REVIEW OF SIGNIFICANT CHANGES IN THE 2011 VIRGINIA WORK AREA PROTECTION MANUAL

VDOT Traffic Engineering Division
Oc7, 2011 Presentation
VA Supplement to the MUTCD

VDOT developed Supplements which consist of:

- VA Supplement to the 2009 MUTCD
- VA Work Area Protection Manual (Part 6)
- VA Standard Highway Signs book
• Oct. 2011 – CTB Workshop Presentation
• Dec. 2011 – CTB Adoption
• Aug 1, 2011 – Design build and Developer projects may begin using these manuals.
• Jan 1, 2012 – VDOT crews, New Maintenance projects, New TCDs, Sign Manufacturing, Renewal Contracts must comply.
• Jan 1, 2012 – Construction projects scheduled for advertisement on or after this date must comply.
• All localities shall follow the provisions of the Manual on Uniform Traffic Control Devices (MUTCD) as adopted by the FHWA and the CTB.

• Localities may be excluded from the requirement to apply the provisions set forth in the Virginia Supplements.

• Counties and independent cities and towns that maintain their own roadways may:
  – recognize the content of the VA Supplements and as official guidance.
  – choose to adopt the Supplement and/or the “Virginia Work Area Protection Manual.”
  – Adopting only one of the publications does not require that the locality adopt the other publication.

• If VDOT funding is involved in the construction of a roadway project within a county, independent city or town, then the Supplements and WAPM shall be followed.
2011 VA WAPM Development

- Incorporates many TE Memorandums such as
  - WZ Speed Limit documentation
  - Slow Roll TTC
  - WZTC Training
- FHWA/VDOT WZS Team Review Findings
  - Pull-off area TTC
  - Expanded detour signing
- Recommendations from field, industry, and municipality personnel
  - Vehicle Warning Light
  - Easier to follow Appendix A

Received over 120 comments during the open review period.
Introduction
Chapter 6A – General
Chapter 6B – Fundamental Principles
Chapter 6C – TTC Elements
Chapter 6D – Pedestrian and Worker Safety
Chapter 6E – Flagger Control
Chapter 6F – TTC Zone Devices
Chapter 6G – Type of TTCZ Activities
Chapter 6H – Typical Applications
Chapter 6I – Traffic Incident Management Areas
Appendix A – Barrier/TCD Guidelines
Appendix B – WZS Checklist
Appendix C – VSP Guidelines
Appendix D – CMS Procedures
Changes/Additions

- Applies to all roads open to the public, including private roads
- Format the same as 2005 WAPM –
  - Standards (shall conditions, bold font)
  - Guidance (should conditions, italicized font)
  - Option (may conditions, underlined font)
  - Support (informational statements, standard font)
- Each paragraph is numbered for easier reference

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

05 Of equal importance to the public traveling through the TTC zone is the safety of workers performing the many varied tasks within the work space.
Changes/Additions

- Section 6A.03 – 78 Definitions of Words and Phrases
  - 28 New Definitions
  - Definition change for Engineering Judgment—... “Changes to TTC as shown in this Manual based on engineering judgment shall be documented.”
  - Regional Traffic Engineer — “a person of responsible charge per the Code of Va., or their designee working under their supervision, who is responsible for design and maintenance of TTC within their jurisdiction.”
Chapter 6A - General

Changes/Additions

- **NEW Section 6A.04 Acronyms and Abbreviations** with 45 listings.

Section 6A.03 Meanings of Acronyms and Abbreviations in this Manual
1. AADT—annual average daily traffic
2. AASHTO—American Association of State Highway and Transportation Officials
3. ATSSA—American Traffic Safety Services Association
4. ADA—American with Disabilities Act
5. ADT—average daily traffic
6. AFAD—Automatic Flagger Assistance Device
7. ANSI—American National Standards Institute
8. CFR—Code of Federal Regulations
9. CMS—Changeable Message Sign
Chapter 6B – Fundamental Principles

Section 6B.01
Fundamental Principles of Temporary Traffic Control

- References the seven fundamental principles of TTC
- References IIM-241/TED 351 for developing TMP’s and TTCP’s
- TTC should be reviewed on a periodic basis during nighttime conditions to ensure TTC devices meet the acceptable standards
- TTC reviews shall be performed after inclement weather
Chapter 6B – Fundamental Principles

Section 6B.01

Fundamental Principles of Temporary Traffic Control

- TCD’s shall be removed as soon as practical when work is suspended 30 minutes or greater.
- Advance warning signs and their portable supports may be stored behind barrier, guardrail or out of the construction clear zone.
- Only individuals trained in WZTC practices shall supervise the selection, placement and maintenance of TTC devices.
Section 6C.01 Temporary Traffic Control Plans

• Only the Regional Traffic Engineer has the authority to reduce the speed limit in a work zone upon completion of an engineering and traffic study warranting the reduction.

• Documentation of the speed reduction change shall be performed and maintained (see Work Zone Speed Analysis form, TE-350).

• All Work Zone speed reductions must to be sent to the Central Office Traffic Engineering Division (Curtis Myers) for filing – state code.
## Section 6C.04 Advance Warning Area

### Updated Table 6C-1 Spacing Advance Warning Signs

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Spacing (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban street with 25 mph or less posted speed</td>
<td>100' – 200'</td>
</tr>
<tr>
<td>Urban street with 30 to 40 mph posted speed</td>
<td>250' – 350'</td>
</tr>
<tr>
<td>* All Other Roadways with 45 mph or less posted speed</td>
<td>350' – 500'</td>
</tr>
<tr>
<td>All Other Roadways with greater than 45 mph posted speed</td>
<td>500' – 800'</td>
</tr>
<tr>
<td>Limited Access highways</td>
<td>1300' – 1500'</td>
</tr>
</tbody>
</table>

* Urban streets with greater than 40 mph posted speed limits fall into this category.
Section 6C.04  Advance Warning Area

In urban conditions it is generally better to attempt to place all advance warning signs within a one block area versus spreading out over several blocks, provided that motorists have time to recognize and react to the signs.
Section 6C.06 Buffer Space

- Updated spacing of the Longitudinal Buffer Space, Table 6C-2

<table>
<thead>
<tr>
<th>Posted Speed Limit</th>
<th>Distance (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 20</td>
<td>115 - 120</td>
</tr>
<tr>
<td>25</td>
<td>155 - 160</td>
</tr>
<tr>
<td>30</td>
<td>200 - 210</td>
</tr>
<tr>
<td>35</td>
<td>250 - 260</td>
</tr>
<tr>
<td>40</td>
<td>305 - 320</td>
</tr>
<tr>
<td>45</td>
<td>360 - 380</td>
</tr>
<tr>
<td>50</td>
<td>425 - 445</td>
</tr>
<tr>
<td>55</td>
<td>500 - 520</td>
</tr>
<tr>
<td>60</td>
<td>570 - 590</td>
</tr>
<tr>
<td>65</td>
<td>645 - 675</td>
</tr>
<tr>
<td>70</td>
<td>730 - 760</td>
</tr>
<tr>
<td>75</td>
<td>820 - 850</td>
</tr>
</tbody>
</table>

- Neither work activity nor storage or placement of equipment, vehicles (including law enforcement), or material shall occur within a buffer space
Section 6C.11 One-Lane, Two-Way Traffic Control

• If the work space on a low-volume (less than 500 vpd) street or road is short and road users from both directions are able to see the traffic approaching from the opposite direction through and beyond the worksite, the movement of traffic through a one-lane, two-way constriction may be self-regulating.

• A one-lane, two-way taper shall be used to close the lane with work activities on roadways 20' or less but the cones separating the work area from the travel lane may be eliminated.

Section 6C.12 Flagger method of One-Lane, Two-Way TC

• Moved to 6C.11 - Due to limited room for vehicles to pass activities and equipment occurring on narrow roadways, cones should not be used for channelization on roadways 20 foot or less in width.
Chapter 6D - Pedestrian and Worker Safety

Section 6D.01
Pedestrian Considerations

• Defined knowledgeable persons as individuals that have received training or certification in work zone traffic control.

Section 6D.03
Worker Safety Considerations

• All workers should be trained on how to work next to motor vehicle traffic in a way that minimizes their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement, TE Memo 345 WZTC Training Requirements
WORKERS, FIRST RESPONDERS, & FLAGGERS shall wear high-visibility safety apparel that meets Performance Class 3 requirements of the ANSI/ISEA 107–2010.

VDOT headwear required to have a minimum of 16 sq. in. retroreflectivity. Non-VDOT recommended to have 10 sq. in., but not required.

Law enforcement and firefighters within a TTC zone may wear ANSI/ISEA 207-2006 High visibility safety apparel.
Section 6D.03 (Worker) & 6E.02 (Flagger)
Beginning July 1, 2012

- Nighttime operations requires workers installing and removing TTC and Flaggers shall wear Type E trousers in addition to their high-visibility safety apparel that meets Performance Class 3.
- Flaggers required to wear Type E trouser in addition to their high-visibility safety apparel meeting Performance Class 3 during other low light conditions such as inclement weather (fog, rain, sleet, snow, etc.).
- Defines nighttime work zones as operations which occur from 30 minutes before sunset until 30 minutes after sunrise.
Chapter 6E – Flagger Control

Section 6E.02 High-Visibility Safety Apparel

• References ASTM or ANSI foot protection and ANSI head protection standards

Section 6E.03 Hand-Signaling Devices

• Defines the nighttime use of a flashlight with steady burn glow-cone or traffic baton with wand to supplement the STOP/SLOW paddle

Section 6E.07 Flagger Procedures

• Added two page Flagger Requirements sheets as Figure 6E-4
Chapter 6E – Flagger Control

Section 6E.07 Flagger Procedures

- New – Flagger Requirement sheets

Flagging Requirements

Methods of Flagging Traffic

Where to stand:
1. Flagging stations shall be preceded by proper advance warning signs. Signs shall be removed when the flagger is no longer at their station.
2. Stand where you can see and be seen by approaching traffic. Clear sight distance from the graphic flagger sign to the flagger station should be 350 to 500 feet where the posted speed limit is 45 m.p.h. or 200 to 800 feet where the posted speed limit is greater than 45 m.p.h.
3. Stand facing traffic either on the edge of the shoulder of the road or near the edge of pavement.
4. Flaggers should be located such that an oncoming vehicle has additional space to stop without entering the work area. The distance from the flagger station to the work area should be:

<table>
<thead>
<tr>
<th>Distance (feet)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mph)</td>
<td>35</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>60</td>
</tr>
</tbody>
</table>

How to release traffic:
1. Before releasing traffic the flagger will return to the normal flagging location. Keep your paddles on STOP or flag extended until you are safely on the shoulder of the roadway.
2. With a Paddle – Stand facing traffic. Hold the SLOW sign paddle in a stationary position with the paddle facing the road user. With your free arm signal the drivers to proceed into the open lane.
3. With a Flag – Stand parallel to roadway facing the road users. Drop the flag to your side and with free hand motion traffic to proceed to open lane.
4. Where traffic is stopped temporarily in one lane, release traffic by turning the paddle a quarter turn so that the word “STOP” faces you and is parallel to the roadway. With your free arm signal the drivers to proceed into the open lane.

Never wave a paddle or flag:
1. Signals must be clear and extending.
2. The hand signals with devices. Don't make drivers guess what they should do.
3. Never wave a paddle or flag to stop traffic or for it to proceed.
NEW:
Section 6E.04
Automated Flagger Assistance Devices

AFADs shall only be used when all of the following conditions are met:
• Two-lane roadway closed to one lane of traffic;
• One lane of approaching traffic in the direction to be controlled;
• ADT is 12,000 or less vehicles or as directed by the RTE;
• Operator must have an unobstructed view of AFAD and approaching traffic;
• RTE approves multiple operators and distances greater than 800 feet.

An AFAD does not take the place of a temporary signal.
NEW:
Section 6E.05
Stop/Slow AFAD
NEW:
Section 6E.06
Red/Yellow Lens
AFAD
Section 6E.07 Flagger Procedures

- Only uniformed law enforcement officers are allowed to direct traffic through an operating traffic signal (see Section 46.2-834 of Highway Laws of Virginia)

- A flagger shall control only one lane of traffic approaching an intersection as shown in Figure TTC-30
Section 6E.08  Flagger Station

- Flagger signs removed, covered, turned away when work is suspended 30 minutes or longer
- Illumination requirements and measurement to determine correct illumination
- If glare from standard types of floodlight equipment cannot be eliminated, then consideration should be made for the use of non-glare lighting devices such as non-glare air-filled lighting devices, Section 6F.90
Section 6F.02 General Characteristics of Signs

- Sign fabrication requirements found in MUTCD’s “Standard Highway Sign & Marking Book” and VA Standard Highway Sign book
- Roll-up signs on portable supports only – not allowed on posts
- Rigid Material for post-mounted signs
  - Aluminum 0.100-inch thickness
  - 0.4 inch thick corrugated polypropylene or polyethylene plastic material
  - 0.079 inch thick aluminum/plastic laminate material
Chapter 6F – TTC Zone Devices

Section 6F.02 General Characteristics of Signs

- Orange rows are VA specific signs
- Pink row VA Incident Management signs
- White and grey rows MUTCD signs
- Example of VA sign designations; W21-V1
- Example of VA sign designation which modifies an MUTCD sign; W20-8 (V)
Chapter 6F – TTC Zone Devices

Figure 6F-2
Regulatory Signs and Plaques in TTC
Chapter 6F – TTC Zone Devices

Figure 6F-3 shows MUTCD and Virginia Signs and Plaques
Chapter 6F – TTC Zone Devices

Figure 6F-3 shows MUTCD and Virginia Signs and Plaques
Chapter 6F – TTC Zone Devices

Figure 6F-4 Vehicle Mounted Signs

Figure 6F-5 Exit, Pull Off Area, Exit Open and Detour signs
Sign changes – the following signs will be changing on Jan. 1, 2013:

- W20-5: Left Lane Closed Ahead
- W20-5a: Left Two Lanes Closed Ahead
- W8-17: Shoulder Drop Off
- W8-V5: Center Lane Closed Ahead
- W20-5a: Center Lane Closed Ahead
- W9-3: Center Lane Closed Ahead
Chapter 6F – TTC Devices

Sign changes – the following signs will be changing on Jan. 1, 2013:

- **W21-6**: SURVEY CREW
- **W21-V8**: SURVEY CREW AHEAD
- **W20-5a**: NEXT 7 MILES
- **W9-3**: NEXT 5 MILES
- **W16-2**: 500 FEET
- **W16-VP3**: 1000 FEET
- **W8-12**: NO CENTER STRIPE
- **W13-1 24" x 24"**: 35 MPH
- **W13-1 30" x 30"**: 35 MPH
Business Entrance Signs

• The Business Entrance (M4-V6a and M4-V6b) signs may be used in urban areas where the original entrance will be relocated for more than 3 months during construction.

• The Business Entrance sign shall be used to identify the business entrance and shall not contain the business logo.

• If the Business Entrance sign is attached to a Group 2 channelizing device, it shall be crashworthy.
Chapter 6F – TTC Zone Devices

Updated Figure 6F-1, Height and Lateral Location of Signs – Typical Post-Mounted Installations
Section 6F.03 Sign Placement

• Median Barrier is considered as part of the shoulder for sign installation and allows smaller sign to be installed on barrier if necessary
• Smaller signs may be installed in narrow medians
• Signs not shown in the WAPM or the SHSM shall be submitted for review and approval by the State TE
Section 6F.03 Sign Placement

- Signs (except sidewalk closure signs and signs for end of the day paving operations) should not be used on portable sign supports for a duration of more than 3 consecutive days (72 consecutive hours).
- Sidewalk closure and end of the day paving operations signs on portable sign stand shall use a sand bags on each leg weighting approximately 25 lbs.
- Portable sign supports must support 20 sq. ft. sign.
- The legs of portable sign supports should be as flush as possible to the ground or roadway for stability.
Chapter 6F – TTC Zone Devices

Section 6F.04 Sign Maintenance

• Signs shall be reviewed after setup and periodically during each work shift

• Expands on covering signs when not in use with silt fence and plywood. No duct tape allowed on the face of a sign.

• Signs and their supports may be stored behind barrier, guardrail or outside the construction clear zone.
Section 6F.69 **Arrow Board**

- Name changed from Arrow “Panel” to Arrow “Board”
- Allows Sequential Chevron arrow
- Does not allow Sequential arrow
- Shall be delineated with 4 channelizing devices
Section 6F.71 - 81
Group 1 and Group 2 Channelizing Devices

Updated - CHANNELIZING DEVICES

New Group 2 Channelizing Devices
Directional Indicator Barricade
Longitudinal Channelizing Device
Chapter 6F – TTC Zone Devices

Section 6F.71 - 81

Group 1 and Group 2 Channelizing Devices

- Group 1 devices require retroreflective sheeting
- Sheetng required on drums, vertical panels, directional indicators, longitudinal channelizing devices and Type 3 Barricades shall meet Section 247 of the R&B Specifications
- Vertical panels size 24" x 12"
- NEW - FIGURE 6F-8, TYPE 3 BARRICADE PLACEMENT GUIDELINES
Section 6F.71 - 81

Group 1 and Group 2 Channelizing Devices

Longitudinal Channeling Device

- Used to direct traffic:
  - Shall be interlocked
  - Supplemented with retroreflective material or delineation for improved nighttime visibility
- Used for pedestrian traffic control
  - Shall interlock to delineate or channelize flow
  - Shall not have gaps that allow pedestrians to stray from the channelizing path.

Working on Specifications to require alternating orange and white longitudinal devices for traffic control and orange only devices for pedestrian control.
Section 6F.71 - 81
Group 1 and Group 2 Channelizing Devices

NEW - Temporary Lane Separators Use:
- To channelize road users,
- Divide opposing vehicular traffic lanes,
- Divide lanes when two or more lanes are open in the same direction,
- Sloping sides in order to facilitate crossover by emergency vehicles.
Temporary Raised Islands

- Requires to be painted with Type A Paint matching pavement marking
- Used to separate traffic on 2-lane, 2-way operations on roadways having up to 15,000 ADT
- Requires retroreflective flex-post delineators (orange)
  - Height 36 to 42 inches by minimum 2 inches wide
  - Requires two 3 inch white retroreflective bands
Chapter 6F – TTC Zone Devices
NEW - Figures 6F-10 & 11

Construction Pavement Marking for Tapers and Turn Lanes

Temporary Pavement Marking and Markers for Tapers and Acceleration, Deceleration & Turn Lanes

AS WORK ACTIVITY PROGRESSES TURN LANES SHOULD BE PROVIDED

4" CONSTRUCTION PAVEMENT MARKING

CONSTRUCTION PAVEMENT MARKING ELONGATED ARROW
30’ OR LONGER USE 3 ARROWS
30’ OR LESS USE 2 ARROWS

OPTIONAL
4" X 2" SKIP LINE
CONSTRUCTION PAVEMENT MARKING

TRANSITIONS MORE THAN 100’ USE
4" X 2" SKIP LINES
4" SPACING

4" CONSTRUCTION PAVEMENT MARKING

NOTE: FOR PAVEMENT MARKING DETAILS SEE ROAD AND BRIDGE STANDARDS PM-3 TO PM-6

ROAD & BRIDGE STANDARD SECTION 500
MIN DESIGN CRITERIA FOR TEMPORARY DETOUR

TEMPORARY PAVEMENT MARKERS
@ 20 SPACINGS

ERADICATION REQUIREMENTS
SEE FIGURE TTC-54

6" CONSTRUCTION PAVEMENT MARKING

24" CONSTRUCTION PAVEMENT MARKING

ERADICATION 200’ OF EXISTING PAVEMENT MARKINGS

4" ON 6" X 2" SKIP LINE
CONSTRUCTION PAVEMENT MARKING

4" SPACING

NOTE: FOR ELONGATED ARROW AND SKIP LINE DETAILS SEE ROAD AND BRIDGE STANDARDS PM-3 TO PM-6
Section 6F.92 Vehicle Warning Lights

- Changed from a size requirement to a performance requirement
  - Visible either day or night conditions a minimum of ½ mile on Limited Access highways or a minimum of 1500 feet on all other roadways.
- Parked vehicles should not have their warning lights in operation unless the vehicle is a perceived hazard
- Prohibits the use of flashing white lights on construction and maintenance vehicles.
Section 6F.95
Crash Cushions

Allows a TMA to protect a fixed object up to three days.

Rear panel of a TMA shall have alternate 6 to 8 inch black and orange inverted stripes.

Shall be used in accordance with manufacturer’s specifications including weight of the support vehicle.

The following distance of TMA’s from a hazard has been increased from 50’-100' to 80’-120'.
NEW Sections Added to Chapter 6G include:

Section 6G.13 Detours and Diversions

Section 6G.16 Work Within the Traveled Way at a Roundabout

Section 6G.24 Slow Roll Temporary Traffic Control Operations

Section 6G.25 Installing/Removing TTC

Section 6G.26 Work Area Ingress/Egress Considerations
Section 6G.13 Detours and Diversions

- **A Short Term Detour**
  - Occupies a location for more than 2 hours within a single work period but not longer than three consecutive days

- **A Long Term Detour**
  - Occupies a location longer than three consecutive days, or on a periodic basis (less than 24 consecutive hours) longer than three days

- Detours and diversions shall be reviewed and approved by the Regional Traffic Engineer prior to implementation
Section 6G.16 Work Within the Traveled Way at a Roundabout

- Section added to go along with new TTC layouts TTC-32, 33, and 34.

- Traffic control provided by flagger control in advanced of the roundabout.

- Accommodations for the turning radius of tractor trailer or other large vehicles should be considered when designing and installing the TTC.
NEW
Section 6G.27
Work Area Ingress/Egress Considerations

• Covers the need to plan for construction access to and from the work area.
• Requires the use of WORK VEHICLE DO NOT FOLLOW signs on the back of truck hauling/delivering material
• Added Table 6G-1

Table 6G-1, Intersection Sight Distance (ISD) for Construction Entrances

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum ISD (Feet)</td>
<td>195</td>
<td>240</td>
<td>290</td>
<td>335</td>
<td>385</td>
<td>430</td>
<td>480</td>
<td>530</td>
<td>575</td>
<td>625</td>
<td>670</td>
</tr>
</tbody>
</table>

Height of eye – 3.5 ft.
Height of object – 3.5 ft.
Figure 6H-1

- Added 13 new symbols.

- Changed the Type 3 barricade symbol from a panel with chevrons to an orange colored sign.

- Changed the work space symbol by adding the worker symbol.
Changes:

- Redesigned every TTC Figure
- Added Twenty-Three (23) New TTC Figures
- Added 70 MPH row to Taper Tables.
- Barrier panels and barrier delineators are spaced 80' on centers along the parallel or tangent sections and 40' on centers along the transition or taper sections. Delineators are spaced in-between the barrier panels.
- Type B flashing light added at the beginning of the barrier run.
- Shadow or TMA vehicle shall be in a position 80'-120' in advance of workers or the work operations vehicle.
Chapter 6H – Typical Applications
Temporary Traffic Control Figure TTC-8

- Pull-Off Areas on Limited Access Highway and Expressway
  - New TTC Figure

Pull-Off Areas on Limited Access Highways
(Figure TTC-8.0)

NOTES

Guidance:
1. Work zone pull-off areas should be provided in work zones along Limited Access Highways where one or both shoulders are closed due to construction.

Options:
2. Work zone pull-off areas may be considered in work zones for other roadways where one or both shoulders are closed due to construction.

Guidance:
3. The spacing of pull-off areas should be as follows:
   - For projects with active areas up to 2.0 miles in length, one every 0.5 to 0.75 mile.
   - For projects with active areas greater than 2.0 miles in length, one every mile.

Pull-off areas should be a minimum of 130 feet long. The width of pull-off areas should be a desirable distance of 15 feet.

Options:
5. The width of the work zone pull-off areas may be reduced to a minimum of 12 feet on roadways with Right-of-Way constraints.

Guidance:
6. Advance warning signs placed after the ROAD WORK AHEAD sign, should be installed as follows:
   a. A 600 X 600 MILL (W16-VP1) supplemental plaque should be provided with the first SHOULDER CLOSED AHEAD (W21-15) or W21-11, sign in the sequence.
   b. The third sign in the sequence should be either:
      • A NO PULL-OFF AREA (W21-115) sign with NEXT XX MILES (W16-VP1) supplemental plaque, if there are no pull-off areas throughout the work area.
      • A LEFT (RIGHT) PULL-OFF AREA (W21-143, W21-14L, or W21-14R) sign with EVERY XX MILE/0.5 MILE (W16-VP2) supplemental plaque, if pull-off areas are provided.
   c. A LEFT (RIGHT) PULL-OFF AREA warning sign with a 1000 FEET (W16-VP3) supplemental plaque should be placed in advance of each pull-off area to give distance information to advise as to the location of the emergency pull-off area. Additional options for the supplemental plaque below PULL-OFF AREA (W21-143, W21-14L, or W21-14R) sign that could be considered for three-lane or wider roadways includes a distance message appropriate for the design speed of the roadway (for example, 500 FT or 1000 FT), NEXT EXIT, EXIT XX, NEXT LEFT or NEXT RIGHT (see Section 6F.45).
   d. A Pull Off / Areas Entrance (ES-22) sign should be placed immediately prior to the pull-off area to help a driver navigate to its safety.
   e. A PULL-OFF AREAS (W21-115) sign (NEXT EXIT (W16-VP4) plaque) signage should be provided within 0.5 mile of a limited access interchange exit if the exit is clearly signed and the interchange facilities provide adequate places for refuge (see Section 6H-45 for additional guidance).

7. Sign spacing should be 1500’-1500’ for Limited access highways.

Standard:
8. Minimum lane closure taper length on all Limited Access highways, regardless of posted speed, shall be 1000 feet. Minimum shoulder taper length of Limited Access highways shall be 300 feet.
9. Barrier panels 8‘ inches in width and 12‘ inches in height shall be placed on top of the concrete barrier and spaced 80‘ on centers along the parallel or tangent sections, and 40‘ on centers along the transition or taper sections. Reflectorized surface shall be fluorescent orange prismatic lens sheeting. The light at the beginning of the barrier run and at the breakpoint where the barrier becomes parallel to the roadway shall be a Type 8 flanking light. Barrier delineators shall be installed along the traffic side of the concrete barrier in between and at the same spacing as the barrier panels approximately 24 inches up from the roadway surface.
Chapter 6H – Typical Applications

TTC Figure TTC-25  Lane Closure Operation on Two-Lane Roadway Using Traffic Control Signals

• New TTC Figure

Typical Traffic Control
Lane Closure Operation on a Two-Lane Roadway Using Traffic Control Signals
(Figure TTC-25.0)

NOTES

1. TTC signals shall be planned, installed and operated in accordance with the provisions of Part 4 of the 2009 MUTCD, the Road and Bridge Specifications, and the Road and Bridge Standards.
2. TTC signal timing shall be established by the appropriate approving agency. Duration of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.
3. When the TTC signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.
4. Stop lines shall be installed with TTC signals for intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the stop lines shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.
5. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.
6. A RESTRICTED WIDTH ROUTE (RS-W1) sign shall be installed on roadways where construction/maintenance activities exist with physical barriers on both sides of a single lane and the clear distance is less than 14 feet. The signs shall also be installed in advance of the last alternate route.
7. The Regional Traffic Engineer shall determine speed reductions.
8. An engineering study shall be conducted to determine if intersection(s) and entrance(s) within the work zone need signalization and the use of positive barriers versus channelizing devices shall be determined. Group 2 channelizing device spacing shall be at the following:

<table>
<thead>
<tr>
<th>Location</th>
<th>Posted Speed Limit (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition Spacing</td>
<td>20' 40'</td>
</tr>
<tr>
<td>Travelway Spacing</td>
<td>40' 80'</td>
</tr>
<tr>
<td>Construction Access</td>
<td>80' 120'</td>
</tr>
</tbody>
</table>

9. The buffer space length shall be shown in Table 6H-3 on Page 6H-5 for the posted speed limit.

Guidance:
10. Signs spacing distance should be 330'-500' where the posted speed limit is 45 mph or less, and 500'-800' where the posted speed limit is greater than 45 mph. Refer to Table 6C-1. Spacing of Advance Warning signs for urban signs spacing. Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway.
11. Where no-gating lines are not already in place, they should be added.
12. Additional RESTRICTED WIDTH ROUTE (RS-W1) signs should be installed on the approaches of the alternate route to alert traffic intending to turn onto the restricted route.

Option:
13. Temporary rumble strips may be used to enhance the work zone.
14. Flashing warning lights may be used on advance warning signs.
15. Advisory Speed (W13-1P) placards may be added to the ONE LANE ROAD AHEAD (W20-4) and BE PREPARED TO STOP (W1-4) signs as directed by the Regional Traffic Engineer.
16. Temporary Signals may be replaced with either a STOP (R1-1) condition or YIELD (R1-2) condition based on engineering study and approval of the Regional Traffic Engineer.
Chapter 6H – Typical Applications

Temporary Traffic Control Figure TTC-32
Inside Lane Closure Operation on a Multi-Lane Roundabout

- New TTC Figure

Typical Traffic Control
Inside Lane Closure Operation on a Multi-Lane Roundabout
(Figure TTC-32.0)

**NOTES**

Support:
1. Each roundabout is unique and the traffic control must be developed to meet the specific conditions of the location and the work operation. A detour could possibly better serve traffic movement and must be considered as an alternative to the traffic circle. This traffic control layout can be used on a traffic circle.

Standard:
2. On divided highways having a median wider than 8', right and left sign assemblies shall be required.
3. A shalow vehicle with either a Type B or C arrow board operating in the caution mode, or at least one high intensity rotating, oscillating, or amber strobe light shall be parked 80'-120' in advance of the first work crew. When the posted speed limit is 45 mph or greater, a truck-mounted attenuator shall be used.
4. Taper length (L) and channelizing device spacing shall be:

<table>
<thead>
<tr>
<th>Taper Length (L)</th>
<th>Speed Limit (mph)</th>
<th>Lane Width (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>25</td>
<td>55</td>
<td>65</td>
</tr>
<tr>
<td>30</td>
<td>135</td>
<td>150</td>
</tr>
<tr>
<td>35</td>
<td>185</td>
<td>205</td>
</tr>
<tr>
<td>40</td>
<td>240</td>
<td>270</td>
</tr>
<tr>
<td>45</td>
<td>405</td>
<td>450</td>
</tr>
<tr>
<td>50</td>
<td>460</td>
<td>500</td>
</tr>
<tr>
<td>55</td>
<td>495</td>
<td>550</td>
</tr>
<tr>
<td>60</td>
<td>540</td>
<td>600</td>
</tr>
</tbody>
</table>

Shoulder Taper = \( \frac{L}{11} \) Minimum

7. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity amber rotating, flashing, oscillating, or strobe lights. Vehicle hazard warning signals can be used to supplement high-intensity amber rotating, flashing, oscillating, or strobe lights.

**Guidance:**
6. Signs spacing distance should be 336'-500' where the posted speed limit is 45 mph or less, and 500'-800' where the posted speed limit is greater than 45 mph.
7. Care should be exercised when establishing the limits of the work zone to assure maximum possible sight distance in advance of the transition, based on the posted speed limit and at least equal or greater than the values in Table 6H-3. Generally speaking, centerlines should have a clear line of sight from the graphic flagger symbol sign to the flagger.
8. When dropping the traffic control and removing the channelizing devices for work activities at roundabouts, accommodations for the turning radius of tractor trailer vehicles and other large vehicles should be considered and the work zone designed accordingly.

**Options:**
9. Periodic adjustments to the channelizing devices may be allowed in an active work zone to accommodate the turning movements of tractor trailer vehicles and other large vehicles.
Chapter 6H – Typical Applications

Temporary Traffic Control Figure TTC-33

Outside Lane Closure Operation on a Multi-Lane Roundabout

- New TTC Figure

Typical Traffic Control
Outside Lane Closure Operation on a Multi-Lane Roundabout
(Figure TTC-33.9)

NOTES

Support:
1. Each roundabout is unique and the traffic control must be developed to meet the specific conditions of the location and the work operation. A detention could possibly better serve traffic movement and must be considered as an alternative to the flagger operation. This traffic control layout can be used on a traffic circle.

Standard:
2. Multi-lane approaches to the roundabout shall be reduced to one lane and a flagger shall control traffic flow on each approach of the roundabout.
3. All flaggers shall be state certified and have their certification card in their possession when performing flagging duties. A lead flagger shall be designated and radio communication shall be used by the flaggers.
4. Only one quadrant of traffic shall be released at a time.
5. Taper length (L) and channelizing device spacing shall be as shown in Note 6 in TTC 32.8.
6. At night, flagger stations shall be illuminated, except in emergencies. Street lights and vehicle headlights shall not be used to illuminate the flagger station.
7. On divided highways having a medium wider than 8’, right and left sign assemblies shall be required.
8. A vehicle with either a Type B or C arrow board operating in the caution mode, or at least one high intensity rotating, oscillating, or amber strobe light shall be parked 80’-120’ in advance of the first work crew. When the posted speed limit is 45 mph or greater, a track-mounted attenuator shall be used.
9. Vehicle hazard warning signals shall not be used instead of the vehicle’s high intensity amber rotating, flashing, oscillating, or strobe lights. Vehicle hazard warning signals can be used to supplement high intensity amber rotating, flashing, oscillating, or strobe lights.
10. A minimum of four (4) area channelizing devices shall be placed on the shoulder in advance of the PCMS in a taper for delineation (see Figure 6H-6).

Guidance:
11. Sensor spacing distance should be 195’-390’ where the posted speed limit is 45 mph or less, and 390’-600’ where the posted speed limit is greater than 45 mph.
12. Care should be exercised when establishing the limits of the work zone to ensure maximum possible sight distance to the flagger station, based on the posted speed limit and at least equal to or greater than the values in Table 6H-3. Generally, speaking, motorists should have a clear line of sight from the graphic flagger symbol to the flagger.
13. A PCMS should be used as part of the traffic control plan to provide clear guidance to motorists on all approaches of the roundabout that must reverse traffic flow.
14. When designing the traffic control and installing the channelizing devices for work activities at roundabouts, accommodations for the turning radius of truck/trailer vehicles and other large vehicles should be considered and the work zone designed accordingly.

Option:
15. Periodic adjustments to the channelizing devices may be allowed in an active work zone to accommodate the turning maneuver of truck/trailer vehicles and other large vehicles.
16. A supplementary flagger may be used at the roundabout exit to help direct traffic and may be positioned on the approaches in advance warning of the flagger operation to alert traffic prior to reaching the flagger station or speeded traffic.
18. On approaches where traffic flow will be split; two pin point vehicles may be used to guide traffic through the roundabout.
Typical Traffic Control
Street Closure Operation with Detour
(Figure TTC-34.0)

NOTES

Guidance:
1. This plan should be used for streets without posted route numbers.
2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be placed in advance of a turn.
3. Sign spacing distance should be 225"-375" where the posted speed limit is 30 to 35 mph, and 100"-200" where the posted speed is 25 mph or less.
4. If the road is opened for a significant distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED (R11-2) and Detour Arrow (M4-19) signs on Type 3 Barriers should be located at the corners of intersecting closed roadway or the traveled way.

Option:
5. Flashing warning lights and/or signs may be used to call attention to the advance warning sign.
6. Flashing warning lights may be used on Type 3 Barriers.
7. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be placed in advance of a turn.
8. A Street Name (M4-VP1a) plaque may be mounted with the Detour sign. The Street Name plaque may be either white on green or black on orange.

Standard:
9. When used, the Street Name plaque shall be placed above the Detour sign.
Support:
10. See Chapter 6 for additional information on incident management traffic control.
Chapter 6H – Typical Applications
Temporary Traffic Control Figure TTC-43
Road Closure with a Diversion

• New TTC Figure

Typical Traffic Control
Road Closure Operation with a Diversion
(Figure TTC-43.0)

NOTES

Guidance:
1. Sign spacing distance should be 500-600' where the posted speed limit is greater than 45 mph, and 350'-500' where the posted speed limit is 45 mph or less.
2. Care should be exercised when establishing the limits of the work zone to ensure maximum possible sight distance in advance of the zone limit, based on the posted speed limit and at least equal to or greater than the values in Table 6H-3.

Option:
3. Temporary traffic barriers, temporary asphalt median or temporary tubular markers may be used to separate opposing vehicular traffic based on guidance in Appendix A.

Guidance:
4. The alignment should be designed as a reverse curve.
5. The current alignment should meet the design criteria contained in the AASHTO “Policy on the Geometric Design of Highways and Streets” (see Sections 1A.11) and current Virginia Road and Bridge Standards (86-10).

Standard:
6. Devices similar to those depicted shall be placed for the opposite direction of traffic.
7. Appropriate impact attenuators or terminal end treatments shall be used to protect the end of longitudinal barriers if the barrier is terminated within the clear zone.
8. Channelizing device spacing shall be:

<table>
<thead>
<tr>
<th>Location</th>
<th>Posted Speed Limit (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-25</td>
</tr>
<tr>
<td>Transition Spacing</td>
<td>20'</td>
</tr>
<tr>
<td>Travelway Spacing</td>
<td>40'</td>
</tr>
<tr>
<td>Construction Access*</td>
<td>600'</td>
</tr>
</tbody>
</table>

* Spacing may be increased to this distance, but shall not exceed one access per 800 ft.

9. Pavement markings and markers no longer applicable to the traffic pattern of the roadway shall be removed or obliterated before any new traffic patterns are open to traffic (see Figure TTC-60).

Guidance:
10. Temporary barrier should be placed at a 45° angle to the traveled way a sufficient distance beyond the Type 3 Barricade but before the work space while providing access to the work space.
11. If the tangent distance along the temporary diversion is more than 600 feet, a Reverse Curve (W1-4 series) sign, left first, should be used instead of the Double Reverse Curve (W24-1) sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.
12. When tangent section of the diversion is more than 600 feet, and the diversion has sharp curves with recommended speeds of 20 mph or less, Reverse Turn (W1-5) signs, should be used.

Standard:
13. Barrier panels 8 inches in width and 12 inches in height shall be placed on top of the temporary concrete barrier, perpendicular to traffic, and spaced 20' on centers along the taper sections. Reflective surface shall be fluorescent orange prismatic lens sheeting. Barrier delineators shall be installed along the traffic side of the concrete barrier in between and at the same spacing as the barrier panels approximately 24 inches up from the roadway surface.
Chapter 6H – Typical Applications

Temporary Traffic Control Figure TTC-44

Median Cross-Over Operation on Freeway

• New TTC Figure

Typical Traffic Control

Median Cross-Over Operation on a Multi-Lane Roadway

(Figure TTC-44.6)

NOTES

Guidance:

1. Sign spacing distance should be 1300'-1500' for Limited Access highways, and on all other roadways 500'-600' where the posted speed limit is greater than 45 mph, and 350'-500' where the posted speed limit is 45 mph or less.

2. Care should be exercised when establishing the limits of the work zone to insure maximum possible sight distance to advance of the transition, based on the posted speed limit and at least equal to or greater than the values in Table 6H-A. For Limited Access highways a minimum of 1000' is desired.

Standard:

3. Temporary traffic barriers, temporary asphalt medians or temporary tubular markers shall be used to separate opposing vehicular traffic based on guidance in Appendix A.

4. An arrow board shall not be used to shift a lane of traffic.

Options:

5. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic (W6-3), DO NOT PASS (W4-11), KEEP UP RIGHT (W4-17) and DO NOT ENTER (RS-1) signs may be eliminated.

Guidance:

6. The alignment of the crossover should be designed as a reverse curve.

7. When the crossover follows a curved alignment, the design criteria contained in the AASHTO ‘Policy on Geometric Design of Highways and Streets’—see Section 14.1.1 and current Virginia Road and Bridge Standard GB-10 should be used.

8. When channelizing devices are used in lieu of traffic barriers and have the potential of leading vehicular traffic out of the intended traffic space, the channelizing devices should be extended a distance in feet equal to the speed in miles beyond the downstream end of the transition area.

9. Where temporary asphalt medians or tubular markers are used, the Two-Way Traffic (W6-3) signs should be repeated every 1 mile.

Options:

10. NLX1 XX MLL1W (W16-6V) Supplemental Distance markers may be used with the Two-Way Traffic signs, where XX is the distance to the downstream end of the two-way section.

Support:

11. If the distance is sufficiently short that road users entering the section can see the downstream and of the section, they are less likely to forget that there is opposing vehicular traffic.

Standard:

12. The sign legends for the four pairs of signs approaching the lane reduction for the non-crossover direction of travel are not shown. They are similar to the signs shown for the crossover direction, except that the left lane is closed.

13. Impact attenuators shall be used to protect traffic barrier if the barrier is terminated within the clear zone.

14. Taper lengths shall be per Table 6C-3 on Page 6C-7; channelizing device spacing shall be per Table 6H-3 on Page 6H-4.

15. Existing conflicting pavement markings and markers shall be removed and temporary pavement markings and markers shall be installed per Figure TTC-60.
Chapter 6H – Typical Applications
Temporary Traffic Control Figure TTC-46
Limited Access Highway Closure Operation with an Off Site Short Term Detour

- New TTC Figure

Guidelines:
1. Regulatory traffic control devices should be modified as needed for the duration of the detour.
2. Figure TTC-46 illustrates a general layout of detour signs. Additional detour signs should be erected at all connecting roadways.
3. Detour signs with an advanced Turn Arrow (M-3) should have a spacing distance of 300' minimum in advance of the intersection. The Detour signs with the Point of Turn Arrow (M-4) should be placed at the intersection.
4. When using a ramp, the channelizing device spacing should be a maximum of 100'

Options:
5. Other sign layouts may be substituted as directed by the Regional Traffic Engineer.
6. Flashing warning lights and/or signs may be used to call attention to the advance warning signs.

Standards:
7. On divided highways having a median wider than 8', right and left sign assemblies shall be required.
8. A minimum of four (4) drum channelizing devices shall be placed on the shoulder in advance of the PCMS in a taper for delineation (see Figure 6H-6).

Support:
9. Short-term stationary operations is daytime work that occupies a location for more than 1 hour within a single daylight period.
10. See Chapter 6J for collision information or incident management traffic control.
Chapter 6H – Typical Applications
Temporary Traffic Control Figure TTC-47
Limited Access Highway Closure Operation with an Off Site Long Term Detour

• New TTC Figure
Typical Traffic Control
Road Closure Operation with a Detour
(Figure TTC-48.0)

NOTES

Guidance:
1. Regulatory traffic control devices shall be modified as needed for the duration of the detour.
2. Sign spacing distance should be 500'-600' where the posted speed limit is greater than 45 mph, and
   350'-500' where the posted speed limit is 45 mph or less. The directional sign should be placed at the
   intersection.
3. If the road is opened for some distance beyond the intersection and/or there are significant
   origins/destinations points beyond the intersection, the ROAD CLOSED (LOCAL TRAFFIC ONLY) (R11-3a)
   and DETOUR (M4-10) signs on Type 3 Barricades should be placed at the corners of intersecting
closed roadway or the traveled way.

Option:
4. If the road is open for some distance beyond the intersection the Rumble Sign Directional Assembly may
   be placed at the traveled way as shown to augment or replace the one shown on the corner.
5. Flashing warning lights and/or signs may be used to null attention to the advance warning signs.
6. Critical direction panels may be used with route signs.

Standard:
7. On divided highways having a median wider than 8', right and left sign assemblies shall be
   required.
8. For short-term duration work the M4-9 or M4-V4 series of signs shall be used. For long-term
   duration work the route shield assembly shall be used with the detour sign.

Option:
9. Long-term detours may be signed with a street name (M4-V2a or M4-V2b) plaque above the
   DETOUR (M4-9 or M4-V4 series) sign (see Figure TTC-35).
Support:
10. See Chapter 6A for additional information on incident management traffic control.

Guidance:
11. Temporary barriers should be placed at a 45° angle to the travelway a sufficient distance beyond the
    Type 3 Barricades but before the work zone while providing equipment access to the work space.

Standard:
12. Barrier panels 8 inches in width and 12 inches in height shall be placed on top of the temporary
    concrete barrier, perpendicular to traffic, and spaced 20' on centers along the taper sections.
    Reflectorized surface shall be fluorescent orange prismatic lens sheeting. Barrier delineators should
    be installed along the traffic side of the concrete barrier in-between and at the same spacing as the
    barrier panels approximately 24 inches up from the roadway surface.
13. An END DETOUR (M4-8a) sign shall be used to terminate the detour route.
Chapter 6H – Typical Applications

Temporary Traffic Control Figure TTC-53
Signing for Project Limits

- Revised TTC Figure
Temporary Pavement Marking and Marker Guidelines

- New TTC Figure
Chapter 6I

Updated Chapter 6I - CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

Figure 6I-1 Presents desired initial scene setup and identification by travel lane:

![Diagram of traffic scene setup]

- LANE 1
- LANE 2
- LANE 3

ADVANCE WARNING (VARIES) 120' TAPER 80' BUFFER SPACE INCIDENT SPACE
Chapter 6I

Updated Chapter 6I -

Figure 6I-2, Examples of Traffic Incident Management Area Signs

- DETOUR (M4-9L (V) 36" X 30"
- DETOUR (M4-9R (V) 36" X 30"
- DETOUR (M4-V1 36" x 30"
- EMERGENCY SCENE AHEAD (W20-V25)
- DETOUR AHEAD (W20-2)
Chapter 6I

Updated Chapter 6I - CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

<table>
<thead>
<tr>
<th>Traffic Incident Levels (Based on Traffic Impact)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
</tr>
<tr>
<td>Level 2</td>
</tr>
<tr>
<td>Level 3</td>
</tr>
</tbody>
</table>
## Updated Chapter 6I -

### Table 6I-2, Index to Traffic Incident Management Control Figures and Notes

<table>
<thead>
<tr>
<th>Type of Incident</th>
<th>Figure Number</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident on Shoulder with Minor Encroachment</td>
<td>TIMC-1.0</td>
<td>6I-9, 6I-10</td>
</tr>
<tr>
<td>Incident in Outside Lane on Four-Lane Roadway</td>
<td>TIMC-2.0</td>
<td>6I-11, 6I-12</td>
</tr>
<tr>
<td>Incident in Inside Lane on Four-Lane Roadway</td>
<td>TIMC-3.0</td>
<td>6I-13, 6I-14</td>
</tr>
<tr>
<td>Incident in Multiple Lanes on a Multi-Lane Highway</td>
<td>TIMC-4.0</td>
<td>6I-15, 6I-16</td>
</tr>
<tr>
<td>Incident Blocking a Lane on a Two-Lane Roadway</td>
<td>TIMC-5.0</td>
<td>6I-17, 6I-18</td>
</tr>
<tr>
<td>Incident Partially Blocking a Ramp</td>
<td>TIMC-6.0</td>
<td>6I-19, 6I-20</td>
</tr>
<tr>
<td>Incident Closing a Highway</td>
<td>TIMC-7.0</td>
<td>6I-21, 6I-22</td>
</tr>
<tr>
<td>Highway Closure Incident with a Temporary Detour</td>
<td>TIMC-8.0</td>
<td>6I-23, 6I-24</td>
</tr>
</tbody>
</table>
Chapter 6I

TIMC-2.0
Chapter 6I

TIMC-7.0
Appendix A – Major Changes
GUIDELINES FOR THE USE OF BARRIER/CHANNELIZING DEVICES IN WORK ZONES
This is a complete revision on the guidance on the selection and use of channelization and barrier devices. Defined the process on the selection and use of channelization and barrier devices.

Introduction - Temporary Traffic Barrier:

• Should be used only if feasible
• List projects that rarely require the use of temporary traffic barrier
• List projects that often require temporary traffic barrier
Appendix A

7 Step Flow Chart Selection Process

1. Determine Variables

2. Check Clear Zone and Drop-off Guide
   - not violated

3. Remove Hazard
   - yes
   - no
   - 3a. Consider Alternatives
     - no

4. Determine Expected Accident Factor, p
   - p ≤ 0.5
   - p > 0.5

5. Select Channelizing Devices
   - no

6. Complete Checklist. Is barrier needed?
   - yes
   - no

7. Design Barrier
   - yes
Figure 2. Clear Zone and Drop-Off Requirements

Updated:

- Clear zones
- Signs vs. channelizing devices vs. Barrier

Slopes less than 4:1 are considered a fixed object hazard.
New
Run off Road Frequency Factor Charts for Limited Access Highways & Example

Example

Interstate highway (2 lanes NB)
ADT = 30,000 (The ADT is for one direction only.)
Length Of Construction: 1 mile
Construction time: 0.5 yr
55 MPH Work Zone Speed Limit

(1) From the limited access highways ROR frequency factor chart, ADT of 30,000 indicates 30 ROR encroachments/mi/yr

(2) Expected ROR frequency \( p = f \times L \times T = 30 \times 1 \times 0.5 = 15 \)

Since the expected ROR frequency is greater than 0.5, go to Checklist of Guidelines for Channelizing Device – Barrier Selection to determine if barrier is needed.

Example for Night or Day only Work Zones

There are projects where lane closures are not continuous for several days. For example, if lane closures are limited to night only, then the traffic volume for the time period of the lane closure should be used instead of ADT. An example is provided below.

A bridge deck on an Interstate highway with 3 lanes in each direction will require patching, milling of the deck and placement of a Latex overlay.
ADT = 50,000 (the ADT is for one direction only). However, the volume required all work to be performed between 9:00 pm and 6:00 am each day. Therefore, the volume to be used will be between these hours, 6,000 vehicles for the 9-hour period.
Length of Construction = Bridge length is 530 ft., therefore, 0.2 mile will be used.
Construction time = 9 hours This is the actual time traffic is exposed to the hazard. \( \frac{9 \text{ hrs}}{365 \text{ days/yr} \times 24 \text{ hrs/day}} = 0.001 \text{ yr} \)
55 mph posted speed limit

(1) From the Limited Access Highways ROR frequency factor chart, a volume of 6,000 indicates 9 ROR encroachments/mi/yr

(2) Expected ROR frequency \( p = f \times L \times T = 9 \times 0.2 \times 0.001 = 0.002 \)

Since the expected ROR frequency is well below the 0.5, select a channelizing device from Figure 4.
Appendix A

New
Run off Road Frequency Factor Charts for All Other Highways & Example

![Graph showing ROR frequency factor chart for all other highways.]

**Example**

Rural primary highway (1 lane each direction))
ADT = 10,000 (ADT is for both directions.)
Length Of Construction: 0.5 mile
Construction time: 0.4 yr
55 MPH Work Zone Speed Limit

1. From the all other highways ROR frequency factor chart, ADT of 10,000 indicates 5 ROR encroachments/mi/yr
2. Expected ROR frequency (p) = f x L x T = 5 x 0.5 x 0.4 = 1.0

If the expected ROR frequency is greater than 0.5, go to Table 1, Barrier-Channelizing Device Chart, to determine type needed.
Developed a CHECKLIST FOR GUIDELINES OF CHANNELIZING DEVICE/BARRIER SELECTION

• Types of Barriers, Barricades and Channelizing Devices
• Provides engineering study documentation
• Used in conjunction with the seven (7) step process to assist in determining and designing the devices to be used.

Barrier Design Considerations

If barrier is warranted it provides guidance:

– Type of barrier and the barrier design
– Barrier anchorage and deflection
– Longitudinal channelization devices
– Construction Access Techniques and Introduced Barrier
– Temporary Asphalt Medians/Temporary Raised Islands
Appendix A
UPDATED
Types of Barriers, Barricades & Channelizing Devices

Figure 4. Types of Barriers, Barricades and Channelizing Devices

**Barricades and Channelizing Devices**

**GROUP 1**
TUBULAR MARKER & CONE

**GROUP 2**
DRUM, VERTICAL PANEL, DIRECTIONAL INDICATOR, BARRICADE & LONGITUDINAL CHANNELIZING DEVICE

**SPACING GUIDE**

<table>
<thead>
<tr>
<th>SPEED</th>
<th>0 – 35 MPH</th>
<th>36 + MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACING</td>
<td>40'</td>
<td>80'</td>
</tr>
</tbody>
</table>

Channelizing device spacing along travelway is in feet. Spacing on curves 6° or greater (radius less than or equal to 955 feet), on transitions, or locations determined by the Regional Traffic Engineer to be 1/2 of the travelway spacing.

**Types of Barriers**

**ROADWAY**

**BRIDGE DECK**

**A POSITIVE**
Barrier may require anchoring to the pavement or bolting to the bridge deck. Refer to Section 3A, Barrier Design Considerations, for additional guidance. If anchoring/bolting is required it shall be on the traffic side(s) of the barrier. All barriers shall be installed in accordance with Section 500 of the current Road and Bridge Standards.
### Appendix A

NEW

Checklist for Guidelines of Channelizing Devices/Barrier Selection

#### SECTION A - ENGINEERING AND TRAFFIC INVESTIGATION

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Project's TMP Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review Requested By</th>
<th>Date of Request</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Scope</th>
<th>Staging MP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading MP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VDOT Project/Contract Manager</th>
<th>Date of Review</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SECTION B - ENGINEERING INVESTIGATION RESULTS

**Checklist for Guidelines of Channelizing Device/Barrier Selection**

<table>
<thead>
<tr>
<th>Information (Inputs)</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **What type of work will be done?**
- **Will a hazard be located within the clear zone?**
  - YES or NO
- **What is the speed limit to be used during construction?**
  - mph
- **What is the design year traffic volume?**
  -          
- **What is the traffic mix for the roadway?**
  -          
- **What Work Zone Clear Zone is to be used?**
  -          
- **Will pedestrian traffic need to be maintained in the work area?**
  - YES or NO
  - Can they be directed to another area? YES or NO

- **What is the crash data for the area?** (Attach HTRIS report if available.)
  - Rate:
  - Frequency:
  - Direction:
  - Prevalent Collision Type:

- **Can work be done when traffic volumes are lower?**
  - YES or NO

- **Considering worker safety, how close will they be to traffic?**
  - hrs per day or ___Days

- **How long will the barrier be in place?** (If over three days consider the use of barriers.)
  - hrs per day or ___Days

#### Decision Process (channelizing devices vs barrier)

<table>
<thead>
<tr>
<th>Information (channelizing devices vs barrier)</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **What is the expected ROR frequency, \( R_0 \)?**
  - If the expected ROR frequency is greater than 6.5, does Table 1, "Channelizing Devices/Barrier Chart", indicate the use of barriers based on speed and volume? YES or NO

- **Have other alternatives been considered other than the use of barriers?** (Like a 6:1 wedge, detour, diversion, time restrictions for the work, elimination of the hazard, or to accelerate the work to reduce exposure time.)
  - YES or NO

- **Consider that barriers may allow the contractor to work anywhere, which may reduce construction time. However, use of Group IIs or cones may limit his work to off-peak hours only.**

- **Generally, barriers cannot be placed around radii smaller than 100.**
  - Do you have any small radii to protect? YES or NO

- **Is the drop-off behind the barrier within 2' from the back of the barrier with a depth equal to or greater than 6'7? If so, can a 6:1 wedge be used instead of the barrier?**
  - YES or NO

- **What is the length of the barrier run?** (Short barrier runs may not be a benefit, when considering the end protection.)
  - YES or NO

- **What is the installation time?** (in hours or days)

The related process is a guideline for aiding the engineer in the selection of barrier or channelizing devices.
Appendix A

Figure 5. Construction Access Technique and Introduced Barrier
Use of Temporary Asphalt Median/Temporary Raised Island

Temporary asphalt medians may be considered for separation of traffic on two-lane, two-way temporary detours on roadways with

- Posted speed limits of 45 mph
- An ADT range of 4,000 to 15,000
- Written approval of the Regional Traffic Engineer.

Figure 6 - Temporary Asphalt Median Detail
Appendixes B, C and D

Appendix B – minor changes
WORK ZONE SAFETY CHECKLIST FORM DOCUMENTATION

Appendix C – minor change
GUIDELINES FOR USE OF VIRGINIA STATE POLICE IN CONSTRUCTION/MAINTENANCE WORK ZONES

Appendix D – minor changes
PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) DISPLAYS

Available On-Line At:
www.virginiadot.org/business/trafficeng-WZS.asp
REVIEW OF SIGNIFICENT CHANGES IN
THE 2011 VIRGINIA WORK AREA
PROTECTION MANUAL

October 07, 2011
VDOT Traffic Engineering Division