td>
<td>Replace superstructure</td>
<td>Overpass</td>
<td>97</td>
<td>48-48-48</td>
<td>50</td>
<td>54.5</td>
<td>57</td>
<td>$5,685</td>
<td>$59,973</td>
<td>52</td>
<td>$2,832</td>
<td>-</td>
<td>41 / 16</td>
<td>$6,665</td>
</tr>
<tr>
<td>Washington Bicentennial (L)</td>
<td>282-00</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>686</td>
<td>51-62-72-108</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>$40,062</td>
<td>$1,457,760</td>
<td>52</td>
<td>$20,003</td>
<td>-</td>
<td>41 / 16</td>
<td>$40,062</td>
</tr>
<tr>
<td>Washington Bicentennial (R)</td>
<td>282-00</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>686</td>
<td>51-62-72-108</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>$40,062</td>
<td>$1,543,600</td>
<td>52</td>
<td>$20,003</td>
<td>$1,029,000</td>
<td>41 / 16</td>
<td>$40,062</td>
</tr>
<tr>
<td>Washington Bicentennial (L)</td>
<td>286-00</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>686</td>
<td>51-62-72-108</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>$40,062</td>
<td>$0</td>
<td>96</td>
<td>$20,003</td>
<td>$1,029,000</td>
<td>67 / 38</td>
<td>$40,062</td>
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<tr>
<td>Washington Bicentennial (R)</td>
<td>286-00</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>686</td>
<td>51-62-72-108</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>$40,062</td>
<td>$0</td>
<td>96</td>
<td>$20,003</td>
<td>$2,744,000</td>
<td>67 / 41</td>
<td>$40,062</td>
</tr>
<tr>
<td>Edain C. Moses (L)</td>
<td>294-75</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>605</td>
<td>77-117-89-89</td>
<td>84</td>
<td>84</td>
<td>80</td>
<td>$35,332</td>
<td>$2,120,000</td>
<td>96</td>
<td>$17,666</td>
<td>$907,500</td>
<td>67 / 41</td>
<td>$35,332</td>
</tr>
<tr>
<td>Edain C. Moses (R)</td>
<td>294-75</td>
<td>Replace substructure and superstructure</td>
<td>Overpass</td>
<td>605</td>
<td>77-117-89-89</td>
<td>84</td>
<td>84</td>
<td>80</td>
<td>$35,332</td>
<td>$2,120,000</td>
<td>96</td>
<td>$17,666</td>
<td>$2,420,000</td>
<td>67 / 41</td>
<td>$35,332</td>
</tr>
</tbody>
</table>
Form 696-3a. Ramp Information

<table>
<thead>
<tr>
<th>DETOUR</th>
<th>ROAD</th>
<th>NUMBER OF SPACES</th>
<th>RAMP DESIGNATION</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLOSURE</th>
<th>PHASE 1</th>
<th>PHASE 2</th>
<th>PHASE 3</th>
<th>PHASE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSURE</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CLOSURE</td>
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</tr>
<tr>
<td>CLOSURE</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CLOSURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Form 696-3b. Example of a Completed Ramp Information Form

<table>
<thead>
<tr>
<th>Ramp Volume (A Trucks)</th>
<th>Number of Lanes</th>
<th>Ramp Designation</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close Up</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>Y</td>
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<tr>
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<tr>
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<tr>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close Up</td>
</tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close Up</td>
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<tr>
<td>Y</td>
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</tr>
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</tr>
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<table>
<thead>
<tr>
<th>Phase 4</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
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</tr>
<tr>
<td>N/A</td>
</tr>
<tr>
<td>N/A</td>
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</table>

<table>
<thead>
<tr>
<th>Duration of Closure of Overpass</th>
<th>Part 2</th>
</tr>
</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Duration of Closure of Median</th>
<th>Part 1</th>
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<tbody>
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<tr>
<td>Part-Width Construction</td>
<td>Cost</td>
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<tr>
<td>Additional Right-of-Way</td>
<td>Cost</td>
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<tr>
<td>Retaining Walls</td>
<td></td>
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<tr>
<td>Additional Bridge Structure</td>
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<tr>
<td>Cut/Fill/Shoring</td>
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<td>Subtotal</td>
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</table>

Form 696-4a. Cost Comparison
<table>
<thead>
<tr>
<th>Part-Width Construction</th>
<th>Cost</th>
<th>Additional Right-of-Way</th>
<th>Retaining Walls</th>
<th>Additional Bridge Structure</th>
<th>Cutoff/Shoring</th>
<th>Lighting</th>
<th>Drainage</th>
<th>Temporary Pavement</th>
<th>Portable Concrete Barrier</th>
<th>Subtotal</th>
<th>15% Contingency</th>
<th>MOT RELATED COST</th>
<th>Project Duration</th>
</tr>
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<tbody>
<tr>
<td>Contra Flow Construction</td>
<td>Cost</td>
<td>$20,000</td>
<td>$150,000</td>
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<td>$0</td>
<td>$114,000</td>
<td>$310,000</td>
<td>$1,824,000</td>
<td>$274,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Form 696-4b. Example of a Completed Cost Comparison Form
# Form 696-5. WTS Daily Inspection Report

**WORKSITE TRAFFIC SUPERVISOR (WTS)**  
**DAILY INSPECTION REPORT**  
**rev Jan '08**

**ODOT PROJECT NO:**  
**CONTRACTOR:**

**DATE:**  
**WEATHER:**  
**TIME:**  
**VISIBILITY:**

**RECEIVED BY:**  
**(ODOT) DATE:**

## A. DRIVE THRU TRAFFIC
- Work zone free of difficult or unexpected maneuvers?  
- Adequate warning of hazards?  
- Signing clear/uncrowded and properly spaced?  
- Traffic control devices sufficiently visible?  
- Is project free of traffic accidents?  
  - If no, list Accident Report Number and describe on Page 2
- Equipment/materials properly stored off roadway?  
- Are congestion points absent from within project limits?  
- Work vehicles properly interacting with traffic?

## B. SIGNS/LIGHTS
- Working properly/visible?  
- Are all permanent/temporary signs consistent with one another?  
- Proper Size?

## C. PORT.CHANGABLE MESS.SIGNS/ARROW PANEL
- Application meets guidelines?  
- Correct Placement?  
- Delineated with cones/drum?  
- Dimmed at night?  
- All boards/signs working properly (bulbs correctly aligned, no bulbs out, etc.)?

## D. DRUMS/BARRICADES/PCB/IMPACT ATTENUATORS
- Acceptable taper length?  
- Spacing acceptable?  
- Properly aligned/cleaned/secured?  
- Adequate number of devices?  
- Object markers/barrier reflectors in-place/visible?  
- Attenuators in place?  
- Attenuators secured in good condition?

## E. PAVEMENT MARKINGS / RAISED PAVEMENT MARKERS (RPM)
- Pavement markings visible in good condition?  
- Is striping free of conflict?  
- RPM's in good condition, proper number and correspond to pavement markings?

## NOTES/COMMENTS FROM CHECKLIST:

**VIDEOS/PHOTOS OF WORKZONE:**  
**NAME OF PHOTOGRAPHER/VIDEOGRAPHER:**

**CORRECTIVE ACTION NEEDED?**  
**YES**  
**NO**
FORM 696-5. WTS DAILY INSPECTION REPORT

WORKSITE TRAFFIC SUPERVISOR (WTS)
DAILY INSPECTION REPORT
rev Jan '08

DESCRIBE TRAFFIC ACCIDENTS (IF ANY):


DAMAGED OR MISSING MOT ITEMS:


LANE CLOSURES/ROLLING ROAD BLOCKS:


NO. OF LEO’S: _______________ TOTAL LEO HOURS _______________

LEO ACTIVITIES


I certify that this document and all attachments submitted are, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information.

INSPECTED BY: ___________________ (CONTRACTOR) DATE: _______________
697-1a Construction / Traffic Maintenance Strategies

As noted in Sections 606-16, 630-2 and 640-25.3, Tables 697-1a through 697-1f present a Compendium of Traffic Control Options of various traffic control strategies and traffic control options. Table 697-1a addresses construction and traffic maintenance strategies in general.

697-1b Corridor Options Outside Work Zones

As noted in Sections 606-16, 630-2 and 640-25.3, Tables 697-1a through 697-1f present a Compendium of Traffic Control Options of various traffic control strategies and traffic control options. Table 697-1b addresses corridor options outside the work zone.

697-1c Traffic Flow Options Inside Work Zones

As noted in Sections 606-16, 630-2 and 640-25.3, Tables 697-1a through 697-1f present a Compendium of Traffic Control Options of various traffic control strategies and traffic control options. Table 697-1c addresses traffic flow options inside work zones.

697-1d Time Limitations With Disincentive Option

As noted in Sections 606-16, 630-2 and 640-24.3, Tables 697-1a through 697-1f present a Compendium of Traffic Control Options of various traffic control strategies and traffic control options. Table 697-1d addresses time limitations with a disincentive option.

697-1e Contracting Procedure Options

As noted in Sections 606-16, 630-2 and 640-25.3, Tables 697-1a through 697-1f present a Compendium of Traffic Control Options of various traffic control strategies and traffic control options. Table 697-1e addresses contracting procedures options.

697-1f Administrative Options

As noted in Sections 606-16, 630-2 and 640-25.3, Tables 697-1a through 697-1f present a Compendium of Traffic Control Options of various traffic control strategies and traffic control options. Table 697-1f addresses various administrative options.

697-2 Rate of Flow (Two-Way) for a Signalized One-Lane, Two-Way Closing

As noted in Sections 641-12.2, Table 697-2 provides rate of flow (two-way) information for use in designing a signalized one-lane, two-way closing related to the length of the one-lane operation.

697-3 Initial Timing Chart

As noted in Sections 641-12 and 641-13, Table 697-3 presents an example of a timing chart that could be used in a plan involving a signalized one-lane, two-way closing to indicate specified signal timing.

697-4 Minimum Lane Widths for Maintaining Traffic on Curves (Where D>10 degrees)

As noted in Section 640-2, Table 697-4 establishes minimum lane widths for maintaining traffic on sharp curves (degree of curvature exceeds 10 degrees).
**697-5 Sample Phasing Chart for Actuated Signal Control**

As noted in *Sections 641-12.3 and 641-13.3, Table 697-5* presents a sample phasing table that can be used in the plan.

**697-6 Reserved for Future Information**

The table “Selection of Crash Cushions and Barriers - TRACC and Triton” has been deleted, but the number/space has been reserved for future information.

**697-7 Reserved for Future Information**

The table “Selection of Crash Cushions - QuadGuard” has been deleted, but the number/space has been reserved for future information.

**697-8 Maximum Closure Lengths**

As noted in *Section 641-12.2, Table 697-8* provides guidance in designing a signalized one-lane, two-way closing. These values are used as a guide as to when a more detailed analysis of the traffic is needed.

**697-9 Barrier Offset on Curved Roadways**

As noted in *Section 641-17, Table 697-9* summarizes required offsets for barriers on curved roadways.

**697-10 Decision Sight Distance for Entrance Ramp Applications**

As noted in *Sections 607-13 and 607-15, Table 697-10* provides the decision sight distance information used in the applications addressed in those Sections.
<table>
<thead>
<tr>
<th>Strategy &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part Width Construction</strong></td>
<td>Easier design. Contractor access interference. May sacrifice quality. More difficult to construct. Narrow lanes and less safe. Longer to construct. Barrier could still be required for some dropoffs.</td>
<td>Minimum lane widths sometimes tough to obtain. Conflict between width of roadway and width needed for work.</td>
<td>When existing two lanes can remain with use of shoulder. Minor work with short duration. One lane may handle only 20,000 ADT with normal backup.</td>
<td>This is the basis of comparison for alternate strategies, the &quot;defacto&quot; standard.</td>
<td></td>
</tr>
<tr>
<td><strong>Close &amp; Detour</strong></td>
<td>Safety/ speeds up construction with full access. Easier and better construction. No distracting traffic.</td>
<td>Public can't get there the &quot;usual&quot; way. Access to businesses. Cost to motorist (time &amp; fuel). Signing. Lost road users complaints. Damage of local roads.</td>
<td>Short distance and ramp access. Local agencies must accept detour and public information is emphasized (i.e., by TMP in urban area). Locations of ramps and intersections. Detour must be adequately signed and may require capacity improvements.</td>
<td>If it produces accelerated construction, alternates are available and drivers are fairly warned.</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
### Table 697-1a. Construction / Traffic Maintenance Strategies - Compendium of Traffic Control Options (continued, 2 of 3)

<table>
<thead>
<tr>
<th>Strategy &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crossover Construction</strong> 3, 4</td>
<td>Safety for workers, familiarity of road user. Easier and better construction. Wider traveled lanes. If left in place, useful in emergency. Should increase contractor productivity. Should increase quality. Could reduce traffic interference as a result of increased contractor productivity leading to shorter phase. Completion dates are mandated.</td>
<td>Ramp interference. Cost. Requires time for crossover construction and removal. Long crossovers less acceptable in rolling to hilly terrain.</td>
<td>Duration of project. Location of crossover depends on ramps, lighting, structure and grade. Phasing limits may impact use. Length of work zone may affect acceptability.</td>
<td>Whenever possible, especially where not many ramps interfere. Long stretches of pavement reconstruction or rehabilitation. Bridge work not conducive to keeping one lane open. One lane each direction should handle about 30,000 ADT with limited backups.</td>
<td><strong>CC↓, MTC↑, RUC↓</strong> Minimum $3 to 2 million per pair.</td>
</tr>
</tbody>
</table>

| **Temporary Pavements (Runaround)** 1, 2, 3, 4 | Separates work from traffic. Expensive and time consuming while constructing. Inefficient use of materials. | Must have sufficient right-of-way. | No adequate detour is available. | **MTC↑, RUC↑** |

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
<table>
<thead>
<tr>
<th>Strategy &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary Structures</strong></td>
<td>Traffic remains on routes.</td>
<td>Cost.</td>
<td>Right-of-Way.</td>
<td>When volumes warrant. No detour available.</td>
<td>MTC↑, RUC↓</td>
</tr>
<tr>
<td>(Allows closure of structure, but no detour for the public)</td>
<td></td>
<td>Time to design and construct.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2</td>
<td></td>
<td>Inefficient use of materials.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Detour of One Direction of Mainline</strong></td>
<td>Work moves faster.</td>
<td>Detour maintenance.</td>
<td>Short distance and ramp access.</td>
<td>Often.</td>
<td>MTC↑</td>
</tr>
<tr>
<td>(Assumes detour for closed direction)</td>
<td>Only half of the traffic detoured at anytime.</td>
<td></td>
<td>Local agencies must accept detour routes and public information is emphasized (i.e., by TMP in urban area).</td>
<td>Urban/suburban freeway is amenable to this when suitable detour is available.</td>
<td></td>
</tr>
<tr>
<td>3, 4</td>
<td>Improves safety of project personnel.</td>
<td></td>
<td>Locations of ramps and intersections.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Detour must be adequately signed and may require capacity improvements.</td>
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</tr>
</tbody>
</table>

Legend:
- Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
- Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary Signals</strong>&lt;br&gt;(At ramps and on expressways, includes construction vehicle crossing and ramp metering)&lt;br&gt;1, 2, 4</td>
<td>Helps maintain ramp and detour capacity.</td>
<td>Change traffic patterns on cross roads.</td>
<td>Should be warranted.</td>
<td>When additional capacity is needed for the short term.</td>
<td>Low.</td>
</tr>
<tr>
<td><strong>Reversible Lanes</strong>&lt;br&gt;(May use movable barriers)&lt;br&gt;2</td>
<td>Flexible to accommodate fluctuations in traffic peak flow direction.</td>
<td>Confusing to infrequent user. Labor intensive.</td>
<td>Need majority commuting traffic.</td>
<td>Large variances in directional volumes between AM &amp; PM; and number of lanes limited.</td>
<td>MTC↑, RUC↓</td>
</tr>
<tr>
<td><strong>Movable Barrier Systems</strong>&lt;br&gt;2, 3, 4</td>
<td>Ability to provide for peak flow capacity.</td>
<td>More costly than drums and fixed barriers.</td>
<td>Shift distance must be a constant. Must determine appropriate end treatment.</td>
<td>When you have a need for repeated barrier shifts.</td>
<td>CC↑, RUC↓</td>
</tr>
<tr>
<td><strong>Signed Alternate Routes</strong>&lt;br&gt;(Eligible for Federal money)&lt;br&gt;1, 2, 4</td>
<td>Reduces congestion. Lessens congestion on mainline.</td>
<td>Hard to get people to use. Signing. Not always used by public.</td>
<td>Must be just as quick or close. Shouldn’t go through other construction zones. Local officials must approve.</td>
<td>With good arterials (parallel). When construction expected to backups. Project is of long duration.</td>
<td>Low cost unless alternate route improvements are required.</td>
</tr>
</tbody>
</table>

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
Table 697-1b. Corridor Options Outside Work Zone - Compendium of Traffic Control Options (continued, 2 of 2)

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unsigned Alternate Routes</strong>&lt;br&gt;(Not eligible for Federal money)&lt;br&gt;(Logical unsigned alternate may be eligible for State money)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2</td>
<td>Reduces congestion. Lessens congestion on mainline.</td>
<td>Difficult to get people to use.</td>
<td>Alternate routes shouldn’t go through other construction zones.</td>
<td>When construction expected to produce backups and good parallel arterials are available.</td>
<td></td>
</tr>
<tr>
<td><strong>Highway Advisory Radio</strong>&lt;br&gt;1</td>
<td>Provides real time information to motorists.</td>
<td>Limited ranges. Low usage rate by motorists due to difficulty tuning in station.</td>
<td>Information needs to be current. May work best with repeat drivers. Should be limited to project specific information.</td>
<td>When alternate routes are available. Long duration of construction.</td>
<td>Low cost.</td>
</tr>
<tr>
<td><strong>Advanced Signing (Time or Distance)</strong>&lt;br&gt;1, 2, 4</td>
<td>A great tool for information to motorists. Gives public advance warning to make decisions.</td>
<td>If project is delayed, sign is wrong.</td>
<td>Need to keep information up to date.</td>
<td>Anytime. Advanced warning/PR is great always.</td>
<td>Low cost for fixed signs. Higher cost for PCMS.</td>
</tr>
</tbody>
</table>

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
## Table 697-1c. Traffic Flow Options Inside Work Zones
Compendium of Traffic Control Options

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Pavements (Widen) 1, 2, 4</td>
<td>Allows for more lanes to stay open. Creates greater capacity through the construction zone - less backups.</td>
<td>Expensive and time consuming while constructing. Bridges and other roadway items.</td>
<td>When volumes warrant keeping all lanes open. When construction is expected to produce backups. When project is of long duration.</td>
<td>MTC↑, RUC↓</td>
<td></td>
</tr>
<tr>
<td>Use Existing Shoulders 1, 2</td>
<td>Keeps flow normal. Allows wider work space or increases capacity. Low cost. Quick.</td>
<td>Requires more maintenance. Trucks may damage weak shoulders. No room for breakdowns/ emergency stops unless parking lots created. Closer to guardrail, embankment and piers.</td>
<td>Must have full shoulder widths, level bridges. Bridges must be able to accommodate. Put trucks in left lane if possible. Must evaluate shoulders during design. Should have full width approach slabs.</td>
<td>High volume. When backups expected. Moving projects.</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
- Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
### Table 697-1c. Traffic Flow Options Inside Work Zones - Compendium of Traffic Control Options (continued, 2 of 4)

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary Signals</strong> <em>(At ramps and on expressways includes construction vehicle crossing and ramp metering)</em></td>
<td>Helps maintain ramp and detour capacity.</td>
<td>Change traffic patterns on cross roads.</td>
<td>Should be warranted.</td>
<td>When additional capacity is needed for the short term.</td>
<td>Low.</td>
</tr>
<tr>
<td><strong>Reversible Lanes</strong> <em>(May use movable barriers)</em></td>
<td>Flexible to accommodate fluctuations in traffic peak flow direction.</td>
<td>Confusing to infrequent user. Labor intensive.</td>
<td>Need majority commuting traffic.</td>
<td>Large variances in directional volumes between AM and PM; and number of lanes limited.</td>
<td><strong>MTC↑, RUC↓</strong></td>
</tr>
<tr>
<td><strong>Movable Barrier Systems</strong></td>
<td>Ability to provide for peak flow capacity.</td>
<td>More costly than drums and fixed barriers. Shift distance must be a constant. Must determine appropriate end treatment.</td>
<td></td>
<td></td>
<td><strong>MTC↑, RUC↓</strong></td>
</tr>
</tbody>
</table>

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost

(April 15, 2011) October 23, 2002 6-209
### Table 697-1c. Traffic Flow Options Inside Work Zones - Compendium of Traffic Control Options (continued, 3 of 4)

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ramp Closures</strong></td>
</tr>
<tr>
<td>2, 3, 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can pave/repair ramp full width.</td>
<td>Blocks traffic pattern.</td>
<td>Should give definite time limit.</td>
<td>When other ramps are close by, or when bridges on mainline are too close to utilize exit and/or entrance ramps.</td>
<td>Relatively cheap.</td>
</tr>
<tr>
<td>See “Close &amp; Detour.”</td>
<td>Forces new traffic pattern.</td>
<td>Best if only two ramps at a time (to and from directional pairs).</td>
<td>Use when you have high-traffic volumes.</td>
<td>Use when you have high-traffic volumes.</td>
</tr>
<tr>
<td>Reduces mainline congestion.</td>
<td>Moves congestion elsewhere.</td>
<td>In urban area, may have negative impact on next intersection.</td>
<td>In areas where alternate routes exists.</td>
<td>In areas where alternate routes exists.</td>
</tr>
<tr>
<td>Reduces cross road congestion.</td>
<td>Easy to sign in rural area.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glare/Gawk Screens</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective way to separate work and keep traffic moving.</td>
<td>Longer to set up than drums.</td>
<td>Widths in certain areas.</td>
<td>When view of intense construction is likely to reduce capacity.</td>
<td>MTC↑</td>
</tr>
<tr>
<td>Safer for work.</td>
<td>Higher cost than 32 inches.</td>
<td>Sight restrictions at intersections and ramps.</td>
<td>With all part-width construction at restricted areas to control headlight glare.</td>
<td>With all part-width construction at restricted areas to control headlight glare.</td>
</tr>
<tr>
<td>Reduce rubber-necking.</td>
<td>Maintenance of glare screen, if used.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If present on both sides, may reduce drive speed.</td>
<td>Barrier can interfere with wide loads.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
### Table 697-1c. Traffic Flow Options Inside Work Zones - Compendium of Traffic Control Options (continued, 4 of 4)

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highway Advisory Radio</strong>&lt;br&gt;1</td>
<td>Provides real time information to motorists.</td>
<td>Limited ranges. Low usage rate by motorists due to difficulty tuning in station. Information needs to be current. May work best with repeat drivers. Should be limited to project specific information.</td>
<td>When alternate routes are available. Long duration of construction.</td>
<td></td>
<td>RUC↓</td>
</tr>
<tr>
<td><strong>Owner Imposed Design Restrictions</strong>&lt;br&gt;1, 3</td>
<td>Can reduce actual construction duration. Requires advance planning during design. Could increase cost.</td>
<td></td>
<td>For certain time critical phases.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Use of Owner Supplied or Stockpiled Materials</strong>&lt;br&gt;1, 3</td>
<td>Can reduce actual construction duration. Requires advance planning.</td>
<td></td>
<td>For time-critical phases to shorten duration. Inexpensive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control of Contractor=s Access to the Work</strong>&lt;br&gt;(By location or time of day.)&lt;br&gt;2, 4</td>
<td>Eliminates potential conflicts between construction traffic and motorist. Improves throughput of motorists. May reduce contractor productivity. Must provide reasonable access for contractor.</td>
<td></td>
<td>Where capacity is critical. Where conflicts between contractor’s equipment and motorists is expected to impact capacity and safety, possibly on grades or locations with poor sight distances.</td>
<td></td>
<td>CC↑, RUC↓</td>
</tr>
</tbody>
</table>

Legend:

Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety

Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
### Table 697-1d. Time Limitations with Disincentive Options

**Compendium of Traffic Control Options**

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary Lane Closures or Restrictions</strong>&lt;br&gt;1, 2</td>
<td>Prevents contractor from keeping lanes closed longer than necessary.&lt;br&gt;Prevents work during specified hour.</td>
<td>May surprise repeat drivers.&lt;br&gt;May be more expensive.&lt;br&gt;More setups and take downs which can reduce construction time.</td>
<td>Rush hour considerations.&lt;br&gt;Use only if work will allow.&lt;br&gt;Give public notices.</td>
<td>Mainline paving on basic freeway lanes.&lt;br&gt;When desired to prohibit closures during specified times.</td>
<td>CC↑, MTC↑, RUC↓&lt;br&gt;Cheap (cone in daylight; drums at night).&lt;br&gt;Possibly higher cost than permanent closure.</td>
</tr>
</tbody>
</table>

| Night Work (Hours of day a specific phase of work is or required to be performed) | 2, 3 | Good PR.<br>Lower cost to motorist.<br>May shorten project duration. | Costly for labor.<br>Lower efficiency.<br>Personnel are isolated.<br>Possibly poorer quality work and inspection difficulty.<br>Difficult to get some materials at night.<br>Increased hazard potential.<br>Difficult to access management or supervision for problem solution. | Residential areas.<br>Work must be able to be accomplished in this time.<br>Urban noise ordinances. | High-volume areas.<br>When extensive backups expected to be created. | CC↑, MTC↑, RUC↓ |

**Legend:**
- Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
- Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
Table 697-1d. Time Limitations with Disincentive Options - Compendium of Traffic Control Options (continued, 2 of 2)

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekend Work (Only)</strong> 2, 3, 4</td>
<td>Lower cost to motorist.</td>
<td>Costly - needs inspection on overtime also. Impacts traveler who is less familiar with alternate routes. Difficult to get some materials on weekends.</td>
<td>Work must be able to be accomplished in this time.</td>
<td>More amenable in urban areas. High volume of commuter traffic expected to be delayed.</td>
<td>CC↑, RUC↓</td>
</tr>
<tr>
<td><strong>Lane Rental (Many variations)</strong> (Contractor loses money for duration of specific lane closures) 1, 2, 3</td>
<td>Work done in the most cost effective and timely manner. Should minimize construction time. Provides incentive to minimize use of road space.</td>
<td>Expect disagreements. New application in Ohio.</td>
<td>Requires careful timekeeping. Too many variables.</td>
<td>Paving freeways.</td>
<td>CC↑, RUC↓</td>
</tr>
<tr>
<td><strong>Interim Completion Dates, By Phase</strong> 3 (possibly 4)</td>
<td>A good tool for timeliness. Prevents contractor from having lanes closed or restricted when not desired.</td>
<td>Only works if enforced by increased disincentives. Schools, weather, plowing, etc. Must require early consideration and follow-up. Must be updated when a sale date is established or revised.</td>
<td>To open roads before winter, specified events.</td>
<td>Cheap.</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
Table 697-1e. Contracting Procedure Options
Compendium of Traffic Control Options

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incentives/ Disincentives</strong>&lt;br&gt;(Usually applies to a phase of a project)</td>
<td>Timeliness.&lt;br&gt;Quicker construction.</td>
<td>More arguments on time extension.&lt;br&gt;Our people must resolve issues quickly.&lt;br&gt;Requires CPM schedule.</td>
<td>None known.&lt;br&gt;Need good plans and a project with the work well defined in advance.&lt;br&gt;Work must be able to be accomplished in allotted time, must follow the incentive/disincentives guidelines.</td>
<td>High volume that truly impacts motorists without good detour or alternate route.</td>
<td>CC↑, RUC↓&lt;br&gt;Must budget for maximum incentive.</td>
</tr>
<tr>
<td><strong>A + B Bidding</strong>&lt;br&gt;(Construction cost plus construction time)</td>
<td>Work done in the most cost effective and timely manner.&lt;br&gt;Should minimize construction time.</td>
<td>May pay more for the work.&lt;br&gt;Expect disagreements.</td>
<td>Limit to high impact projects.&lt;br&gt;Currently limited to test projects.&lt;br&gt;Need very good plans and no expected changes.&lt;br&gt;Need reasonable completion times.</td>
<td>High volume that truly impacts motorists without good detour or alternate route.</td>
<td>CC↑, RUC↓</td>
</tr>
</tbody>
</table>

Legend:
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase;
↓ = Cost Decrease; CC + MTC = Contract Cost
<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lane Rental</strong> <em>(Many variations)</em></td>
<td>Work done in the most cost effective and timely manner.</td>
<td>Expect disagreements.</td>
<td>Requires careful timekeeping.</td>
<td>Paving freeways.</td>
<td>CC↑, RUC↓</td>
</tr>
<tr>
<td><em>(May be combined with A+B Bidding)</em></td>
<td>Should minimize construction time.</td>
<td>New application in Ohio.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(Contractor loses money for duration of specific lane closures)</em></td>
<td>Provides incentive to minimize use of road space.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2, 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:

Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety

Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
Table 697-1f. Administrative Options
Compendium of Traffic Control Options

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
</table>
| Traffic Management Program (Area, corridor or project) (May include enforcement, demand management, public information, public perception adjustment) 1, 2, 4 | - Keeps checks on conflicts.  
- Helps with consistency.  
- Coordinates all projects, develops a forum for discussion of construction problems. | - Not welcomed by some.  
- Takes extra time and planning.  
- Tends to be expensive.  
- Additional funding required from Districts and Locals.  
- Project outside area boundaries may cause public relation problems.  
- Requires more staff time. | - Takes extra time and planning.  
- Area must be large enough to make worthwhile. | - Anytime.  
- Most often used in larger urban areas and particularly (eight MPO's) with large projects. | CC↑, MTC↑, RUC↓  
Personnel only (mainly).  
Typical program is $500,000 to $1 million per year. |
| Enforcement 1, 2, 4 | - Expedited, orderly traffic flow, incident support. | - Cost. | - When incident support is required, or enforcement presence is desired. | - Medium high. |
| Incident Management 1, 2, 3, 4 | - Minimizes effect incidents have on traffic flow. | - Cost of standby incident response personnel and vehicles; administrative cost. | - Freeway sections with high v/c ratio and high likelihood of incidents. | - High. |

Legend:
- Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
- Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
### Table 697-1f. Administrative Options -
Compendium of Traffic Control Options (continued, 2 of 2)

<table>
<thead>
<tr>
<th>Option &amp; Objectives</th>
<th>Pros</th>
<th>Cons</th>
<th>Restrictions</th>
<th>When to Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demand Management</strong> 1, 2, 3, 4</td>
<td>Shifts some demand from highway under construction. Good PR.</td>
<td>Requires advance planning and coordination. Cost.</td>
<td>Alternative routes and modes must be available.</td>
<td>Large urban and suburban projects in congested corridor.</td>
<td>High.</td>
</tr>
<tr>
<td><strong>Contractor Proposed Options</strong> 3</td>
<td>May result in shorter construction duration.</td>
<td>Contractor may not be as familiar with recommended procedure as claimed. Usually requires rush reviews by ODOT.</td>
<td>Requires adequate lead time for PR and permits.</td>
<td>CC↓</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety
Cost: CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; ↑ = Cost Increase; ↓ = Cost Decrease; CC + MTC = Contract Cost
Table 697-2. Rate of Flow (Two-Way) for a Signalized One-Lane, Two-Way Closing

<table>
<thead>
<tr>
<th>Total cycle length</th>
<th>Length of One-Lane Operation (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Minutes</td>
<td>Seconds</td>
</tr>
<tr>
<td>1.0</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>70</td>
</tr>
<tr>
<td>1.5</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>90</td>
</tr>
<tr>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>120</td>
</tr>
<tr>
<td>3.0</td>
<td>180*</td>
</tr>
<tr>
<td>4.0</td>
<td>240*</td>
</tr>
<tr>
<td>5.0</td>
<td>300*</td>
</tr>
</tbody>
</table>

This table assumes a 12 foot lane width. If the lane width is 11 feet, reduce the rate of flow by using a factor of 0.97 and for a 10 foot lane width, reduce the rate of flow by using a factor of 0.93.

* Cycle lengths greater than three minutes should be considered only in unusual cases. It is important to remember that a road user encountering a signal staying red for more than two minutes is very likely to become impatient and/or assume the signal is malfunctioning. This is particularly true if the motorist cannot see that opposing traffic is using the open lane. For the same reasons, closure lengths greater than about 800 feet should not be used until carefully evaluated. Where relatively short closure lengths are involved but high peak traffic volumes tend to support the need for a longer cycle length, it will probably be appropriate to employ a technique which will allow a shorter cycle length to be used during lower traffic periods. Traffic actuated operation and/or multi-plan time-of-day operation should be considered.
Table 697-3. Initial Timing Chart

<table>
<thead>
<tr>
<th>Approach</th>
<th>Approaching (Time)</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound Green</td>
<td>31.0*</td>
<td>41.0</td>
<td>16.0*</td>
</tr>
<tr>
<td>Northbound Yellow</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Northbound All Red (Internal Clearance)</td>
<td>18.0</td>
<td>18.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Southbound Green</td>
<td>30.0</td>
<td>20.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Southbound Yellow</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Southbound All Red (Internal Clearance)</td>
<td>19.0</td>
<td>19.0</td>
<td>19.0</td>
</tr>
</tbody>
</table>

| Total Cycle Length                            | 105.0*             | 105.0 | 75.0* |

* Provide timing appropriate for the signal location under consideration.

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>SUN</th>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>THUR</th>
<th>FRI</th>
<th>SAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midnight - 7:00 a.m.</td>
<td>C*</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C*</td>
</tr>
<tr>
<td>7:00 a.m. - 9:00 a.m.</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>9:00 a.m. - 4:00 p.m.</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>4:00 p.m. - 6:00 p.m.</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>6:00 p.m. - Midnight</td>
<td>C*</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C*</td>
</tr>
</tbody>
</table>
Table 697-4. Minimum Lane Widths for Maintaining Traffic on Curves (Where D >10 degrees)

<table>
<thead>
<tr>
<th>RADIUS feet</th>
<th>Predominant Traffic Type **</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type A feet</td>
</tr>
<tr>
<td>&gt; 500</td>
<td>10</td>
</tr>
<tr>
<td>500</td>
<td>10</td>
</tr>
<tr>
<td>300</td>
<td>10</td>
</tr>
<tr>
<td>200</td>
<td>10</td>
</tr>
<tr>
<td>150</td>
<td>10 *</td>
</tr>
<tr>
<td>100</td>
<td>10 *</td>
</tr>
</tbody>
</table>

** Type A - Passenger cars govern design.
Type B - Single unit trucks govern design.
Type C - Semitrailer vehicles (WB-50) govern design. Larger units may need to be rerouted if their required width cannot be accommodated.

Note: Widths shown in excess of 10 feet are based on the width of wheel track plus a 1.5 foot allowance for maneuverability. Minimum barrier offset in addition to the widths shown is 1.5 foot. Values marked by an asterisk (*) are those situations where minimum barrier clearance cannot be waived.
Table 697-5. Sample Phasing Chart for Actuated Signal Control

<table>
<thead>
<tr>
<th>Phase</th>
<th>Phase*</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>7+/-</td>
<td>10</td>
<td>8</td>
<td>10+/-</td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>11</td>
<td>30</td>
<td>12</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>3</td>
<td>3.5</td>
<td>3</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>All Red</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Recall</td>
<td>ON+/-</td>
<td>OFF</td>
<td>ON</td>
<td>OFF+/-</td>
<td></td>
</tr>
</tbody>
</table>

* Phases as shown on SCD MT-96.20 for Actuated Control.
+/- Provide timing for the signal location under consideration.
Table 697-6. Reserved for Future Information

The table “Selection of Crash Cushions and Barriers - TRACC and Triton” has been deleted, but the number/space has been reserved for future information.
Table 697-7. Reserved for Future Information

The table “Selection of Crash Cushions - QuadGuard” has been deleted, but the number/space has been reserved for future information.
Table 697-8. Maximum Closure Lengths

<table>
<thead>
<tr>
<th>MAXIMUM ADT</th>
<th>MAXIMUM CLOSURE LENGTH Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>200</td>
</tr>
<tr>
<td>9,000</td>
<td>400</td>
</tr>
<tr>
<td>8,000</td>
<td>600</td>
</tr>
<tr>
<td>7,000</td>
<td>800</td>
</tr>
<tr>
<td>5,000</td>
<td>1200</td>
</tr>
<tr>
<td>4,000</td>
<td>1600</td>
</tr>
<tr>
<td>3,000</td>
<td>2000</td>
</tr>
</tbody>
</table>
Table 697-9. Barrier Offset on Curved Roadways

<table>
<thead>
<tr>
<th>Degree of Curvature (Radius)</th>
<th>Required Offset From Edge of Pavement Feet</th>
<th>Minimum Width of Median Required Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 to 3.5</td>
<td>36</td>
<td>66</td>
</tr>
<tr>
<td>3.6 to 4.5</td>
<td>42</td>
<td>72</td>
</tr>
<tr>
<td>4.6 to 5.5</td>
<td>48</td>
<td>78</td>
</tr>
</tbody>
</table>
Table 697-10. Decision Sight Distance for Entrance Ramp Applications
(see Sections 607-13 and 607-15)

<table>
<thead>
<tr>
<th>Posted Mainline Speed (mph)</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>675 feet</td>
<td>930 feet</td>
</tr>
<tr>
<td>55</td>
<td>865 feet</td>
<td>1135 feet</td>
</tr>
</tbody>
</table>
| 65                          | Diamond ramp = 1050 feet
                           | Loop Ramp = 1200 feet | 1365 feet   |
698 FIGURES INDEX

698-1 Component Parts of a Traffic Control Zone

As noted in Sections 602-4.1, 602-4.4.4 and 605-5.1, Figure 698-1 illustrates the components of a traffic control zone.

698-2 Reserved for Future Information

Figure deleted but the space has been saved for now.

698-3a&b Temporary Traffic Control Signs

As noted in Section 605-2.1, Figures 698-3a and 698-3b illustrate Regulatory, Warning and Guide Signs discussed in this Manual that are not shown in the OMUTCD.

698-4 Median Crossover for Entrance Ramp

Figure 698-4 illustrates a typical application involving a median crossover for an entrance ramp. Section 607-13 provides additional information directly related to this application. Section 606-17 also provides additional information about work near interchanges.

698-5 Work in Vicinity of Entrance Ramp

Figure 698-5 illustrates a typical application involving work in the vicinity of an entrance ramp. Section 607-15 provide additional information directly related to this application. Section 606-17 also provides additional information about work near interchanges.

698-6 Two-Lane Crossover Design (Existing 4-Lane Facility)

Figure 698-6 illustrates a two-lane crossover design for an existing four-lane facility. Sections 606-16, 607-12 and 640-12 address crossovers.

698-7 Example of Typical Sections (Existing 4-Lane Facility)

Figure 698-7 illustrates typical sections for a median crossover on an existing four-lane facility. Sections 606-16, 607-12 and 640-12 address crossovers.

698-8 Two-Lane Crossover Design (Existing 6-Lane Facility)

Figure 698-8 illustrates a two-lane crossover design for an existing six-lane facility. Sections 606-16, 607-12 and 640-12 address crossovers.

698-9 Example Typical Sections (Existing 6-Lane Facility)

Figure 698-9 illustrates typical sections involving a median crossover for an existing six-lane facility. Sections 606-16, 607-12 and 640-12 address crossovers.

698-10 Sample Lane Configuration Diagrams and Cross Sections

Figure 698-10 provides a couple of samples of Lane Configuration Diagrams and Cross Sections described in Section 630-5 as part of an MOTAA.

698-11 Pothole Patching on Multi-Lane Facilities That Will Violate the PLCS

Figure 698-11 is an example of TTC guidelines established in Section 660-4.3 for pothole patching on ODOT-maintained multi-lane facilities that will violate the PLCS.
698-12 Pothole Patching on Multi-Lane Facilities That Will Not Violate the PLCS

*Figure 698-12* is an example of TTC guidelines established in *Section 660-4.4* for pothole patching on ODOT-maintained multi-lane facilities that will not violate the PLCS.
Figure 698-1. Component Parts of a Traffic Control Zone

Legend:
- Direction of travel
- Channelizing device
- Work space
- Sign

- Termination Area
  - lets traffic resume normal operations
- Activity Area
  - where work takes place
- Transition Area
  - moves traffic out of its normal path
- Shoulder Taper
- Advance Warning Area
  - tells traffic what to expect ahead

Traffic Space
- allows traffic to pass through the activity area
- Buffer Space (lateral)
  - provides protection for traffic and workers
- Buffer Space (longitudinal)
  - provides protection for traffic and workers
- Work Space
  - is set aside for workers, equipment, and material storage

Downstream Taper

Advance Warning Area
Figure 698-2.

Figure has been deleted; however, for now the space has been saved for a future revision.
Figure 698-3a. Temporary Traffic Control Signs

- **M2-H3**
  - 605-7.3

- **M4-H9bR**
  - 605-7.2

- **R11-H5a**
  - 605-4.3

- **W3-H7**
  - 642-33

- **W8-H12**
  - 605-5.15

- **W8-H12a**
  - 605-5.15

- **W8-H16**
  - 605-17

- **W9-H4R**
  - 641-17

- **W9-H5**
  - 641-17

- **W9-H6**
  - 641-17

- **W20-7**
  - 605-5.7
Figure 698-3b. Temporary Traffic Control Signs

- **SHOULDER WORK AHEAD**
  - W21-H5
  - 606-6

- **SURVEY CREW AHEAD**
  - W21-H6
  - 605-5.9

- **MOWING AHEAD**
  - W21-H8
  - 606-6

- **ROAD WILL BE CLOSED MONDAY FOR 27 DAYS INFO: 555-555-1212**
  - W20-H13
  - 605-6.2

- **ROAD WILL BE CLOSED MONDAY FOR 27 DAYS OHIO DEPT OF TRANSPORTATION**
  - W20-H14
  - 605-6.2

- **NO MERGE AREA**
  - W23-H2
  - 607-15
Figure 698-4. Median Crossover for Entrance Ramp
(See Section 607-13 for related details.)
Figure 698-5. Work in Vicinity of Entrance Ramp
(See Section 607-15 for related details.)

# TYPICALLY ASSUME 50 MPH MERGE SPEED
Figure 698-6. Two-Lane Crossover Design
(Existing 4-Lane Facility)
Figure 698-7. Example of Typical Sections (Existing 4-Lane Facility)
Figure 698-8. Two-Lane Crossover Design (Existing 6-Lane Facility)
Figure 698-9. Example Typical Sections
(Existing 6-Lane Facility)
Figure 698-10. Sample Lane Configuration Diagrams and Cross Sections
Figure 698-11. Pothole Patching on Multi-Lane Facilities That Will Violate the PLCS

Notes:
1.) All vehicles shall be equipped with high-intensity rotating, flashing oscillating or strobe lights.
2.) Preferred location of work vehicle and the first shadow vehicle is in the lane adjacent to the shoulder when the shadow vehicle has a TMA.
3.) Both shadow vehicles shall be equipped with arrow boards.
4.) The second shadow vehicle may be replaced by a law enforcement officer (LEO).
Figure 698-12. Pothole Patching on Multi-Lane Facilities That Will Not Violate the PLCS (Sheet 1 of 2)

Detail A

Notes:
1. The shadow vehicle shall be equipped with an arrow board.
2. The preferred location of the work vehicle is in the lane adjacent to the shoulder.
3. If a TMA is not available, the work vehicle and shadow vehicle should be located on the shoulder.
4. All vehicles shall be equipped with high-intensity rotating, flashing, oscillating or strobe lights.
Figure 698-12. Pothole Patching on Multi-Lane Facilities That Will Not Violate the PLCS (Sheet 2 of 2)

Notes:
1. This drawing is only intended to be used for low-volume multi-lane highways where roadway geometry and terrain do not necessitate the use of a shadow vehicle, TMA, LEO, etc.
2. The work vehicle shall be equipped with a truck-mounted arrow board and high-intensity rotating, flashing, oscillating or strobe lights.