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## Part 6 - TEMPORARY TRAFFIC CONTROL

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intended motor vehicle 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.

All channelizing devices used in maintaining traffic should have a minimum lateral offset from the edge of the traveled lane of 1.5 feet (0.5 meter). A lateral offset of less than 1.5 feet (0.5 meter) 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.56.

Reflectorization of cones shall be as specified in OMUTCD Section 6F.56, and accomplished with bands of Type G reflective 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. The use of cones on freeways and other multi-lane highways shall be limited to short-term stationary lane closures. On freeways and multilane highways, the use of cones shall be limited to operations of twelve hours or less, for either day or night. Upon completion of work within this time period, the cones shall be removed. The cones may again be placed on the highway when the work is to resume on the following day or night. Cones used at night on freeways and other multilane highways shall be at least 42 inches (1.1 meters) in height. Any lane closure using channelization devices, expected to remain for more than twelve hours, shall require the use of drums or barriers.

   Night use of cones on freeways and other multilane 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, should be 40 feet (12 meters).

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

This section addresses requirements for drums used for traffic warning or channelization that are in addition to those found in OMUTCD Sections 6F.59.

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

Drums shall be kept clean so that reflectivity 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 (25 millimeters) in character height and located at least 2 inches (50 millimeters) below the reflectorized band or on the top or bottom horizontal surfaces of the drum.

Drums shall be reflectorized with 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.72 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 reflectorized drums are insignificant. Therefore, the use of these lights on reflectorized 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 barricades, tubular markers and vertical panels that are in addition to those found in OMUTCD Sections 6F.57, 6F.58 and 6F.60.

Faces of barricades and vertical panels shall be reflectorized 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 reflectorized with bands of Type G sheeting. For details on band widths and sequencing see OMUTCD Section 6F.57.

605-11.6 Direction Indicator Barricade

The Direction Indicator Barricade (see OMUTCD Section 6F.61 and Figure 6F-4) 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.

605-11.7 Barrier Used as a Channelizing Device

Temporary traffic barriers (see OMUTCD Section 6F.62) 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 (see Sections 605-14.1, 605-14.4.2 and 605-19). For additional information, refer to OMUTCD Section 6F.62 and Section 605-14.

605-11.8 Temporary Raised Islands

Temporary raised islands (see OMUTCD Section 6F.63) 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 mph (70km/h) or less.
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 Maps/Schedules 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 motorist 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 motorist. 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.

If two projects implementing the speed-reduction and the double-fines policies are located adjacent to each other or are separated by less than 1 mile (1.6 kilometer), the projects should be treated as one project for the purpose of placing Regulatory Signs. (Also, see Section 640-18 and Section 600-2.)

640-18 Speeds in Work Zones

640-18.1 Design Speed

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. Where maintaining the legal speed limit is not feasible or practical, the maintenance of traffic design speed may be decreased below the posted speed limit, with the minimum design speed being 25 miles per hour. 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 the OMUTCD. Posted speed reductions are discussed in Section 640-18.2.

Whenever a speed reduction is to be used, the design speed for maintenance of traffic items shall remain at the original posted speed limit on approaches to the work zone and shall be the temporary reduced speed limit within the work zone.

640-18.2 Speed Limit Reductions

A 10 mile per hour reduction in the speed limit shall be implemented in construction projects on freeways and expressways and on rural four or more lane highways. The speed limit for any other type of facility should not be changed.

Speed limit reductions shall only apply to projects lasting thirty consecutive calendar days or more where traffic is to be maintained. Speed limit reduction is not intended for use with bridge rehabilitation/repair work or night-only lane closures, and is generally not suitable for use on projects of less than one-half mile in length.

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, speed reduction in the direction of the work does not automatically constitute speed reduction in the opposite direction. 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.
Whenever a lowered speed limit is to be used within a section that has more than one original posted speed, the lowest temporarily reduced speed required by the above discussion should apply as the speed limit for the entire length of the project. The speed limit reduction shall be accomplished in 10 mile per hour increments.

Exceptions to the above criteria must be submitted to the Office of Traffic Engineering for approval.

When a speed reduction during construction is required, it shall be accomplished by a statement preceding the Director’s signature on the plan title sheet and by plan note. For the Plan Note, see Section 642, Plan Note 642-24. For the statement intended to precede the Director’s signature, see L&D Manual Volume Three, Section 1302.12.4. The Plan Note shall be worded to require that the revised Speed Limit signs be erected or uncovered no earlier than four hours prior to the actual start of work, and removed or covered no later than four hours following restoration of all lanes to traffic with no restrictions.

For projects on which the activity is limited to one section of the site for at least thirty days and then is moved to another section of the site upon completion of work in the first portion, the speed limit reduction shall be limited to only the active portion of the site at the given time. Signing for a speed limit reduction, as well as all other advance construction signing, shall be relocated when the concentration of activity is relocated. For projects on which the activity is scheduled for thirty days or more, with day-to-day variation in activity location, possibly performing a sequence of activities, the speed limit reduction, if applied to the project, should apply to the entire length of project for its entire duration. If the activity location moves significantly from day to day, it is possible that the project does not qualify for speed reduction.

For a project which lasts more than one construction season, if all lanes are open to traffic during the winter months and no restrictions exist, the speed limit shall return to the original posted speed, and temporary Speed Limit signs shall be removed or covered no later than four hours following restoration of all lanes to traffic with no restrictions for the winter. Temporary Speed Limit signs may be re-erected or uncovered no earlier than four hours prior to resumption of work.

The first temporary Speed Limit sign shall be placed either 500 feet (150 meters) in advance of the lane reduction or shift taper or at the point where construction begins (dual mounted for divided highways), whichever comes first. See Plan Note 642-24 in Part 642 for information on locating Work Zone Speed Limit Signs. Signing shall be repeated immediately after each entrance ramp within the zone, at every 1 mile (1.6 kilometers) for 55 mile per hour zones, and at every one-half mile (800 meters) for 45 miles per hour zones. The sign may also be repeated in advance of intermediate lane closures. The REDUCED SPEED AHEAD sign (R2-5a) shall be placed in advance of the beginning point of the speed reduction zone; at 1000 feet (300 meters) ahead on freeways and expressways and at 500 feet (150 meters) ahead on other rural four-lane divided highways. The R2-1 Speed Limit sign should be erected at the point where the legal speed is resumed, typically 500 feet (150 meters) beyond the end of work, excluding traffic control devices. On divided highways, Speed Limit signs should be dual-mounted.

Where adjacent projects exist, the speed reduction should be continuous from one project to the adjacent project. The project engineer, or other responsible ODOT representative, shall insure that speed reduction signing is limited to the first project in the series and legal speed resumption signing is limited to the last project in the series in the direction of flow of the traffic. This procedure should also be applied to projects which are separated by a non-construction zone of up to 1 miles (1.6 kilometers).

640-19 Law Enforcement Officers (LEOs)

LEOs with patrol cars are effective for slowing traffic speed through work zones. Their use shall be specifically identified in the construction plans.
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. 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 ODOT expense.

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. Use of LEOs is required during the entire advance preparation and closure sequence where complete blockage of traffic is required. LEOs should not be used where the OMUTCD intends that flaggers be used.

Use of LEOs by contractors other than the uses specified above will generally 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.

For projects specifying the use of LEOs by municipalities, the designer shall contact the cities that are to provide the LEO to ensure that the necessary patrol services will be available. If the municipality cannot guarantee the availability of services, the plans should be modified to use other available LEOs from either the sheriff department or OSHP or eliminate the LEO from the plans.

State Highway Patrol Officers may be specified on rural Interstate projects. They shall not be used exclusively on other projects when local LEOs are available.

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, Sections 605, 607, 641 and 642, in the Traffic SCDs and in CMS 614.04.

640-21 Removal of Logo Signs

As noted in Sections 650 and 660, Logo signs (which include establishments for Gas, Food, Lodging, Camping and Attractions) are the property of Ohio Logos, Inc. and are not to be removed or replaced by ODOT staff or by contractors working for ODOT. The contractor shall notify Ohio Logos (toll-free 1-800-860-LOGO) at least sixty days prior to the date of desired removal. If maintenance work necessitates removal of the LOGO sign, Ohio Logos must be given reasonable time to remove the sign. Failure by Ohio Logos to respond in reasonable time may necessitate removal by ODOT staff.

640-22 Temporary Lighting

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.

For additional guidance in use of temporary lighting, see SCDs MT-100.00, MT-102.10 and MT-102.20, and Plan Note 642-29 in Section 642. Part 11 of this Manual provides additional guidance for general lighting design principles.

640-23 Temporary Traffic Barrier

640-23.1 General

The various types of temporary traffic barrier are addressed in Section 605-14. Additional design details are provided in this section.

640-23.2 Length of Need

The method used to design the length 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.

**640-23.3 Portable Concrete Barrier (PCB)**

**640-23.3.1 General**

The decision to use PCB is based upon characteristics of the work zone and engineering judgment. As noted in Section 605-14.4.1, the use of PCB should be required during construction in any area where penetration or deflection permitted by other traffic control devices cannot be tolerated.

Since the possible number of encroachments into the work zone increase over longer periods of time, PCB should be considered for use where long-term work zones will exist. Also, work zones which will have heavy equipment or dangerous obstacles near the traveled way should be considered for PCB protection. Where the work zone involves drop-off areas, the information in Section 640-6 should be used to determine where to use PCB.

As noted in Section 640-12.2, PCB is required to separate opposing traffic on high-speed highways (> 45 miles per hour) which are normally separated by a median.

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

PCB is also required on bridge decks where the parapet or guardrail is removed. SCD PCB-91 and the Design Data Sheet PCBDD (accessed from the Office of Structural Engineering website by using the “Bridge Standards” link) provide additional information for Bridge-Mounted Portable Concrete Barrier.

**640-23.3.2 End Treatment**

The exposed end of the PCB 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 PCB located within the clear zone.

Exposed ends of PCB located outside the clear zone shall be tapered. If two PCB runs overlap, with the first PCB 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 PCB, see L&D Manual Volume One, Figure 602-1 and the SCDs.

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

**640-23.3.3 Anchoring PCB**

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

640-23.3.4 PCB 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 4.1M and RM 4.2M.

640-23.4 Plastic Water-Filled Barrier

A plastic water-filled barrier provides positive separation and redirective capability in work zones; however, it deflects substantially upon impact. For this reason, it cannot be used as an alternate in all situations to PCB. The designer must ensure that there is adequate clearance behind the barrier to accommodate expected deflections.

For portable water-filled barriers, the minimum length of need recommended by the manufacturer should be provided if it is greater than the calculated length of need (Section 640-23.2). In locations where the water-filled barrier is used primarily as a visual channelizing device, the length of the barrier is determined in a manner similar to that for drums.

Plastic water-filled barriers may have advantages over PCB 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

They may also provide a higher level of channelization at certain locations where drums would normally be used, such as at exit ramps.

640-23.5 Triton

The Triton is a specific plastic, water-filled, portable, longitudinal barrier manufactured by Energy Absorption, Inc.

Segments are 78 inches (1981 millimeters) long, 32 inches (813 millimeters) high and 21 inches (533 millimeters) wide. The NCHRP Report 350 Test Level 2 (TL-2) version can be used in work zones where speeds are 40 miles per hour and lower. The NCHRP Report 350 Test Level 3 (TL-3) version is created by adding two pedestal supports under each segment of the TL-2 design. This increases the effective height of the barrier to 39 inches (991 millimeters) and enables it to be used in work zones where speeds are greater than 40 miles per hour.

The minimum length of an installation of the TL-3 design is thirty interconnected units totaling 195 feet (59.5 meters). The length of need shall begin at the 11th segment from the end of the installation. The minimum length of an installation of the TL-2 design is sixteen interconnected units totaling 104 feet (30 meters). The length of need shall begin at the 5th segment from the end of the installation.

The Triton barrier is approved as its own non-redirective end treatment when the last segment on the end contains no water and the retaining pin is left out of the exposed (free) joint. For TL-3 this section also must be turned upside down and supported by a 5 inches (130 millimeters) modified pedestal. During cold weather, the next nine sections of the TL-3 and the next four sections of the TL-2 should have enough anti-freeze in them to prevent the water from freezing. The rest of the barrier can freeze without sacrificing performance.

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 Section 1306 of that manual. Additional information specific to MOT plans is provided in this section and Section 640. The detail needed in Maintenance of Traffic 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 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 Maintenance of Traffic) 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 Section 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 chapter, Designer Notes specifically related to the Standard Construction Drawings (SCDs) have been included in this section. Designer notes have also been included with the Plan Notes in Section 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 Maintenance of Traffic 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 Section 1311.

Other MOT plans may be submitted to the Office of Traffic Engineering (OTE) Maintenance of Traffic 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 maintenance of traffic plan can be developed accordingly.

641-3  Traffic Plan Insert Sheets (PISs)

Traffic PISs are addressed in general in Section 104. They are addressed as appropriate throughout the text of this Manual; and this section also 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 in electronic format from the ODOT web site from the Design Reference Resource Center (DRRC).

641-4  Standard Construction Drawings (SCDs)

SCDs are addressed in general in Section 103. They are addressed as appropriate throughout the text of this Manual; and this section 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 in electronic format from the ODOT web site from the Design Reference Resource Center (DRRC).

641-5  Closing Right or Left Lane of a Multi-lane Divided Highway (MT-95.30 and 95.40)

641-5.1  General

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 concrete barrier (PCB) in accordance with Section 605-14.4 and 640-23.3.

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), 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 item.

641-5.2  Advance Warning Sign Groups

SCDs MT-95.30 and 95.40 allow 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 Maintence 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 (1.6 to 3.2 kilometer) intervals between the first AWSG and the normal Warning Signs location. AWSGs would typically be specified for 2 miles (3.2 kilometers), 3 miles (4.8 kilometers), 5 miles (8 kilometers) and 8 miles (12.8 kilometers) 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 plate which is placed below the RIGHT/LEFT LANE CLOSED AHEAD sign (W20-5, W20-5a). This sign should be located approximately 1 mile (1.6 kilometers) 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 Sign (W13-1)**

The designer may also specify the use of the Advisory Speed sign (W13-1) by a **Plan Note** in **Item 614 Maintaining Traffic**. Unless specified, this sign would only be used when directed by the project engineer. The designer may also specify the speed to be shown (see OMUTCD **Section 6F.45**). A 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 regulatory speed limit has been altered by establishment of a lower legal speed limit for the construction activity, the Advisory Speed sign 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 Note 11 on **SCD MT-95.30** (see Note 9 on **SCD 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).

**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 Panel, Warning Lights and Protection Vehicle.
The following items will be shown as a separate quantity in the plans, when required:

- Item 614, Work Zone Edge Line, Class 1 (By Type) Mile (Kilometers)
- Item 622, Portable Concrete Barrier, ____” (____ mm) Foot (Meter)
- 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 Multilane Undivided Highway (MT-95.31, 95.32 and 95.41)

641-6.1 General

SCD MT-95.31 and 95.32 depict traffic control for closing the right and left lane, respectively, of a multilane undivided highway using drums. MT-95.41 is used to close the right or left lane on a multilane undivided highway when construction procedure or the condition requires that the work area be protected by portable concrete barrier (PCB) in accordance with Section 605-14.4 and 640-23.3.

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 SCD 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), 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 item.

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-95.30 would have to be included in the plan with a reference in the Item 614 Maintain Traffic Plan Note requiring additional AWSGs as shown on MT-95.30 as part of the signing required for MT-95.31 with the exception that median-mounted signs would not be used.

641-6.3 Advisory Speed Sign (W13-1)

The designer may specify the use of the Advisory Speed sign (W13-1) by a note in Item 614 Maintain Traffic (Section 642-2). Unless specified, this sign would only be used when directed by the project engineer. The designer may also specify the speed shown (see OMUTCD Section 6F.45). A speed reduction, if any, would normally be 10 miles per hour. If the speed is not
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 OMUTCD 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 directed by the Engineer for the maintenance of traffic.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 410, Traffic Compacted Surface, Type A or B</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>Item 410, Traffic Compacted Surface, Type C</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>Item 614, Asphalt Concrete for Maintaining Traffic</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>Item 616, Water</td>
<td>M. Gal. (Cu. Meter)</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.) (every 40 cubic meters of CMS Item 410 will require 4 cubic meters of CMS Item 616, Water (minimum of 200 cubic meters)).

642-10 **Item 614, Maintaining Traffic (ROAD CLOSED Sign)**

The Contractor shall provide, erect and maintain standard 48 x 30 inches (1200 x 750 millimeters) ROAD CLOSED signs, sign supports, barricades, gates 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 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 the Traffic Plan Insert Sheet (PIS) 2010190, Dropoffs in Work Zones, to determine the necessary treatment or protection to be specified in the plan. This Traffic PIS is available from the Office of Traffic Engineering and can be accessed from the OTE or Design Reference Resource Center (DRRC) web sites.
642-15 Overnight Trench Closing

The base widening shall be completed to a depth of no more than _____ inches (millimeters) 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 (7.5 meters 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 the Traffic PIS 2010190, Dropoffs in Work Zones, to determine the necessary treatment or protection to be specified in the plan. This Traffic PIS is available from the Office of Traffic Engineering and can be accessed from the OTE or Design Reference Resource Center (DRRC) web sites.

642-16 Concrete Median Barrier Replacement

Removing, grading and installing the replacement barrier in a continuous operation shall be limited to _____ linear feet (meter) 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 Guardrail Replacement

This note has been incorporated into the 2002 CMS.

642-18 Item 614 - Law Enforcement Officer (With Patrol Car)

In addition to the requirements of CMS 614 and the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), a uniformed law enforcement officer (and official patrol car with working top-mounted emergency flashing lights) shall be provided for controlling traffic for the following 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.
- During the entire advance preparation and closure sequence where complete blockage of traffic is required.
- During a traffic signal installation.

Law enforcement officers (LEOs) should not be used where the OMUTCD intends that flaggers be used. The LEOs are considered to be employed by the Contractor and the Contractor shall be responsible for their actions. Although they are employed by the Contractor, the Engineer shall have control over their placement. The official patrol car shall be a public safety vehicle as required by the Ohio Revised Code. The Contractor shall make arrangements for these services with: (list law enforcement agency, address and telephone number).

Law enforcement officers (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). The following estimated quantities have been carried to the General Summary.
Item 614, Law Enforcement Officer ______ Hours
Item 614, Law Enforcement Officer With Patrol Car ______ Hours

The hours paid shall include minimum show-up time required by the law enforcement agency involved.

If Contractors wish to utilize LEOs for flagging and traffic control other than for that required in these plans, they may do so at their own expense. Payment for the excess above the contract requirements will be included under Item 614, Maintaining Traffic.

**Designer Note**: See L&D Manual Volume One, Section 502.17 for additional information. The three tasks shown are generalizations. The plans shall clearly specify when and where the LEO is to be utilized. This note should be edited to conform with the project requirements.

### 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. (Cu. Meter)

**Designer Note**: For every cubic yard (cubic meter) of earthwork (embankment plus excavation), use between 0.002 M. Gallon (0.01 cubic meter) and 0.004 M. Gal (0.02 cubic meter) 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" (1270 mm), As Per Plan

This work shall consist of furnishing, installing, maintaining, and subsequently removing a 50 inch (1270 millimeter) Portable Concrete Barrier at the locations shown on the plans. For details, see SCD RM-4.1.

Portable Concrete Barrier, 32 inches (813 millimeters) high with an 18 inch (457 millimeter) minimum height glare screen may be used at the option of the Contractor. The glare screen shall be constructed using one of the following systems or an approved equal:

- Carsonite Modular Glare Screen
  Carsonite International
  605 Bob Gifford Blvd.
  Early Branch, South Carolina 29916    702-883-5104 or 800-648-7974

- Trinity Glarefoil
  Trinity Industry
  1170 N. State St.,
  Girard, Ohio 44420    330-545-4373
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 (813 millimeter) Portable Concrete Barrier using the hardware and procedures specified by the manufacturer.

Payment shall include all labor, material, and equipment necessary to perform the work and shall be paid for at the contract price per foot (meter) for Item 622, Portable Concrete Barrier, 50 inch (1270 millimeter), as per plan.

**Designer Note:** A plan detail will be required for this item. Additional information may be obtained by contacting the Office of Roadway Engineering Services.

### 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 square foot (square meter) 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 _____ square feet (square meters) 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. 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. 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 days, such as during winter shut-downs.

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, speed reduction in the direction of the work does not automatically constitute speed reduction in the opposite direction. 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 any lane restriction expected to last at least 30 consecutive calendar days, 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 500 feet (150 meters) in advance of the lane reduction or shift taper or at a point wherever construction begins, whichever comes first. On undivided highways the sign shall be mounted on the right side, 250 feet (75 meters) in advance of the taper. The sign shall be repeated, on the side nearest traffic, every 1 mile (1.6 kilometers) for 55 mph zones and every one-half mile (0.8 kilometers) for 50 mph and 45 mph zones. These signs shall also be erected immediately after each open entrance ramp within the zone.)

Reduced Speed Ahead signs shall be erected in advance of the speed reduction, approximately 1300 feet (390 meters) on multi-lane highways and 500 feet (150 meters) on 2-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. R2-1 (Speed Limit) signs shall be used on undivided roadways. R2-1 (Speed Limit) and R2-H2a signs shall be used on divided roadways. When used the R2-1 and R2-H2a signs shall be mounted side-by-side on separate supports. The Contractor may use signs and supports in used, but good, condition provided the signs meet current ODOT specifications. Sign faces shall be reflectorized 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.

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 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. The following estimated quantity has been carried to the General Summary.

Item 614, Work Zone Speed Limit Sign ______ Each

The signs will be placed at the following locations:

Designer Note: This note shall be included in projects where speed limits are reduced in
According to *Section 640-18.2.*

When this note is used, it should be accompanied by the **Prima Facie Speed Limit Note** on the Title Sheet (**L&D Manual Volume Three, Section 1302.12.4**).

The fourth paragraph shall only be used when the sign locations are not itemized in the note.

Sufficient numbers of the Work Zone Speed Limit signs shall be included to cover the entire project at the spacing required by the note plus one for each entrance ramp, for each direction. For example, for a 2.33 mile (3.75 kilometer) project on an urban Interstate freeway:

Spacing = 0.5 miles (800 meters)  
2.33/0.5 = 4.66 signs or 5 signs (3750/800 = 4.69 signs or 5 signs)  
Both sides of roadway = 5 x 2 = 10 signs  
Both directions of roadway = 10 x 2 = 20 signs  
Plus entrance ramps = 20 + 4 = 24 signs  
Total number of Work Zone Speed Limit signs = 24

**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 directed by the Engineer.

The following estimated quantities are provided for use as directed by the Engineer to maintain and subsequently restore the designated local Detour Route.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Asphalt Concrete Base, PG 64-22</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>304</td>
<td>Aggregate Base</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>448</td>
<td>Asphalt Concrete Surface Course, Type 1, PG 64-22</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>407</td>
<td>Tack Coat</td>
<td>Gal. (Liter)</td>
</tr>
<tr>
<td>408</td>
<td>Prime Coat</td>
<td>Gal. (Liter)</td>
</tr>
<tr>
<td>614</td>
<td>Asphalt Concrete for Maintaining Traffic</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>616</td>
<td>Water</td>
<td>M. Gal. (Cu. Meter)</td>
</tr>
<tr>
<td>617</td>
<td>Compacted Aggregate, Type A</td>
<td>Cu. Yd. (Cu. Meter)</td>
</tr>
<tr>
<td>617</td>
<td>Water</td>
<td>M. Gal. (Cu. Meter)</td>
</tr>
<tr>
<td>642</td>
<td>Center Line</td>
<td>Mile (Kilometer)</td>
</tr>
</tbody>
</table>

**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.

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 Concrete Barrier used for traffic control. Barrier Reflectors, Object Markers and their installation shall conform to CMS626, except that the spacing shall be 50 feet (15 meters). 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.

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 shall be dual mounted. 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 (3 kilometers) through the construction work limits.)

The Contractor may use signs and supports in used, but good, condition provided the signs meet current ODOT specifications. Sign faces shall be reflectorized 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 (0.80 kilometers), 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:

- Excavation for Maintaining Traffic: _____ Cu. Yd. (Cu. Meter)
- Embankment for Maintaining Traffic: _____ Cu. Yd. (Cu. Meter)

**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 (Unidirectional or Bidirectional)**

This item shall consist of furnishing and installing either of the following impact attenuators:


The length of the six-bay QuadGuard CZ is 20'-9" (6.33 meters). Installation shall be at the locations specified in the plans, in accordance with the manufacturer’s specifications as detailed on the following pre-approved shop drawings:

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Drawing Name</th>
<th>Drawing/Revision Date</th>
<th>ODOT Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-40-10</td>
<td>QuadGuard System Concrete Pad, CZ, QG</td>
<td>11/19/97 Rev. D</td>
<td>8/27/99</td>
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<tr>
<td>35-40-16</td>
<td>QuadGuard System Backup Assembly, CZ, QG</td>
<td>7/30/99 Rev. F</td>
<td>8/27/99</td>
</tr>
<tr>
<td>354051z</td>
<td>QuadGuard CZ System Nose Assembly, CZ, QG, 24, 30, 36</td>
<td>5/17/99</td>
<td>8/27/99</td>
</tr>
</tbody>
</table>
2. The TRACC (Trinity Attenuating Crash Cushion) manufactured by Trinity Industry, 1170 N. State Street, Girard, Ohio 44420 (telephone: 330-545-4373).

The TRACC is 21'-0" (6.4 meters) long and 2'-7" (0.8 meter) wide. Installation shall be at the locations specified in the plans, in accordance with the manufacturer’s specifications as detailed on the following pre-approved shop drawings:

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Drawing Name</th>
<th>Drawing/Revision Date</th>
<th>ODOT Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS450</td>
<td>Crash-cushion Attenuating Terminal Plan, Elevation &amp; Sections</td>
<td>3/12/99 Rev. 1</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS455</td>
<td>TRACC Transition to W-beam Median Barrier Plan, Elevation &amp; Sections</td>
<td>2/18/99</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS461</td>
<td>TRACC Transition to Concrete Safety Shape Barrier Plan, Elevation &amp; Sections</td>
<td>6/30/99 Rev. 1</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS462</td>
<td>TRACC Transition to Concrete Barrier Single Slope Plan, Elevation &amp; Sections</td>
<td>6/30/99</td>
<td>8/27/99</td>
</tr>
</tbody>
</table>

3. The GREAT CZ impact attenuator manufactured by Energy Absorption Systems, Inc.

This attenuator may be used until January 1, 2007 if the item was purchased before October 1, 1998 and is in the Contractor’s inventory.

The Contractor shall provide a replacement unit when an impact is severe enough to require complete replacement of the attenuator. The Contractor shall have a spare parts package available on the project site at all times when an attenuator is in place. The Contractor shall provide a minimum of one complete spare parts package for every one to six units installed on the project site. For example, five installed units require one spare parts package and seven installed units require two spare parts packages.

When bidirectional designs are specified, the Contractor shall supply appropriate transitions. Payment for the above work shall be made at the unit price bid for Item 614, Work Zone Impact Attenuator, (Unidirectional or Bidirectional), Each, and shall include all labor, tools, equipment and materials necessary to construct, maintain, repair, replace or relocate 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, PCB and other narrow hazards (24 inches (610 millimeters) or less
in width) located in work zones where speeds are over 40 miles per hour. When a work zone impact attenuator is needed to protect wider hazards or in work zones where speeds are 40 miles per hour or lower, the designer should specify **Item 614 Work Zone Impact Attenuator, QuadGuard CZ ([model #], (Unidirectional or Bidirectional))** and add the corresponding note to the plans.

2. 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.

3. The attenuator can be installed on a concrete pad or asphalt pavement. Consult the manufacturer's specifications for minimum pavement thicknesses.

4. Pre-approved shop drawings are reviewed and kept on file. Contact the **Office of Roadway Engineering Services** for the current Dwg/Rev. and ODOT Approval dates.

5. The QuadGuard CZ and TRACC are non-gating systems.

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 (762 millimeters) 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.

**642-31 Item 614, Work Zone Impact Attenuator, QuadGuard CZ ([Model #], (Unidirectional or Bidirectional))**

This item shall consist of furnishing and installing a QuadGuard CZ work zone impact attenuator manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601 (telephone: 312-467-6750).

Installation shall be at the locations specified in the plans, in accordance with the manufacturer's specifications as detailed on the following pre-approved shop drawings:

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Drawing Name</th>
<th>Drawing/Revision Date</th>
<th>ODOT Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-40-10</td>
<td>QuadGuard System Concrete Pad, CZ, QG</td>
<td>11/19/97 Rev. D</td>
<td>8/27/99</td>
</tr>
<tr>
<td>35-40-16</td>
<td>QuadGuard System Backup Assembly, CZ, QG</td>
<td>7/30/99 Rev. F</td>
<td>8/27/99</td>
</tr>
<tr>
<td>354051z</td>
<td>QuadGuard CZ System Nose Assembly, CZ, QG, 24, 30, 36</td>
<td>5/17/99</td>
<td>8/27/99</td>
</tr>
<tr>
<td>35400260</td>
<td>QuadGuard System PCMB Anchor Assembly</td>
<td>11/19/97 Rev. C</td>
<td>8/27/99</td>
</tr>
</tbody>
</table>
The Contractor shall provide a replacement unit when an impact is severe enough to require complete replacement of the attenuator. The Contractor shall have a spare parts package available on the project site at all times when an attenuator is in place. The Contractor shall provide a minimum of one complete spare parts package for every one to six units installed on the project site. For example, five installed units require one spare parts package and seven installed units require two spare parts packages.

When bidirectional designs are specified, the Contractor shall supply appropriate transitions. Payment for the above work shall be made at the unit price bid for Item 614, Work Zone Impact Attenuator, QuadGuard CZ ((Model #), (Unidirectional or Bidirectional)), Each, and shall include all labor, tools, equipment and materials necessary to construct, maintain, repair, replace or relocate 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, PCB and other fixed objects located in work zones where speeds are 40 miles per hour or lower and for the protection of hazards wider than 24 inches (610 millimeters), but less than 36 inches (915 millimeters) in work zones where speeds are over 40 miles per hour.

As shown in Table 697-7, the QuadGuard CZ comes in three widths, 24 inches (610 millimeters), 30 inches (760 millimeters), and 36 inches (915 millimeters). The six-bay unit is 22'-1" (6.74 meters) long and can be used in work zones where speeds are over 40 miles per hour. The three-bay unit is 13'-1" (4.00 meters) long and can be used in work zones where speeds are 40 miles per hour and lower.

When a 24 inch (610 millimeters) wide six-bay QuadGuard CZ is needed, the designer should specify Item 614, Work Zone Impact Attenuator, (Unidirectional or Bidirectional) and add the corresponding note to the plans.

2. 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.

3. The QuadGuard CZ can be installed on a concrete pad or asphalt pavement. Consult the manufacturer’s specifications for the minimum pavement thicknesses.

4. Pre-approved shop drawings are reviewed and kept on file. Contact the Office of Roadway Engineering Services for the current Dwg/Rev. and ODOT Approval dates.

5. The QuadGuard CZ is a non-gating system.

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 (762 millimeters) 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 Note deleted, but space saved for future note.

This note has been deleted.
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 1/4 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:

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:

a 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.

b The agreement to assist by the Aviation Section Headquarters shall be forwarded to the appropriate ODOT District Highway Management Administrator.

c 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.
Intentionally blank.
643 SPECIFICATIONS

ODOT specifications discussed in this chapter 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

650 CONSTRUCTION

650-1 General

This section 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 section. 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 Signs

Logo signs (which include establishments for Gas, Food, Lodging, Camping and Attractions) are the property of Ohio Logos, Inc. and are not to be removed or replaced by ODOT staff or by contractors working for ODOT. The contractor shall notify Ohio Logos (toll-free 1-800-860-LOGO) at least sixty days prior to the date of desired removal.

650-3 Quality Standards for Sheeting

The ATSSA publication Quality Standards for Work Zone Traffic Control Devices (Section 695-4) shall be used to determine the acceptability of reflectivity conditions for work zone traffic control devices.
Intentionally blank.
660 MAINTENANCE / OPERATIONS

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 the other chapters regarding maintenance activities related to signing, markings, traffic signals and lighting.

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 ½ 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 concrete barrier and unprotected hazards;
4. Portable changeable message signs and arrow panels;
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

Logo signs (which include establishments for Gas, Food, Lodging, Camping and Attractions) are the property of Ohio Logos, Inc. and are not to be removed or replaced by ODOT staff or by contractors working for ODOT. If maintenance work necessitates removal of the LOGO sign, Ohio Logos must be given reasonable time to remove the sign (toll-free 1-800-860-LOGO). Failure by Ohio Logos to
respond in reasonable time may necessitate removal by ODOT staff.
670 OTHER CONSIDERATIONS

670-1 General

This section has been reserved for information on other considerations that should be noted, but for various reasons have not been addressed in the other sections of the chapter. For example, it may at times be used to expedite incorporating information that will later be consolidated into other sections.

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, bicycle paths, 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.

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 or contain rumble strips, loose gravel 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 flashing, rotating or oscillating amber light visible to all directions of traffic for at least one-quarter mile (0.4 kilometer), 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 reflectorized orange background. The overlay for the D5-1 and D5-H2a signs shall be 8 x 1.5 feet (2.4 x 0.15 meters). The overlay for the D5-2 and D5-H6 signs shall be 4 x 1.5 feet (1.2 x 0.46 meters). 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 (700 x 250 mm).

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-98.19, the entrance ramp to the rest area shall be closed by use of drums, as per CMS 614.03. 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 reflectorized orange background, shall be used to inform the road user of the closure. On freeways and expressways the D5-H33, 48 x 48 inches (1.2 x 1.2 meters) 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 (0.6 x 0.6 meters), 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.
Intentionally blank.
695 REFERENCE RESOURCES

695-1 General

Various reference resources that may be useful have been noted in Sections 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.

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 Work Zone Traffic Control Devices

Published by ATSSA, 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.

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 motorists of traffic conditions due to construction activity.

695-6 Project Communication Manual

As noted in Section 600-5, the Project Communication Manual was developed by the Office of Communications to give guidance in developing a communication plan for a specific project in order to insure adequate communication with all interested parties at all stages of development. It is attached to Policy No. 516-003(P) as Appendix F (see Section 1311).
Intentionally blank.
696 FORMS INDEX

696-1 Maintenance of Traffic Alternative Analysis - Work Zone Constraints

Form 696-1 is submitted as part of the Maintenance of Traffic Alternative Analysis described in Section 630-5 for projects involving Interstates and Interstate Look-alikes.
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Form 696-1. Work Zone Constraints

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Work Zone Alternatives</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to meet Work Zone Policy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to maintain all accesses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to provide required on-ramp merge decision sight distance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right-of-way impacts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental impacts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final bridge widths</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant impacts for construction duration and/or construction costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant impacts to earthwork, retaining walls, pier clearances, profile differences, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to maintain existing drainage and lighting systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constructability; and construction equipment access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location of crossovers (e.g., Can crossovers be located near the project?)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Where a constraint is identified, it should be clear in which phase(s) of construction the constraint will be present; and
2. It should be footnoted and an explanation should be provided after the table in the analysis report. The explanation should provide sufficient information for ODOT to determine the magnitude of the constraint.
3. Examples of constraint footnoted information are provided in Section 630-5.
Intentionally blank.
697  TABLES INDEX

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 Liquidated Damages Option

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 697-1d addresses time limitations with a liquidated damages 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  Selection of Crash Cushions and Barriers - TRACC and Triton

As noted in Sections 605-14.5, 605-15.2.3 and 642-32, Table 697-6 presents resource information for use when selecting crash cushions.

697-7  Selection of Crash Cushions - QuadGuard

As noted in Sections 605-15.2.2 and 642-31, Table 697-7 presents resource information for use when selecting a QuadGuard crash cushion.

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 641-24, Table 697-9 summarizes required offsets for barriers on curved roadways.
Table 697-1a. Construction / Traffic Maintenance Strategies
Compendium of Traffic Control Options

<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>Part Width Construction</td>
<td>Easier design.</td>
<td>Contractor access interference.</td>
<td>Minimum lane widths sometimes tough to obtain.</td>
<td>When existing two lanes can remain with use of shoulder.</td>
<td>This is the basis of comparison for alternate strategies, the “defacto” standard.</td>
</tr>
<tr>
<td></td>
<td>Cheaper MOT cost.</td>
<td>May sacrifice quality.</td>
<td>Conflict between width of roadway and width needed for work.</td>
<td>Minor work with short duration.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No detour to follow.</td>
<td>More difficult to construct.</td>
<td></td>
<td>One lane may handle only 20,000 ADT with normal backup.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ramps can remain open.</td>
<td>Narrow lanes and less safe.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longer to construct.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barrier could still be required for some dropoffs.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Minimum lane widths sometimes tough to obtain.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Conflict between width of roadway and width needed for work.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>When existing two lanes can remain with use of shoulder.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Minor work with short duration.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>One lane may handle only 20,000 ADT with normal backup.</td>
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<tr>
<td></td>
<td></td>
<td>This is the basis of comparison for alternate strategies, the “defacto” standard.</td>
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</tr>
<tr>
<td>Close &amp; Detour (Unusual on Interstates and expressway routes)</td>
<td>Safety/ speeds up construction with full access.</td>
<td>Public can’t get there the “usual” way.</td>
<td>Short distance and ramp access.</td>
<td>If it produces accelerated construction, alternates are available and drivers are fairly warned.</td>
<td>CC••, MTC••, RUC••••. Cheap if only signs are used; but will cost more if alternate route modifications are required.</td>
</tr>
<tr>
<td></td>
<td>Easier and better construction.</td>
<td>Access to businesses.</td>
<td>Local agencies must accept detour and public information is emphasized (i.e., by TMP in urban area).</td>
<td>Detours-usually signed by ODOT.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No distracting traffic.</td>
<td>Cost to motorist (time &amp; fuel).</td>
<td>Locations of ramps and intersections.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Signing.</td>
<td>Detour must be adequately signed and may require capacity improvements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lost road users complaints.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Damage of local roads.</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 697-1a. 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>Crossover Construction 3, 4</td>
<td>Safety for workers, familiarity of road user.</td>
<td>Ramp interference.</td>
<td>Duration of project.</td>
<td>Whenever possible, especially where not many ramps interfere.</td>
<td>CC+ MTC+ RUC+</td>
</tr>
<tr>
<td></td>
<td>Easier and better construction.</td>
<td>Cost.</td>
<td>Location of crossover depends on ramps, lighting, structure and grade.</td>
<td>Long stretches of pavement reconstruction or rehabilitation.</td>
<td>Minimum $\frac{1}{4}$ to $\frac{1}{2}$ million per pair.</td>
</tr>
<tr>
<td></td>
<td>Wider traveled lanes.</td>
<td>Requires time for crossover construction and removal.</td>
<td>Phasing limits may impact use.</td>
<td>Bridge work not conducive to keeping one lane open.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If left in place, useful in emergency.</td>
<td>Long crossovers less acceptable in rolling to hilly terrain.</td>
<td>Length of work zone may affect acceptability.</td>
<td>One lane each direction should handle about 30,000 ADT with limited backups.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Should increase contractor productivity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Should increase quality.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Could reduce traffic interference as a result of increased contractor productivity leading to shorter phase.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completion dates are mandated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Pavements (Runaround) 1, 2, 3, 4</td>
<td>Separates work from traffic.</td>
<td>Expensive and time consuming while constructing.</td>
<td>Must have sufficient right-of-way.</td>
<td>No adequate detour is available.</td>
<td>MTC+ RUC+</td>
</tr>
<tr>
<td></td>
<td>Inefficient use of materials.</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 697-1a. Construction / Traffic Maintenance Strategies - Compendium of Traffic Control Options (continued, 3 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>
</table>
| Temporary Structures  
(Allows closure of structure, but no detour for the public)  
1, 2 | Traffic remains on routes.                 | Cost.                              | Right-of-Way.         | When volumes warrant.       | MTC**: RUC**       |
| Detour of One Direction of Mainline  
(Assumes detour for closed direction)  
3, 4 | Work moves faster.  
Only half of the traffic detoured at anytime.  
Improves safety of project personnel. | Detour maintenance.  
Short distance and ramp access.  
Local agencies must accept detour routes 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. | | Often.  
Urban/suburban freeway is amenable to this when suitable detour is available. | MTC**  
Could require detour improvements. |

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

<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; number of lanes limited.</td>
<td>CC• 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></td>
<td>Reduces congestion.</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>(Not eligible for Federal money)</strong></td>
<td>Lessens congestion on mainline.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(Logical unsigned alternate may be eligible for State money)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1, 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highway Advisory Radio</strong></td>
<td>Provides real time information to motorists.</td>
<td>Limited ranges.</td>
<td>Information needs to be current.</td>
<td>When alternate routes are available.</td>
<td>Low cost.</td>
</tr>
<tr>
<td><strong>1</strong></td>
<td></td>
<td>Low usage rate by motorists due to difficulty tuning in station.</td>
<td>May work best with repeat drivers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Advanced Signing (Time or Distance)</strong></td>
<td>A great tool for information to motorists.</td>
<td>If project is delayed, sign is wrong.</td>
<td>Need to keep information up to date.</td>
<td>Anytime.</td>
<td>Low cost for fixed.</td>
</tr>
<tr>
<td><strong>1, 2, 4</strong></td>
<td>Gives public advance warning to make decisions.</td>
<td></td>
<td></td>
<td></td>
<td>Addition to MOT, unless PCMS is used at $3000 per month.</td>
</tr>
<tr>
<td><strong>Legend:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objectives:</strong> 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Cost:</strong> CC = Construction Cost; MTC = Maintenance of Traffic Cost; RUC = Road User Cost; • • Cost Increase; • Cost Decrease; CC + MTC = Contract Cost</td>
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</tbody>
</table>
### 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>
</table>
| **Temporary Pavements**<br>(Widen)<br>1, 2, 4 | Allows for more lanes to stay open. | Expensive and time consuming while constructing. | Bridges and other roadway items. | When volumes warrant keeping all lanes open. | MTC• •
| | Creates greater capacity through the construction zone - less backups. | | | When construction is expected to produce backups. | RUC• • |
| **Use Existing Shoulders**<br>1, 2 | Keeps flow normal. | Requires more maintenance. | Must have full shoulder widths, level bridges. | High volume. | |
| | Allows wider work space or increases capacity. | Trucks may damage weak shoulders. | Bridges must be able to accommodate. | When backups expected. | |
| | Low cost. | No room for breakdowns/emergency stops unless parking lots created. | Put trucks in left lane if possible. | Moving projects. | |
| | Quick. | Closer to guardrail, embankment and piers. | Must evaluate shoulders during design. | | |
| | | | Should have full width approach slabs. | | |

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>&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 and 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>MTC••; RUC••</td>
</tr>
</tbody>
</table>

Legend:<br>Objectives: 1 = Reduce Complaints; 2 = Maximize Corridor Capacity; 3 = Minimize duration of motorist inconvenience; 4 = Maximize motorist / worker safety<br>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>Ramp Closures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, 3, 4</td>
<td>Can pave/repair ramp full width. Better, safer construction. See “Close &amp; Detour.” Reduces mainline congestion. Reduces cross road congestion. Easy to sign in rural area.</td>
<td>Blocks traffic pattern. See “Close &amp; Detour.” Forces new traffic pattern. Moves congestion elsewhere. In urban area, may have negative impact on next intersection.</td>
<td>Should give definite time limit. See “Close &amp; Detour.” Best if only two ramps at a time (to and from directional pairs).</td>
<td>When other ramps are close by, or when bridges on mainline are too close to utilize exit and/or entrance ramps. See “Close &amp; Detour.” Use when you have high-traffic volumes. In areas where alternate routes exists.</td>
<td>Relatively cheap. See “Close &amp; Detour.”</td>
</tr>
<tr>
<td><strong>Glare/Gawk Screens</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, 4</td>
<td>Effective way to separate work and keep traffic moving. Safer for work. Reduce rubber-necking.</td>
<td>Longer to set up than drums. Higher cost than 32 inches (813 millimeters). Maintenance of glare screen, if used. If present on both sides, may reduce drive speed. Barrier can interfere with wide loads.</td>
<td>Widths in certain areas. Sight restrictions at intersections and ramps.</td>
<td>When view of intense construction is likely to reduce capacity. With all part-width construction at restricted areas to control headlight glare.</td>
<td>MTC••</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>Highway Advisory Radio 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>Owner Imposed Design Restrictions 1, 3</td>
<td>Can reduce actual construction duration.</td>
<td>Requires advance planning during design. Could increase cost.</td>
<td>For certain time critical phases.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of Owner Supplied or Stockpiled Materials 1, 3</td>
<td>Can reduce actual construction duration.</td>
<td>Requires advance planning.</td>
<td>For time-critical phases to shorten duration.</td>
<td></td>
<td>Inexpensive.</td>
</tr>
<tr>
<td>Control of Contractor’s Access to the Work (By location or time of day.) 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 Liquidated Damages 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>
<tr>
<td><strong>Night Work</strong>&lt;br&gt;(Hours of day a specific phase of work is or required to be performed)&lt;br&gt;2, 3</td>
<td>Good PR.&lt;br&gt;Lower cost to motorist.&lt;br&gt;May shorten project duration.</td>
<td>Costly for labor.&lt;br&gt;Lower efficiency.&lt;br&gt;Personnel are isolated.&lt;br&gt;Possibly poorer quality work and inspection difficulty.&lt;br&gt;Difficult to get some materials at night.&lt;br&gt;Increased hazard potential.&lt;br&gt;Difficult to access management or supervision for problem solution.</td>
<td>Residential areas.&lt;br&gt;Work must be able to be accomplished in this time.&lt;br&gt;Urban noise ordinances.</td>
<td>High-volume areas.&lt;br&gt;When extensive backups expected to be created.</td>
<td>CC••, MTC••, 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 Liquidated Damages 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) 2, 3, 4</strong></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. More amenable in urban areas. High volume of commuter traffic expected to be delayed.</td>
<td></td>
<td>CC**, RUC***</td>
</tr>
<tr>
<td><strong>Lane Rental (Many variations) (Contractor loses money for duration of specific lane closures) 1, 2, 3</strong></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 3 (possibly 4)</strong></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 liquidated damages. 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></td>
<td>Cheap.</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.&lt;br&gt;Our people must resolve issues quickly.&lt;br&gt;Requires CPM schedule.</td>
<td>More arguments on time extension.&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>None known.&lt;br&gt;High volume that truly impacts motorists without good detour or alternate route.</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••&lt;br&gt;Must budget for maximum incentive.</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 Procedures 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>
</table>
| Lane Rental (Many variations) | Work done in the most cost effective and timely manner.  
Should minimize construction time.  
Provides incentive to minimize use of road space. | Expect disagreements.  
New application in Ohio. | Requires careful timekeeping. | Paving freeways. | CC• 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 697-1f. 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>
<tbody>
<tr>
<td><strong>Traffic Management Program</strong>&lt;br&gt;(Area, corridor or project)&lt;br&gt;(May include enforcement, demand management, public information, public perception adjustment)</td>
<td>Keeps checks on conflicts. Helps with consistency. Coordinates all projects, develops a forum for discussion of construction problems.</td>
<td>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.</td>
<td>Takes extra time and planning. Area must be large enough to make worthwhile.</td>
<td>Anytime. Most often used in larger urban areas and particularly (eight MPO's) with large projects.</td>
<td>CC⁺⁺, MTC⁺⁺, RUC⁺⁺ Personnel only (mainly). Typical program is $500,000 to $1 million per year.</td>
</tr>
<tr>
<td><strong>Enforcement</strong>&lt;br&gt;1, 2, 4</td>
<td>Expedited, orderly traffic flow, incident support.</td>
<td>Cost.</td>
<td>When incident support is required, or enforcement presence is desired.</td>
<td>Medium high.</td>
<td></td>
</tr>
<tr>
<td><strong>Incident Management</strong>&lt;br&gt;1, 2, 3, 4</td>
<td>Minimizes effect incidents have on traffic flow.</td>
<td>Cost of standby incident response personnel and vehicles; administrative cost.</td>
<td>Freeway sections with high v/c ratio and high likelihood of incidents.</td>
<td>High.</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>
<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>&lt;br&gt;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>&lt;br&gt;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></td>
<td><strong>CC</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
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>400 (122)</th>
<th>500 (152)</th>
<th>600 (183)</th>
<th>700 (213)</th>
<th>800 (244)*</th>
<th>900 (274)*</th>
<th>1000 (305)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes</td>
<td>Seconds</td>
<td>60</td>
<td>450</td>
<td>310</td>
<td>170</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>70</td>
<td>570</td>
<td>445</td>
<td>320</td>
<td>200</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>690</td>
<td>579</td>
<td>475</td>
<td>365</td>
<td>260</td>
</tr>
<tr>
<td>1.5</td>
<td>90</td>
<td>810</td>
<td>715</td>
<td>625</td>
<td>530</td>
<td>440</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>870</td>
<td>780</td>
<td>700</td>
<td>615</td>
<td>530</td>
</tr>
<tr>
<td>2.0</td>
<td>120</td>
<td>990</td>
<td>915</td>
<td>844</td>
<td>788</td>
<td>712</td>
<td>638</td>
</tr>
<tr>
<td>3.0</td>
<td>180*</td>
<td>1154</td>
<td>1117</td>
<td>1075</td>
<td>1027</td>
<td>983</td>
<td>934</td>
</tr>
<tr>
<td>4.0</td>
<td>240*</td>
<td>1247</td>
<td>1215</td>
<td>1184</td>
<td>1151</td>
<td>1118</td>
<td>1081</td>
</tr>
<tr>
<td>5.0</td>
<td>300*</td>
<td>1302</td>
<td>1276</td>
<td>1253</td>
<td>1226</td>
<td>1200</td>
<td>1170</td>
</tr>
</tbody>
</table>

This table assumes a 12 foot (3.6 meters) lane width. If the lane width is 11 feet (3.4 meters), reduce the rate of flow by using a factor of 0.97 and for a 10 foot (3.0 meters) 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 (244 meters) 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>Approach</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound Green</td>
<td></td>
<td>31.0*</td>
<td>41.0</td>
<td>16.0*</td>
</tr>
<tr>
<td>Northbound Yellow</td>
<td></td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Northbound All Red (Internal Clearance)</td>
<td></td>
<td>18.0</td>
<td>18.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Southbound Green</td>
<td></td>
<td>30.0</td>
<td>20.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Southbound Yellow</td>
<td></td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Southbound All Red (Internal Clearance)</td>
<td></td>
<td>19.0</td>
<td>19.0</td>
<td>19.0</td>
</tr>
</tbody>
</table>

<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>

* Provide timing appropriate for the signal location under consideration.
### Table 697-4. Minimum Lane Widths for Maintaining Traffic on Curves (Where D >10 degrees)

<table>
<thead>
<tr>
<th>RADIUS feet (meters)</th>
<th>Type A feet (meters)</th>
<th>Type B feet (meters)</th>
<th>Type C feet (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 500 (&gt;150)</td>
<td>10 (3.0)</td>
<td>10 (3.0)</td>
<td>10 (3.0)</td>
</tr>
<tr>
<td>500 (150)</td>
<td>10 (3.0)</td>
<td>10.5 (3.15)</td>
<td>11.5 (3.45)</td>
</tr>
<tr>
<td>300 (90)</td>
<td>10 (3.0)</td>
<td>11.0 (3.3)</td>
<td>12.5 (3.75)</td>
</tr>
<tr>
<td>200 (60)</td>
<td>10 (3.0)</td>
<td>11.5 (3.45)</td>
<td>13.5 (4.05)</td>
</tr>
<tr>
<td>150 (45)</td>
<td>10 (3.0) *</td>
<td>12.0 (3.6)</td>
<td>14.5 (4.35)</td>
</tr>
<tr>
<td>100 (30)</td>
<td>10 (3.0) *</td>
<td>13.5 (4.05)</td>
<td>17.0 (5.1) *</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 (3.0 meters) are based on the width of wheel track plus a 1.5 foot (0.45 meter) allowance for maneuverability. Minimum barrier offset in addition to the widths shown is 1.5 foot (0.45 meter). 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>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>
</tr>
<tr>
<td>Vehicle</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Maximum</td>
<td>11</td>
<td>30</td>
<td>12</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>ON+/-</td>
<td>OFF</td>
<td>ON</td>
<td>OFF+/-</td>
</tr>
</tbody>
</table>

* Phases as shown on SCD MT-96.26 for Actuated Control.
+/- Provide timing for the signal location under consideration.
Table 697-6. Selection of Crash Cushions - TRACC and Triton

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Drawing Name</th>
<th>Drawing Revision Date</th>
<th>ODOT Approval Date*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS450</td>
<td>Crash-cushion Attenuating Terminal Plan, Elevation &amp; Sections</td>
<td>3/12/99 Rev. 1</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS450m</td>
<td></td>
<td>3/12/99 Rev. 1</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS455</td>
<td>TRACC Transition to W-beam Median Barrier Plan, Elevation &amp; Sections</td>
<td>2/18/99</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS461</td>
<td>TRACC Transition to Concrete Safety Shape Barrier Plan, Elevation &amp; Sections</td>
<td>6/30/99 Rev. 1</td>
<td>8/27/99</td>
</tr>
<tr>
<td>SS462</td>
<td>TRACC Transition to Concrete Barrier Single Slope Plan, Elevation &amp; Sections</td>
<td>6/30/99</td>
<td>8/27/99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Drawing Name</th>
<th>Drawing Revision Date</th>
<th>ODOT Approval Date*</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-95-02</td>
<td>Barrier Section Assembly, Triton Barrier</td>
<td>10/25/96 Rev. G</td>
<td>8/27/99</td>
</tr>
<tr>
<td>3595361</td>
<td>Triton Barrier TI-3 End Treatment</td>
<td>1/12/98 Rev. A</td>
<td>8/27/99</td>
</tr>
</tbody>
</table>

* Contact the Office of Roadway Services for to confirm the latest approval dates.
Table 697-7. Selection of Crash Cushions - QuadGuard

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Drawing Name</th>
<th>Drawing Revision Date</th>
<th>ODOT Approval Date*</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-40-10</td>
<td>QuadGuard System Concrete Pad, CZ, QG</td>
<td>11/19/97 Rev. D</td>
<td>8/27/99</td>
</tr>
<tr>
<td>354051z</td>
<td>QuadGuard CZ System Nose Assembly, CZ, QG, 24, 30, 36</td>
<td>5/17/99</td>
<td>8/27/99</td>
</tr>
<tr>
<td>35400260</td>
<td>QuadGuard System PCMB Anchor Assembly</td>
<td>11/19/97 Rev. C</td>
<td>8/27/99</td>
</tr>
</tbody>
</table>

* Contact the Office of Roadway Engineering Services for to confirm the latest approval dates.

QuadGuard CZ Model #s for Units Approved for Use in Ohio on the NHS*

<table>
<thead>
<tr>
<th># of bays</th>
<th>Work Zone Design Speed miles per hour (kilometers/hour)</th>
<th>System Length feet (meters)</th>
<th>Unit Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>40 (70) and below</td>
<td>13'-1&quot; (4.00)</td>
<td>QZ2403Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>QZ3003Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>QZ3603Y</td>
</tr>
<tr>
<td>6</td>
<td>over 40 (70)</td>
<td>22'-1&quot; (6.74)</td>
<td>QZ2406Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>QZ3006Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>QZ3606Y</td>
</tr>
</tbody>
</table>

* See Section 130-5 for information about the National Highway System (NHS).
Table 697-8. Maximum Closure Lengths

<table>
<thead>
<tr>
<th>MAXIMUM ADT</th>
<th>MAXIMUM CLOSURE LENGTH Feet (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>200 (61)</td>
</tr>
<tr>
<td>9,000</td>
<td>400 (122)</td>
</tr>
<tr>
<td>8,000</td>
<td>600 (183)</td>
</tr>
<tr>
<td>7,000</td>
<td>800 (244)</td>
</tr>
<tr>
<td>5,000</td>
<td>1200 (366)</td>
</tr>
<tr>
<td>4,000</td>
<td>1600 (488)</td>
</tr>
<tr>
<td>3,000</td>
<td>2000 (610)</td>
</tr>
</tbody>
</table>
### Table 697-9. Barrier Offset on Curved Roadways

<table>
<thead>
<tr>
<th>Degree of Curvature (Radius Meters)</th>
<th>Required Offset From Edge of Pavement Feet (Meters)</th>
<th>Minimum Width of Median Required Feet (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 to 3.5 (1250 to 900)</td>
<td>36 (11)</td>
<td>66 (20)</td>
</tr>
<tr>
<td>3.6 to 4.5 (899 to 700)</td>
<td>42 (13)</td>
<td>72 (22)</td>
</tr>
<tr>
<td>4.6 to 5.5 (699 to 500)</td>
<td>48 (15)</td>
<td>78 (24)</td>
</tr>
</tbody>
</table>
Intentionally blank.
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  **Saved for later revision.**

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 OMQTD.

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* provides 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.
Intentionally blank.
Figure 698-1. Components of a Traffic Control Zone

- **Traffic Space**: Allows traffic to pass through the activity area.
- **Buffer Space (Lateral)**: Provides protection for traffic and workers.
- **Activity Area**: Where work takes place.
- **Work Space**: Set aside for workers, equipment, and material storage.
- **100' Downstream Taper**: Helps in traffic flow.
- **Transition Area**: Moves traffic out of its normal path.
- **Advanced Warning Area**: Tells traffic what to expect ahead.
- **Termination Area**: Where traffic resumes normal driving.
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

- TO WEST
- DETOUR
- M2-H3 605-7.3
- M4-H9bR 605-7.2

- WORK ZONE
- SPEEDING
- FINES
- DOUBLED
- CAUSE DEATH OR INJURY
- FINE/JAIL
- WATCH FOR STOPPED TRAFFIC
- NO CENTER LINE
- NO EDGE LINES
- R11-H5a 605-4.3
- W3-H7 642-33
- W8-H12 605-5.15
- W8-H13 605-5.15

- RUMBLE STRIPS
- RIGHT LANE ENDS MERGE LEFT
- RIGHT LANE ENDS 1/2 MILE
- W8-H16 605-17
- W9-H4R 641-17
- W9-H5 641-17

- FREEWAY ENDS 1 MILE
- FLAGGER AHEAD
- ALL TRUCKS USE RIGHT LANE
- W9-H6 641-17
- W20-7 605-5.7
- W20-H10 607-10
Figure 698-3b. Temporary Traffic Control Signs (continued)

- **W20-H11**
  - 607-10
  - *ALL TRUCKS LEFT 2 LANES*

- **W20-H12**
  - 607-10
  - *RIGHT LANE MUST USE SHOULDER*

- **W20-H13**
  - 605-8.3
  - *ROAD WILL BE CLOSED MONDAY FOR 27 DAYS INFO: 555-555-1212*

- **W20-H14**
  - 605-8.3
  - *ROAD WILL BE CLOSED MONDAY FOR 27 DAYS OHIO DEPT. OF TRANSPORTATION*

- **W21-H5**
  - 606-6
  - *SHOULDER WORK AHEAD*

- **W21-H6**
  - 605-5.9
  - *SURVEY CREW AHEAD*

- **W21-H8**
  - 606-6
  - *MOWING AHEAD*

- **W23-H2**
  - 607-15
  - *NO MERGE AREA*
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)