



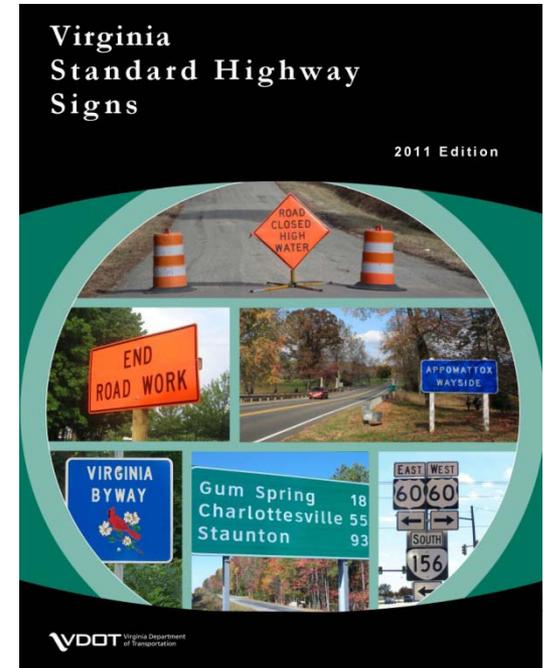
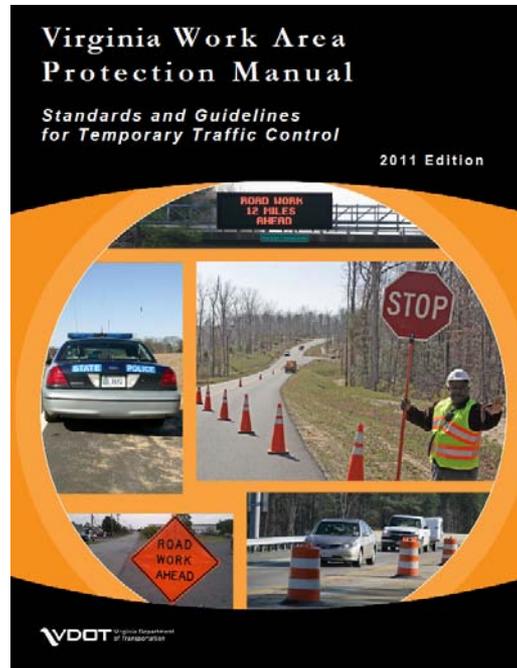
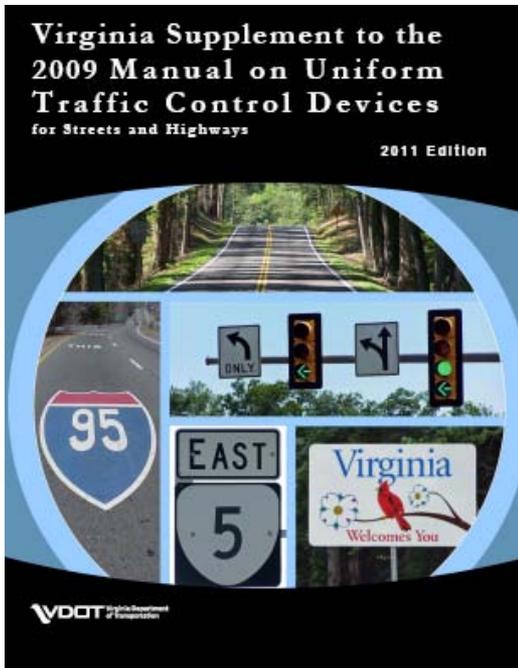
# **REVIEW OF SIGNIFICANT CHANGES IN THE 2011 VIRGINIA WORK AREA PROTECTION MANUAL**

**VDOT Traffic Engineering Division  
Oc7, 2011 Presentation**

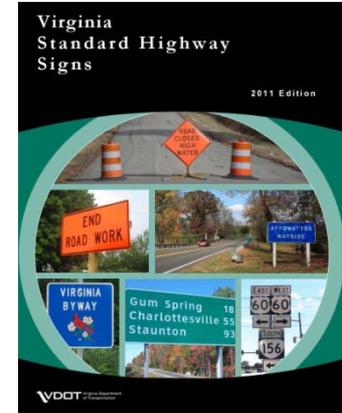
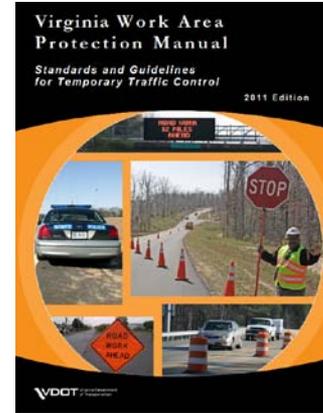
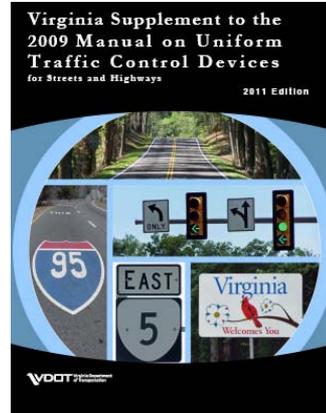
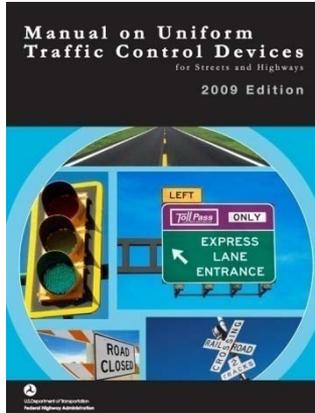
# VA Supplement to the MUTCD

VDOT developed Supplements which consist of:

- VA Supplement to the 2009 MUTCD
- VA Work Area Protection Manual (Part 6)
- VA Standard Highway Signs book

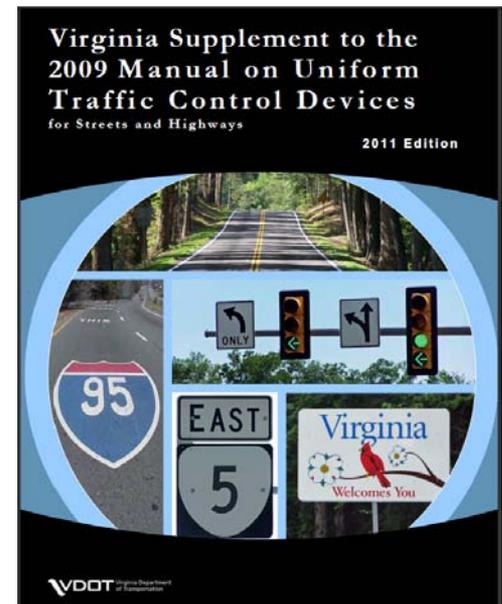
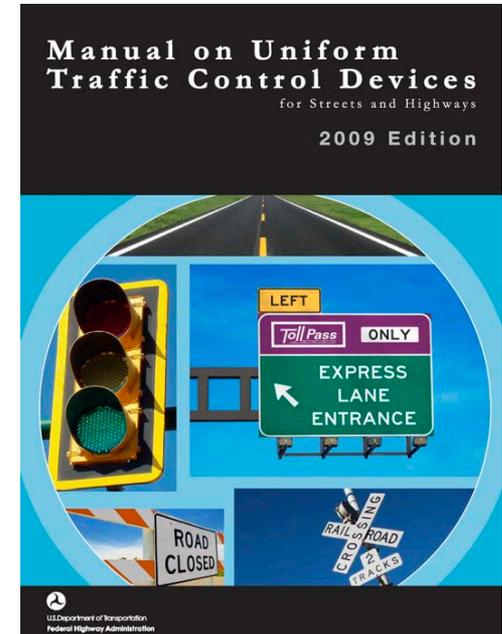


# Manual on Uniform Traffic Control Devices (MUTCD) & State Manuals Adoption



- **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.

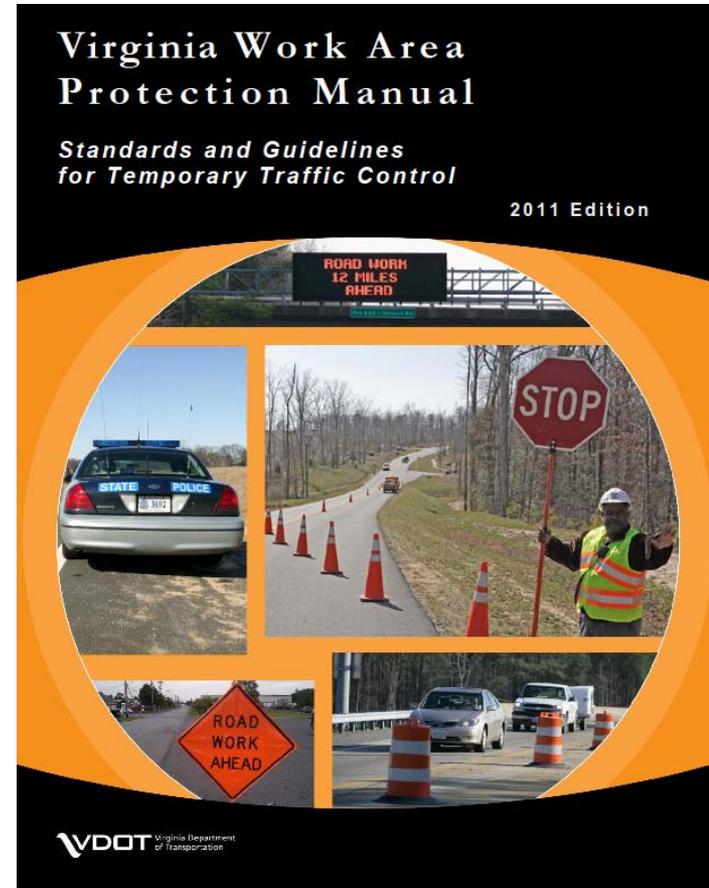
- All localities shall follow the provisions of the Manual on Uniform Traffic Control Devices (MUTCD) as adopted by the FHWA and the CTB.
- Localities may be excluded from the requirement to apply the provisions set forth in the Virginia Supplements.
- Counties and independent cities and towns that maintain 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.



# 2011 VA WAPM Contents

## 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**

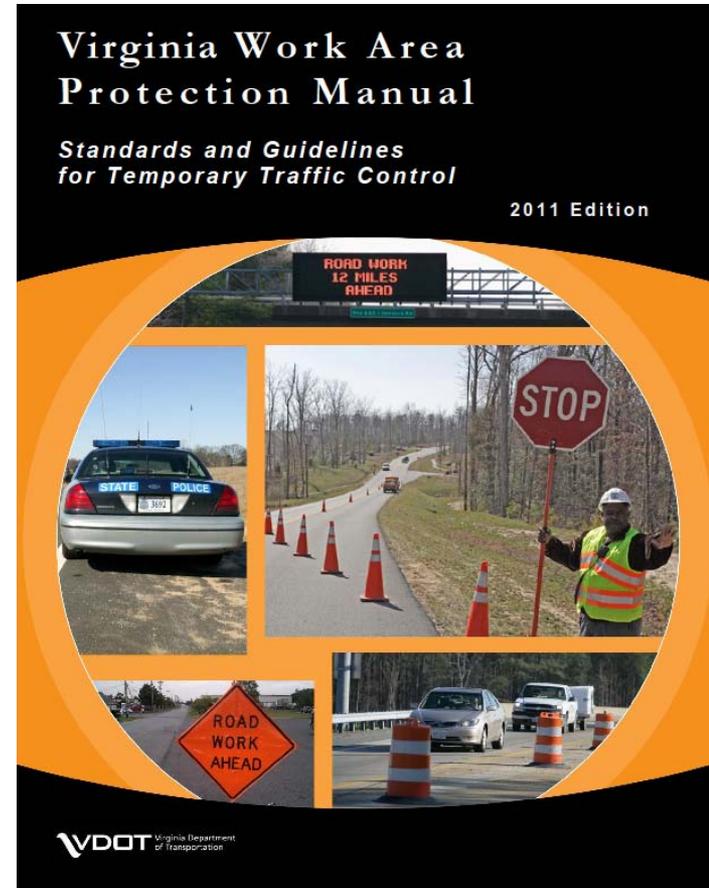
**Chapter 6I – Traffic Incident Management Areas**

**Appendix A – Barrier/TCD Guidelines**

**Appendix B – WZS Checklist**

**Appendix C – VSP Guidelines**

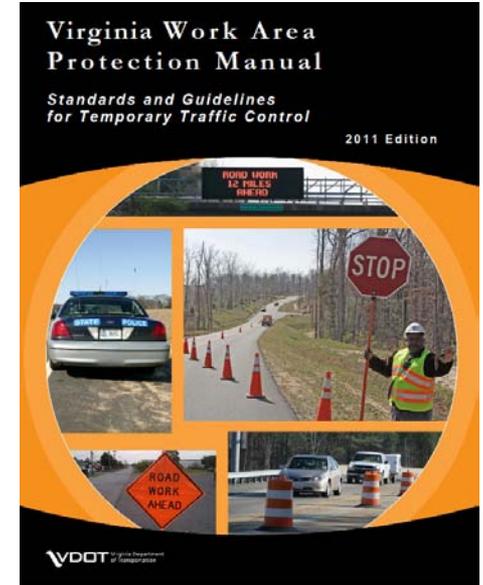
**Appendix D – CMS Procedures**



# 2011 VA WAPM - Introduction

## 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



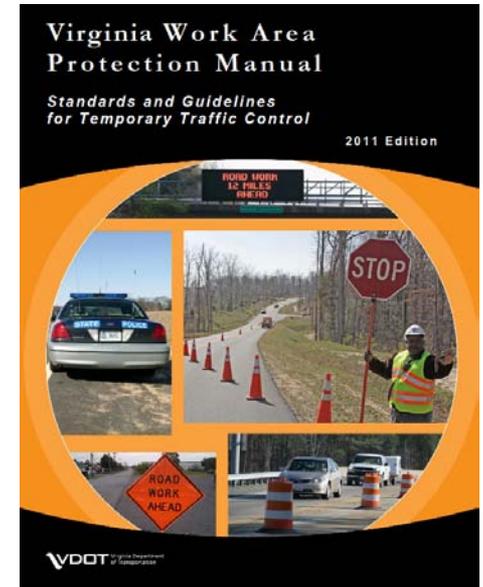
04 The primary function of TTC is to provide for the reasonably safe and effective movement of road users through or around TTC zones while reasonably protecting road users, workers, responders to traffic incidents, and equipment.

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.

## Chapter 6A - General

### 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.”**



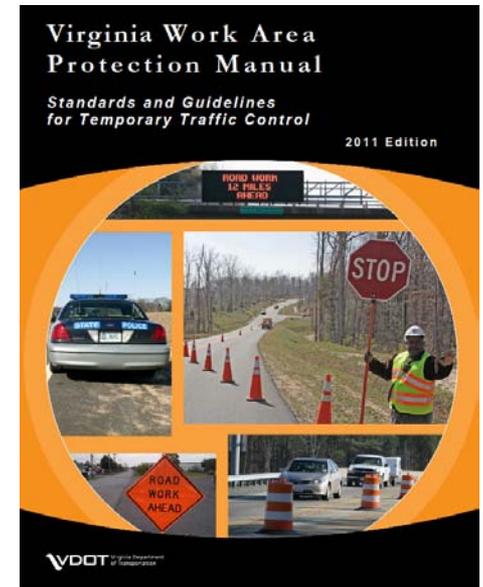
## Chapter 6A - General

### 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



## Chapter 6C – TTC ELEMENTS

### 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*



## Chapter 6C – TTC ELEMENTS

### Section 6C.04 Advance Warning Area

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

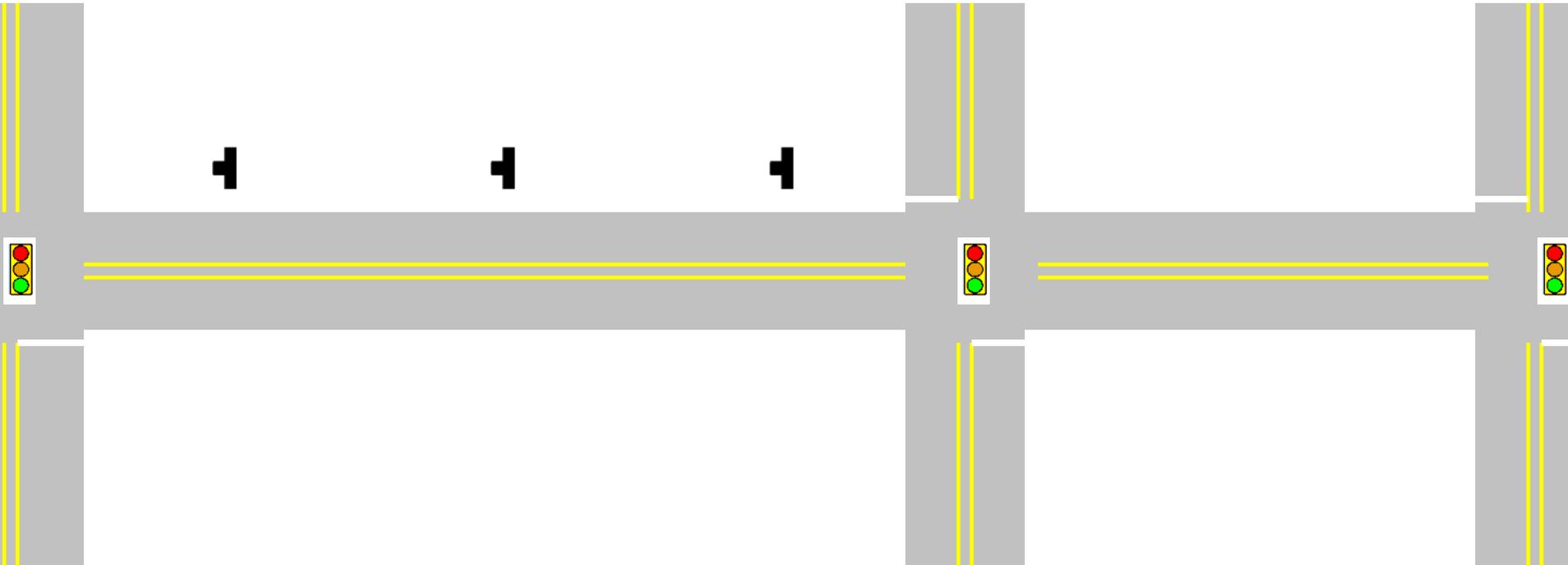
Road Type	Spacing (in feet)
Urban street with 25 mph or less posted speed	100' – 200'
Urban street with 30 to 40 mph posted speed	250' – 350'
* All Other Roadways with 45 mph or less posted speed	350' – 500'
All Other Roadways with greater than 45 mph posted speed	500' – 800'
Limited Access highways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

\* Urban streets with greater than 40 mph posted speed limits fall into this category.

## Chapter 6C – TTC ELEMENTS

### 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.



## Chapter 6C – TTC ELEMENTS

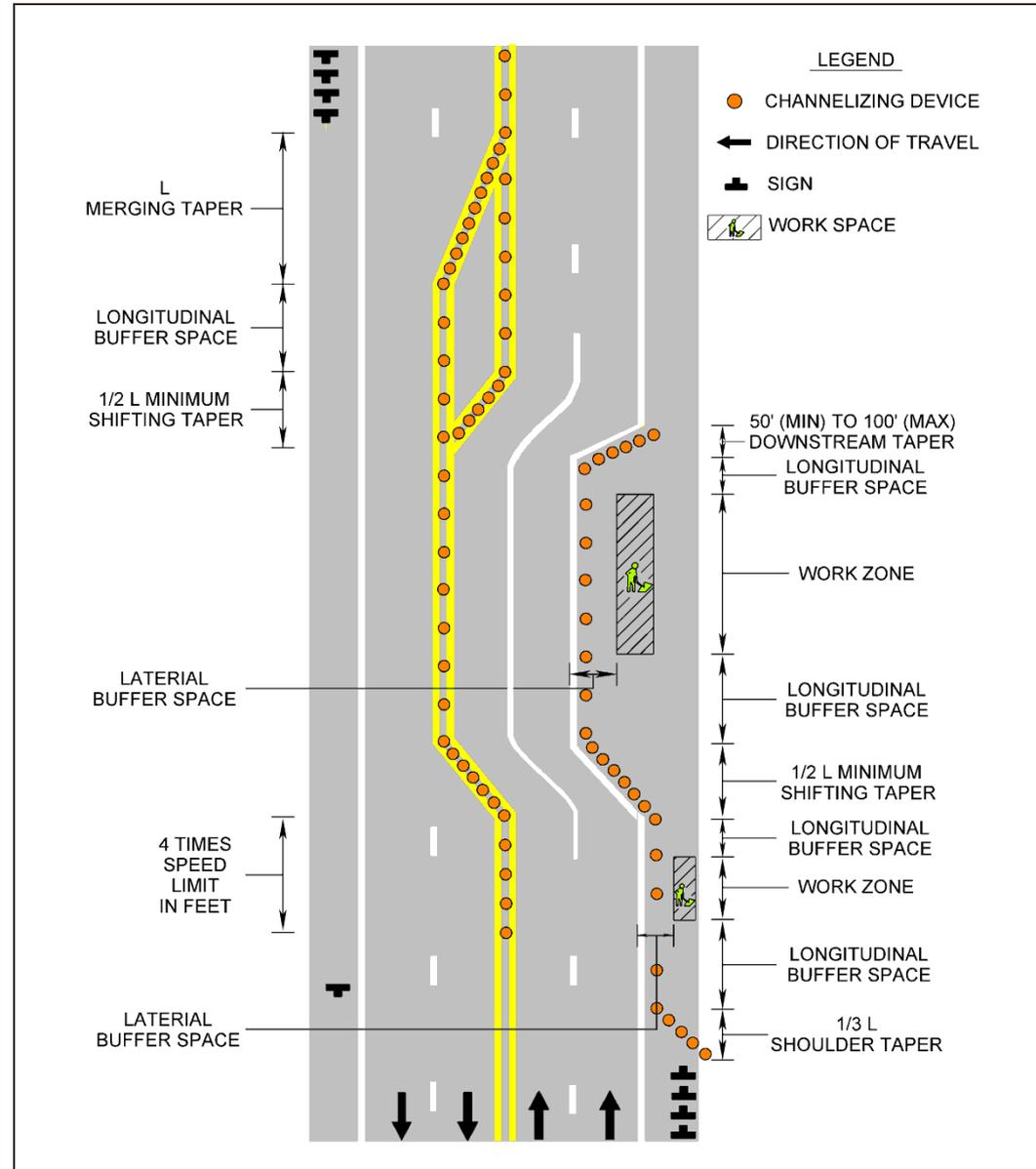
### Section 6C.06 Buffer Space

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

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

- Neither work activity nor storage or placement of equipment, vehicles (including law enforcement), or material shall occur within a buffer space

Updated  
Figure 6C-2



## Chapter 6C – TTC ELEMENTS

### **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

VIRGINIA DEPARTMENT OF TRANSPORTATION  <i>TRAFFIC ENGINEERING DIVISION</i>  MEMORANDUM	
GENERAL SUBJECT: Work Zone Safety	NUMBER: TE-345
SPECIFIC SUBJECT: Work Zone Traffic Control Training Procedures	DATE: Sept. 21, 2007  SUPERSEDES:
LEARNING CENTER DIVISION APPROVAL:  <i>Barbara Patterson</i>	TRAFFIC ENGINEERING DIVISION APPROVAL:  <i>R. J. Kfoury.</i>
DIRECTED TO: District Administrators Division Administrators	

Revised FHWA regulations provided in 23 CFR 630 Subpart J states that, "States shall require that personnel involved in the development, design, implementation, operation, inspection, and enforcement of work zone related transportation management and traffic control be trained, appropriate to the job decisions each individual is required to make."



## Chapter 6D - Pedestrian and Worker Safety

### Chapter 6E – Flagger Control

**Section 6D.03 & 6E.02**  
**Beginning July 1, 2012**



**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.**

# Chapter 6D - Pedestrian and Worker Safety

## Chapter 6E – Flagger Control

### 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

Virginia Department of Transportation

### Flagging Requirements

**Paddle**  
(Primary Device)

To Stop Traffic

Traffic Proceed

To Alert and To Slow Traffic

**Paddle**  
(Primary Device)

**Flag**  
(Emergency Traffic Spotters and TTC Spotters)

To Stop Traffic

Traffic Proceed

To Alert and To Slow Traffic

**Flag**  
(Emergency Traffic Spotters and TTC Spotters)

**Safeguard Traffic**

- A sufficient number of competent, certified, courteous, neat and fully dressed flaggers shall be provided and available at all times when required.
- The flagger is responsible for safeguarding his fellow workers on the job, warning motorists of dangers ahead, and guiding them safely through a work area.
- Flaggers shall be available to stop traffic, advise the motorist of any delay, and to keep vehicles in the proper lanes along the work area.
- Flaggers shall communicate in English specific instructions clearly, firmly and courteously while flagging.
- Flaggers shall be at least 18 years old.

**Flaggers shall perform their duties in the following manner:**

- Never sit upon any installed prior to performing flagging operations.
- Do not eat and/or drink at all times.
- The flagger shall stand alone, never permitting a group of workers to congregate around the flagger station or allow work vehicles near the flagger station.
- Always stand while waiting for traffic.
- Have an escape route if approached by an errant vehicle.
- Use proper hand signals with the STOP/SLOW paddle.
- Visible eye contact with motorists.
- Do not leave your post until you are properly relieved.
- Coordinate with other flaggers.
- Have your certificate on hand to your possession while performing flagging duties.

**Proper Dressed**

- Hard hat.
- Retroreflective High-Visibility safety apparel meeting ANSI/ISEA 107-2010 Class 2 min. exposure for daytime and ANSI/ISEA 107-2010 Class 206 exposure when still include Type E trousers.
- Protective footwear must comply with ANSI Z41-1996, ASTM F-2413-2009, ASTM F-2413-2005 (or more current ASTM).
- Start with sleeves and long pants. (Removal of shirt is prohibited).
- Headphones are prohibited.

*Note: Nighttime hours are defined as starting 30 minutes before sunset to 30 minutes after sunrise.*

**Sign Paddle**

- The sign paddle shall be octagon shaped, at least 24" wide with 8" outer "O" letters. The SLOW face shall be fluorescent orange plastic or lens clearing. The STOP face shall be red uncoated lens clearing.
- When flashing white lights are used on the STOP/SLOW paddle, the standard size of the paddle may be reduced to 18" wide with 6" outer "O" letters.
- Sign paddle shall be legible and clean.
- 7' minimum height from the bottom of the sign paddle to the roadway.

**Flag**

- Flag work shall be limited to emergency situations or by a traffic spotter.
- The flag shall be red, not less than 24 inches square on a staff at least 36" long, made of a good grade red material and should be equipped at the bottom with adequate weight to hang vertically in heavy winds.
- The flag shall be retroreflective red when used at night.

Virginia Department of Transportation

### Methods of Flagging Traffic

**Where to stand**

- Flagging stations shall be preceded by proper advance warning signs. Signs shall be removed when the flagger is no longer at their station. At night, flagging stations shall be illuminated with a minimum of horizontal luminance of 5-foot candles (50 lux).
- 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' where the posted speed limit is 45 m.p.h. or 500' to 800' where the posted speed limit is greater than 45 m.p.h. (Less spacing may be necessary in areas where conditions warrant).
- Stand facing traffic either on the edge of the shoulder of the road or near the edge of pavement.
- Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work area. The distance from the flagger station to the work area should be:

Posted Speed (mph)	20	25	30	35	40	45	50	55	60
Minimum S.D.	95	100	105	110	115	120	130	140	155

**How to stop traffic**

- Stand on the shoulder of the roadway facing traffic.
- (a) With a Paddle - Hold the STOP sign paddle in a stationary position. Look directly at the approaching traffic. Raise your free hand with palm exposed to approaching driver and make eye contact with the driver.
  - With a Flag - Hold the staff in a horizontal position and extend it toward the travel lane being careful not to encroach the travel lane. Look directly at the approaching traffic. Raise your free hand with palm exposed to approaching driver and make eye contact with the driver.
- If time permits, drivers may be informed concerning the reason for the delay. Speaking in English be courteous and brief. For example, "Patching a hole, please drive on the left."

**How to release traffic**

- Before releasing traffic the flagger will return to the normal flagging location. Keep your paddle on STOP or flag extended until you are safely on the shoulder of the roadway.
- (a) 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.
  - With a Flag - Stand parallel to roadway facing the road users. drop the flag to your side and with your free hand motion traffic to proceed to the open lane.
  - 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.

**How to alert and slow traffic but not stop it**

- Stand facing traffic.
- (a) With a Paddle - Hold the SLOW sign paddle in a stationary position with the arm extended horizontally away from the body. For added emphasis, the flagger may raise and lower the free hand with the palm down.
  - With a Flag - Stand parallel to traffic movement. The flagger should raise the flag from the ground to the shoulder and slowly motion up and down with the free palm down.

**Never wave a paddle or flag**

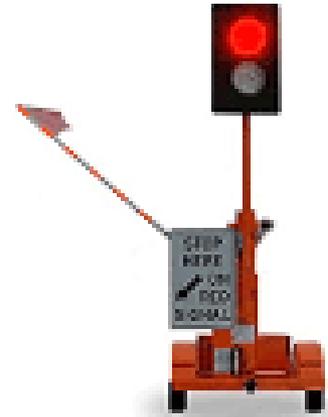
- Signals must be clear and direct.
- Use hand signals with devices. Don't make drivers guess what they should do.
- Never wave a paddle or flag to stop traffic or for it to proceed.

## Chapter 6E – Flagger Control

**NEW:**

**Section 6E.04**

### **Automated Flagger Assistance Devices**



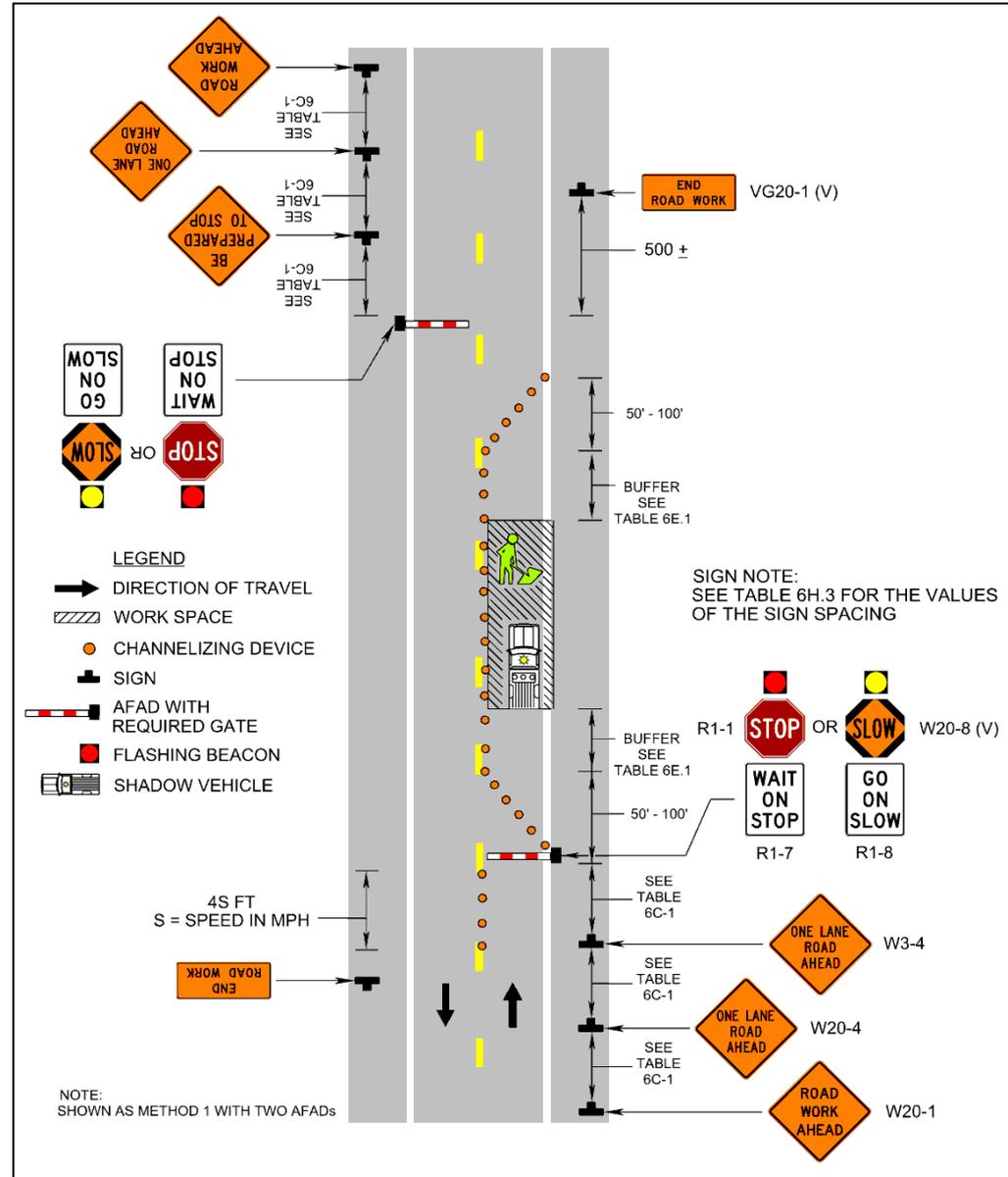
**AFADs shall only be used when all of the following conditions are met:**

- **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.**

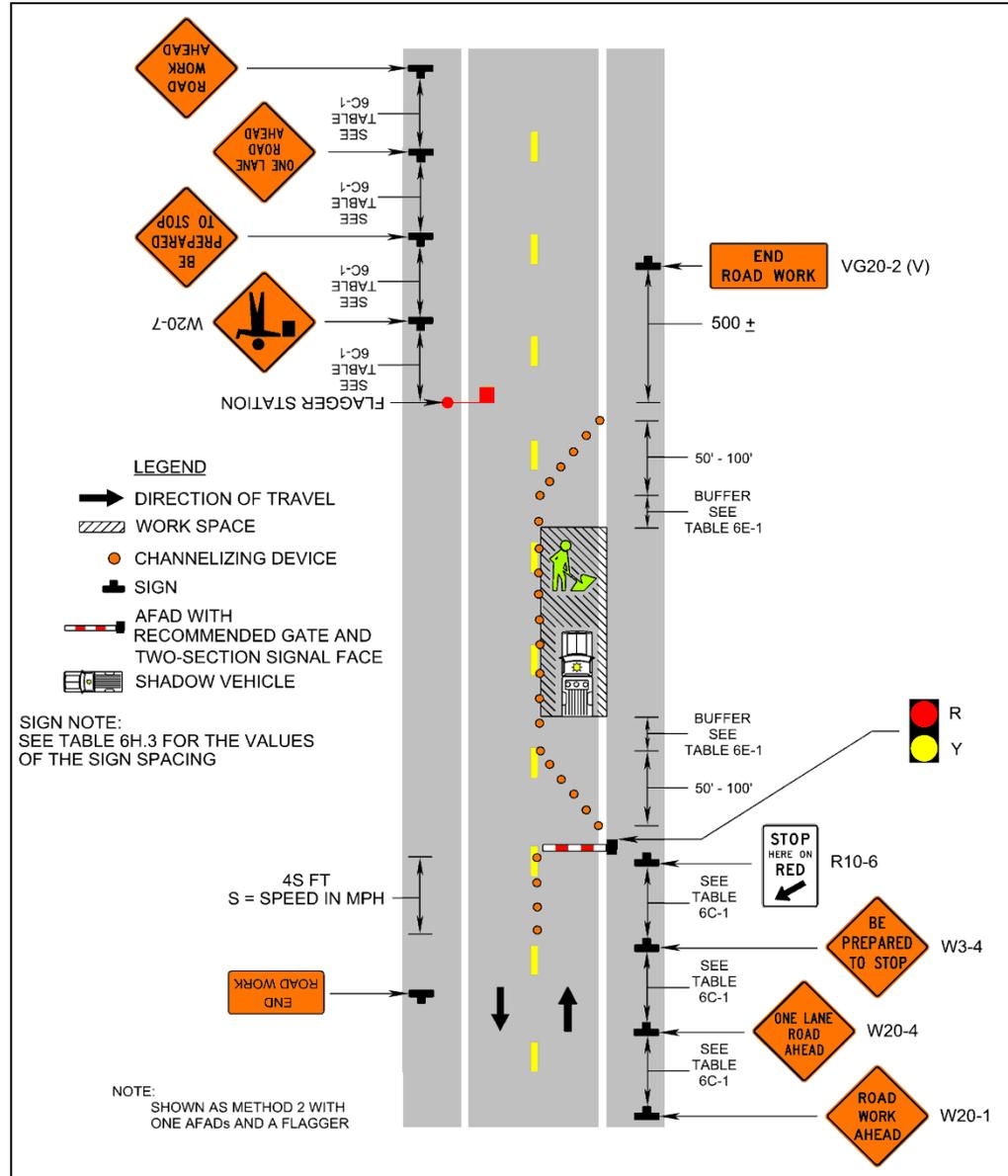
# Chapter 6E – Flagger Control

## NEW: Section 6E.05 Stop/Slow AFAD



# Chapter 6E – Flagger Control

## NEW: Section 6E.06 Red/Yellow Lens AFAD





## Chapter 6E – Flagger Control

### Section 6E.08 Flagger Station

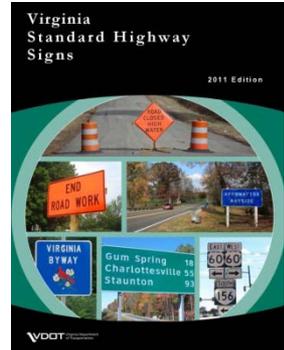
- Flagger signs removed, covered, turned away when work is suspended 30 minutes or longer
- Illumination requirements and measurement to determine correct illumination
- If glare from standard types of floodlight equipment cannot be eliminated, then consideration should be made for the use of non-glare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



## Chapter 6F – TTC Zone Devices

### 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)

Table 6F-1, Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 4 of 5)

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of-Way Roadway	*Residential & Urban – < 500 ADT & ≤ 30 MPH
<b>VEHICLE-MOUNTED SIGNS</b>					
Line Painting Ahead – Center Lane Closed Road Line Painting Ahead – Left (X Left) Lane(s) Closed * – Right (X Right) Lane(s) Closed	W20-V5C, V5L, V5La, V5R, V5Ra	6F.34	84 x 36	84 x 36	84 x 36
Spraying Ahead – Left (Right) Shoulder Closed	W20-V6L, V6R	6F.34	84 x 36	84 x 36	84 x 36
Spraying Ahead – Left (Right) Lane Closed	W20-V7L, V7R	6F.34	84 x 36	84 x 36	84 x 36
Pre-Storm Treatment – Center Lane Closed Pre-Storm Treatment – Left (X Left) Lane(s) Closed * – Right (X Right) Lane(s) Closed	W20-V8C, V8L, V8La, V8R, V8Ra	6F.34	84 x 36	84 x 36	84 x 36
Pre-Storm Treatment	W20-V9	6F.34	48 x 18	48 x 18	48 x 18
Keep Back 100 FT	W20-V10	6F.34	18 x 18	18 x 18	18 x 18
Road Closed High Water	W20-V11	6F.24	48 x 48	36 x 36	48 x 48
Ramp Closed Ahead	W20-V12	6F.24	48 x 48	36 x 36	48 x 48
Center (Left) (Right) Turn Lane Closed Ahead	W20-V13C, V13L, V13R	6F.26	48 x 48	36 x 36	48 x 48
Emergency Scene Ahead	W20-V25	6F.27	48 x 48	36 x 36	48 x 48
Slow Moving Vehicle (Vehicle-Mounted Sign)	W21-4	6G.06	36 x 18	36 x 18	36 x 18
Shoulder Work	W21-5	6F.42	48 x 48	36 x 36	48 x 48
Left Shoulder Closed	W21-5aL, 5aR	6F.42	48 x 48	36 x 36	48 x 48
Left Shoulder Closed Ahead	W21-5bL, 5bR	6F.42	48 x 48	36 x 36	48 x 48
Utility Work Ahead	W21-7	6F.45	48 x 48	36 x 36	48 x 48
Mowing Ahead	W21-8	6F.22	48 x 48	36 x 36	48 x 48
Watch for Slow Moving Vehicles	W21-V1	6F.22	48 x 48	36 x 36	48 x 48
Road Work Next 2 Miles	W21-V2	6F.21	48 x 48	36 x 36	48 x 48
Mowing Next 2 Miles	W21-V3	6F.22	48 x 48	36 x 36	48 x 48
Line Painting Next 5 Miles	W21-V4	6F.22	48 x 48	36 x 36	48 x 48
Spraying Next 5 Miles	W21-V5	6F.22	48 x 48	36 x 36	48 x 48
Cleanup Crew Working	W21-V6	**2H.08	48 x 48	36 x 36	48 x 48
Litter Pick Up	W21-V7	6F.18	48 x 48	36 x 36	48 x 48
Survey Crew Ahead	W21-V8	6F.44	48 x 48	36 x 36	48 x 48
All Traffic Merge Left (Right)	W21-V9L, V9R	TTC-45	48 x 48	36 x 36	48 x 48
Slow	W21-V10	6F.38	48 x 48	36 x 36	48 x 48
Both Shoulders Closed	W21-V11	6F.42	48 x 48	36 x 36	48 x 48
Both Shoulders Closed Ahead	W21-V12	6F.42	48 x 48	36 x 36	48 x 48
Pull-Off Area	W21-V13	6F.43	48 x 48	36 x 36	48 x 48
Left (Right) Pull-Off Area	W21-V14L, V14R	6F.43	48 x 48	36 x 36	48 x 48
No Pull-Off Area	W21-V15	6F.43	48 x 48	36 x 36	48 x 48
Ramp Work Ahead	W21-V16	6F.31	48 x 48	36 x 36	48 x 48
Signal Work Ahead	W21-V17	6F.32	48 x 48	36 x 36	48 x 48
Blasting Zone Ahead	W22-1	6F.47	48 x 48	36 x 36	48 x 48
Turn Off 2-Way Radio and Cell Phone	W22-2	6F.48	42 x 36	42 x 36	42 x 36
End Blasting Zone	W22-3	6F.49	42 x 36	42 x 36	42 x 36
Slow Traffic Ahead	W23-1	6F.34	48 x 24	48 x 24	48 x 24
New Traffic Pattern Ahead	W23-2	6F.37	48 x 48	36 x 36	48 x 48

Dimensions are shown in inches and shown as width x height

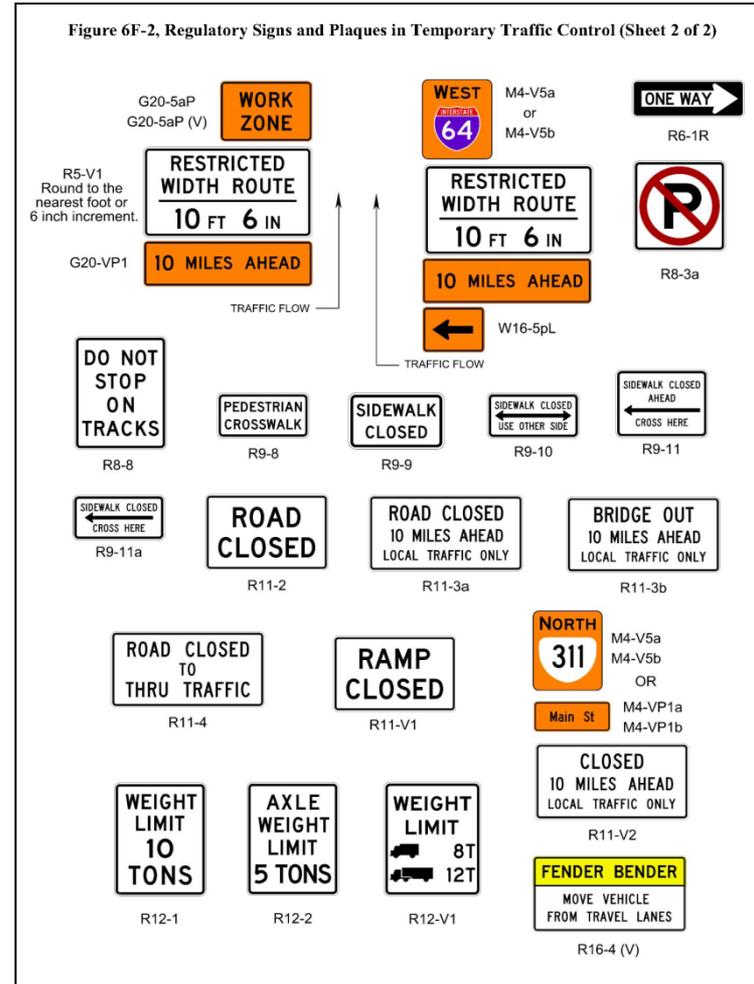
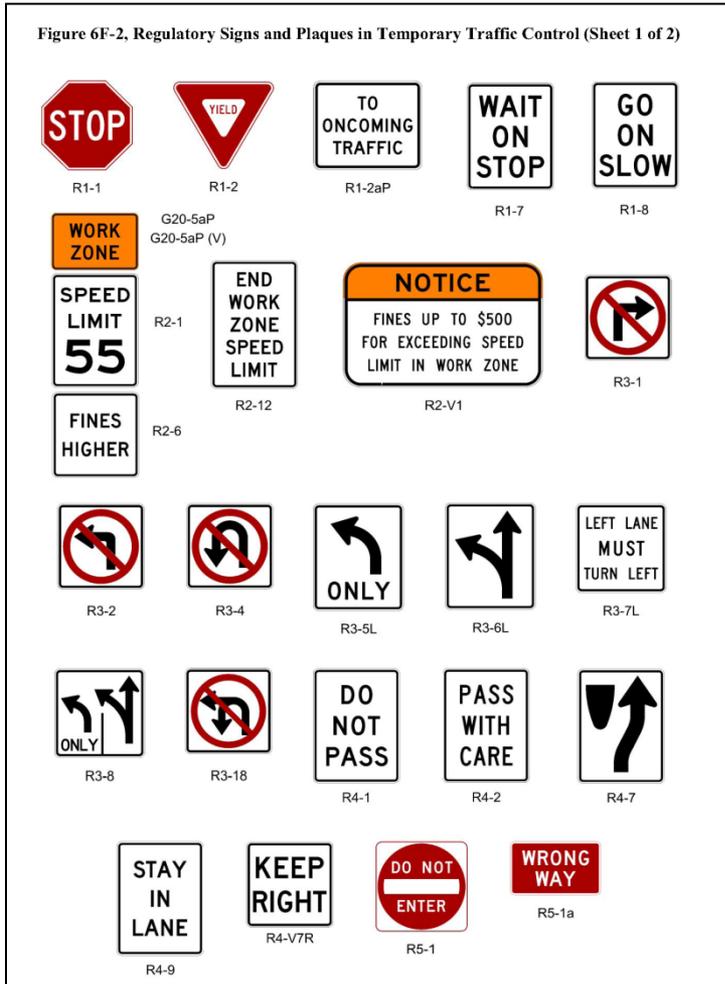
\* Sign sizes found in the Non-Restricted Right-of-Way Roadway column shall be used unless geometric condition prohibits their use; otherwise the other columns shall be used (see Section 6F-02 Paragraph 10).

\*\* Sign information is found in the Virginia Supplement to the 2009 MUTCD.

# Chapter 6F – TTC Zone Devices

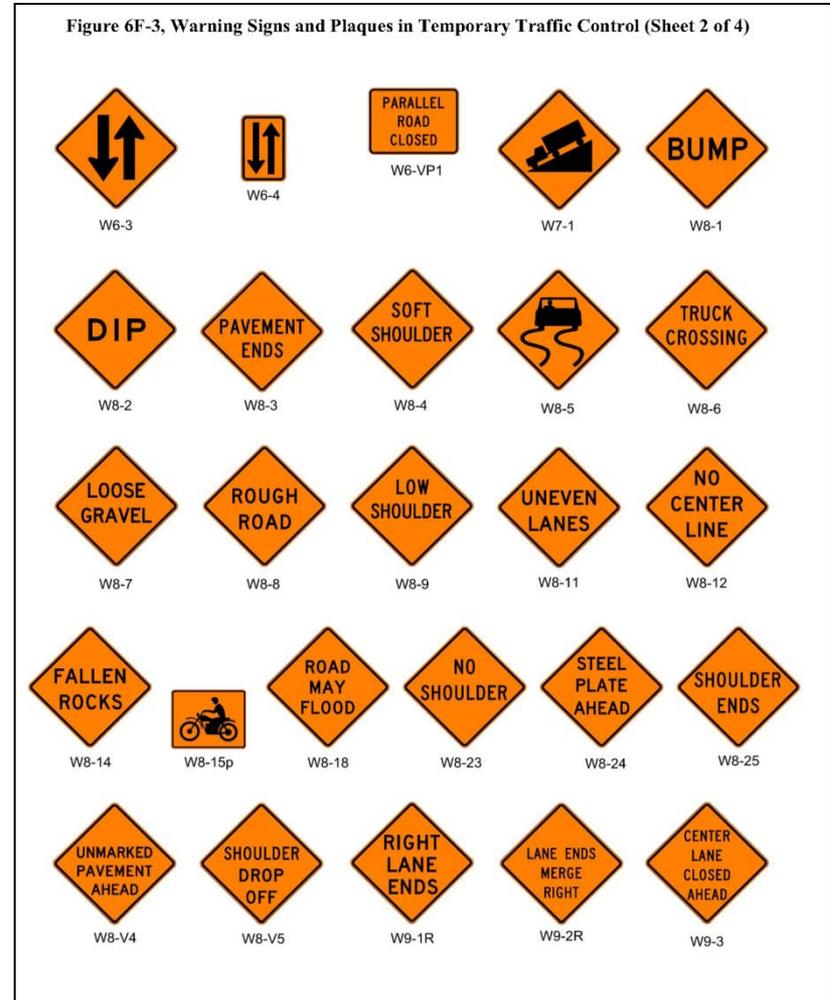
## Figure 6F-2

## Regulatory Signs and Plaques in TTC



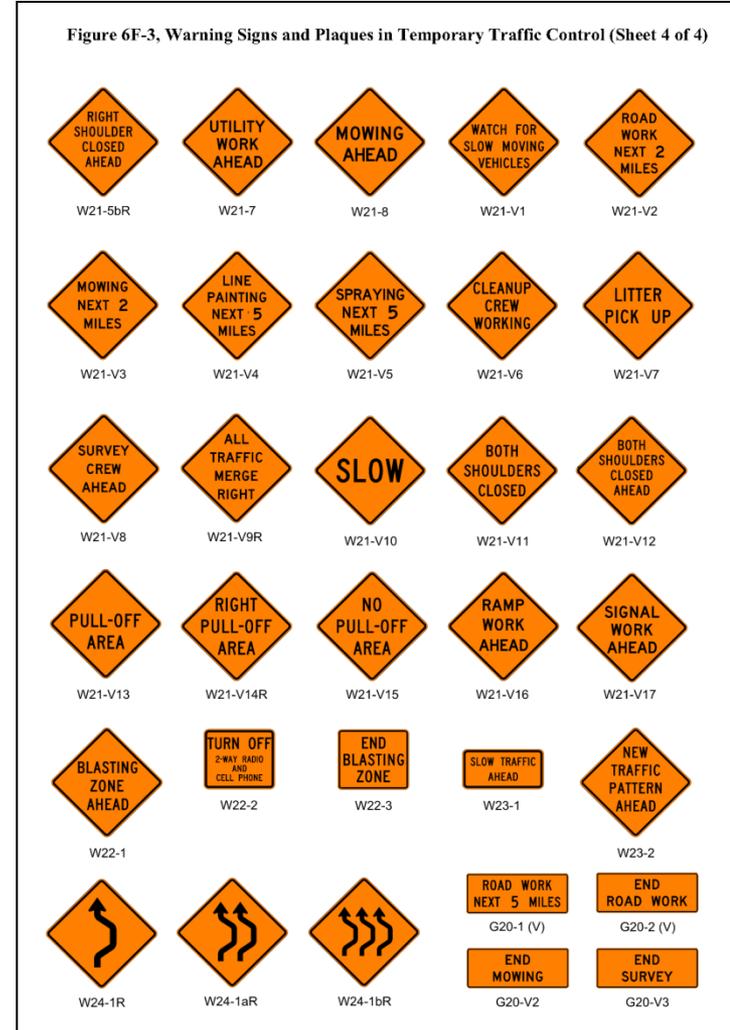
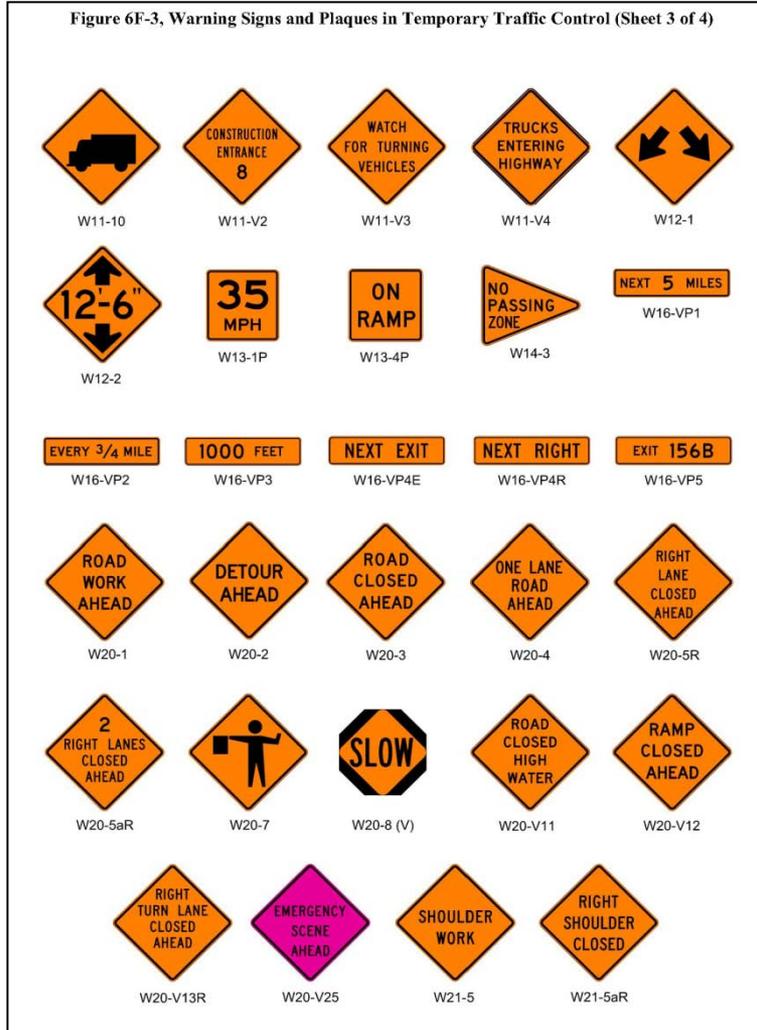
# Chapter 6F – TTC Zone Devices

## 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

Figure 6F-4, Vehicle-Mounted Signs for Temporary Traffic Control

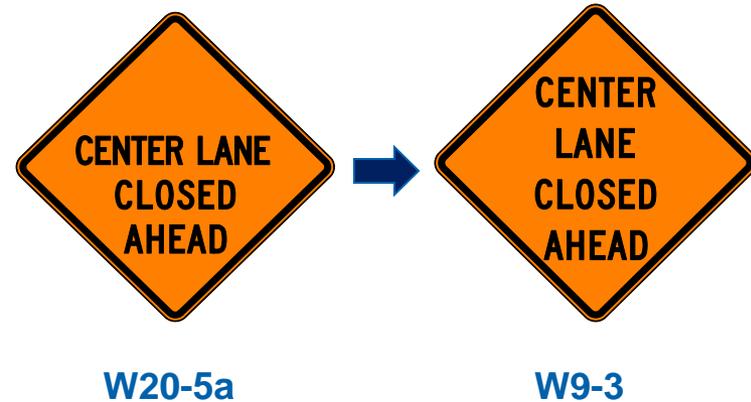
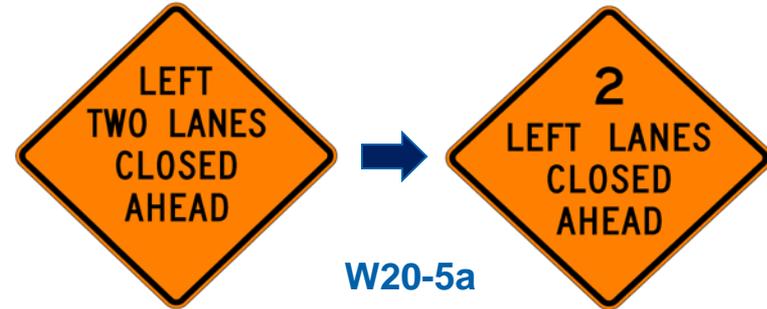
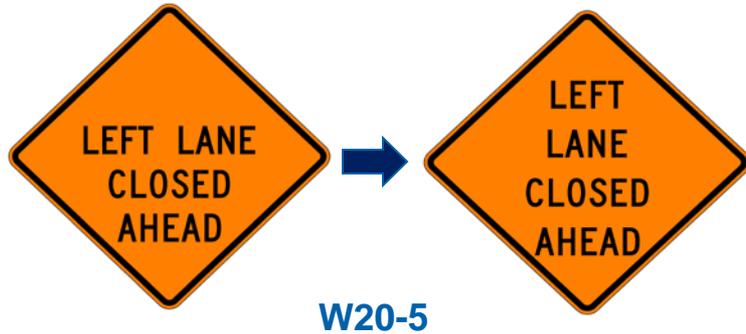
 LANE CLOSED <b>DO NOT PASS</b> R4-V6	 ROAD WORK AHEAD RIGHT SHOULDER CLOSED W20-V3R - MOWING AHEAD W20-V6R - SPRAYING AHEAD W20-V1R		
 ROAD WORK AHEAD RIGHT LANE CLOSED W20-V2R W20-V3R - MOWING AHEAD W20-V5R - LINE PAINTING AHEAD W20-V6R - SPRAYING AHEAD W20-V8R - PRESTORM TREATMENT	VARIOUS MESSAGES: CENTER LANE CLOSED LEFT LANE CLOSED 2 RIGHT LANES CLOSED 3 RIGHT LANES CLOSED 2 LEFT LANES CLOSED	 PRE-STORM TREATMENT W20-V9   KEEP BACK 100 FT W20-V10	
 SLOW MOVING VEHICLE W21-4	 PILOT CAR FOLLOW ME G20-4	 WORK VEHICLE DO NOT FOLLOW G20-V1	 CAUTION FREQUENT STOPS G20-V4

Figure 6F-5, Exit, Pull Off Area, Exit Open, and Detour Signs for Temporary Traffic Control

 EXIT OPEN E5-2	 EXIT CLOSED E5-2a	 EXIT ONLY E5-3	 EXIT E5-V1R	 PULL OFF AREA E5-V2R
 DETOUR M4-8	 END DETOUR M4-8a	 DETOUR M4-9R M4-9R (V)	 DETOUR M4-9aR	 DETOUR M4-9bR
 DETOUR M4-9cR	 DETOUR M4-V1	 DETOUR M4-V2R	 DETOUR M4-V3R	 DETOUR M4-V4R
 NORTH 29 M4-V5a 2-DIGITS	 WEST 1545 M4-V5b 3 or 4 -DIGITS	 Joe's Diner M4-V6aR	 Johnny's Motors M4-V6bR	WEST 50 DETOUR OR INTERSTATE 95 DETOUR LONG - TERM STATIONARY DETOUR ASSEMBLY
M4-VP1a  Main St DETOUR M4-VP1a	M4-VP1b  Main St North DETOUR M4-VP1b LONG - TERM STATIONARY DETOUR ASSEMBLY	 DETOUR M4-10R		

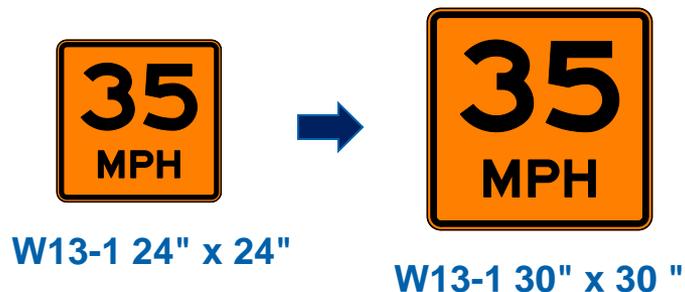
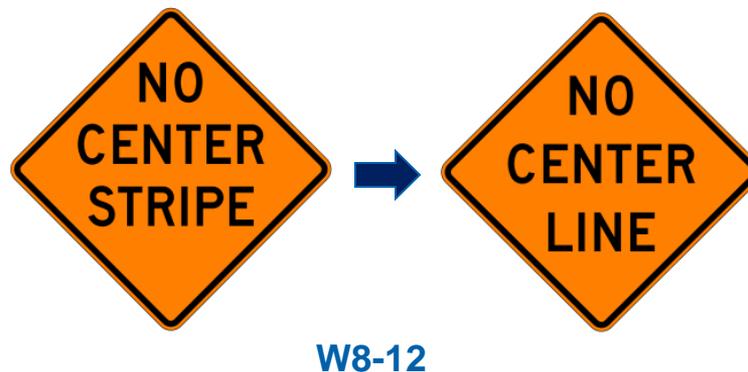
## Chapter 6F – TTC Devices

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



## Chapter 6F – TTC Devices

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



## Chapter 6F – TTC Devices

### Business Entrance Signs



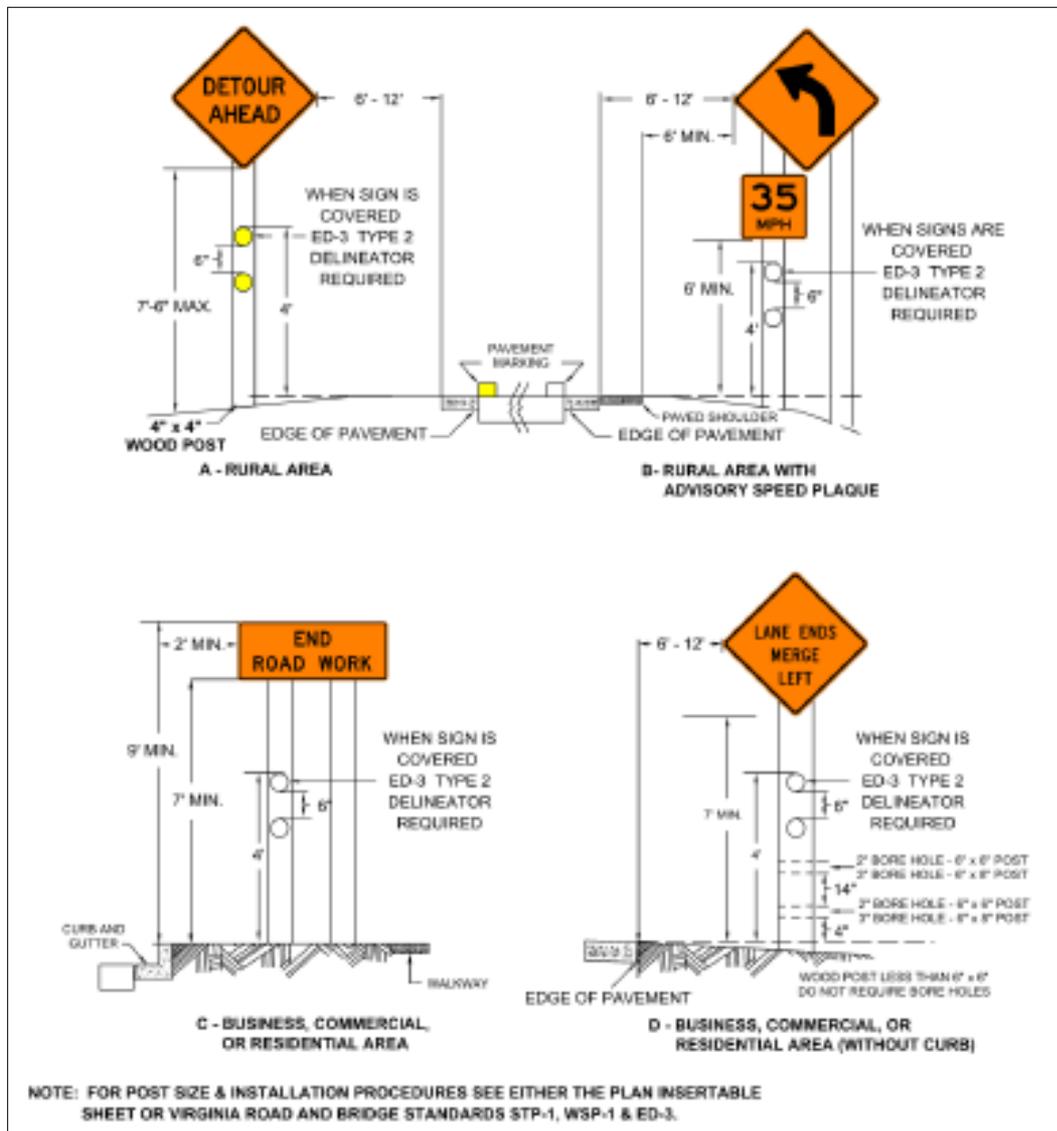
M4-V6aR



M4-V6bR

- 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

## Updated Figure 6F-1, Height and Lateral Location of Signs – Typical Post- Mounted Installations



## Chapter 6F – TTC Zone Devices

### 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



## Chapter 6F – TTC Zone Devices

### 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

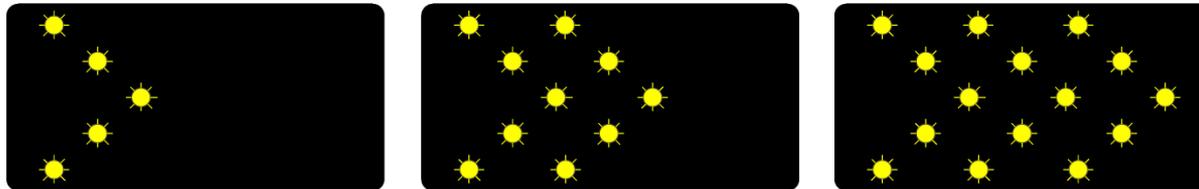
- Signs shall be reviewed after setup and periodically during each work shift
- Expands on covering signs when not in use with silt fence and plywood. No duct tape allowed on the face of a sign.
- Signs and their supports may be stored behind barrier, guardrail or outside the construction clear zone.



## Chapter 6F – TTC Zone Devices

### 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



Sequential Chevron Arrow Display

# Chapter 6F – TTC Zone Devices

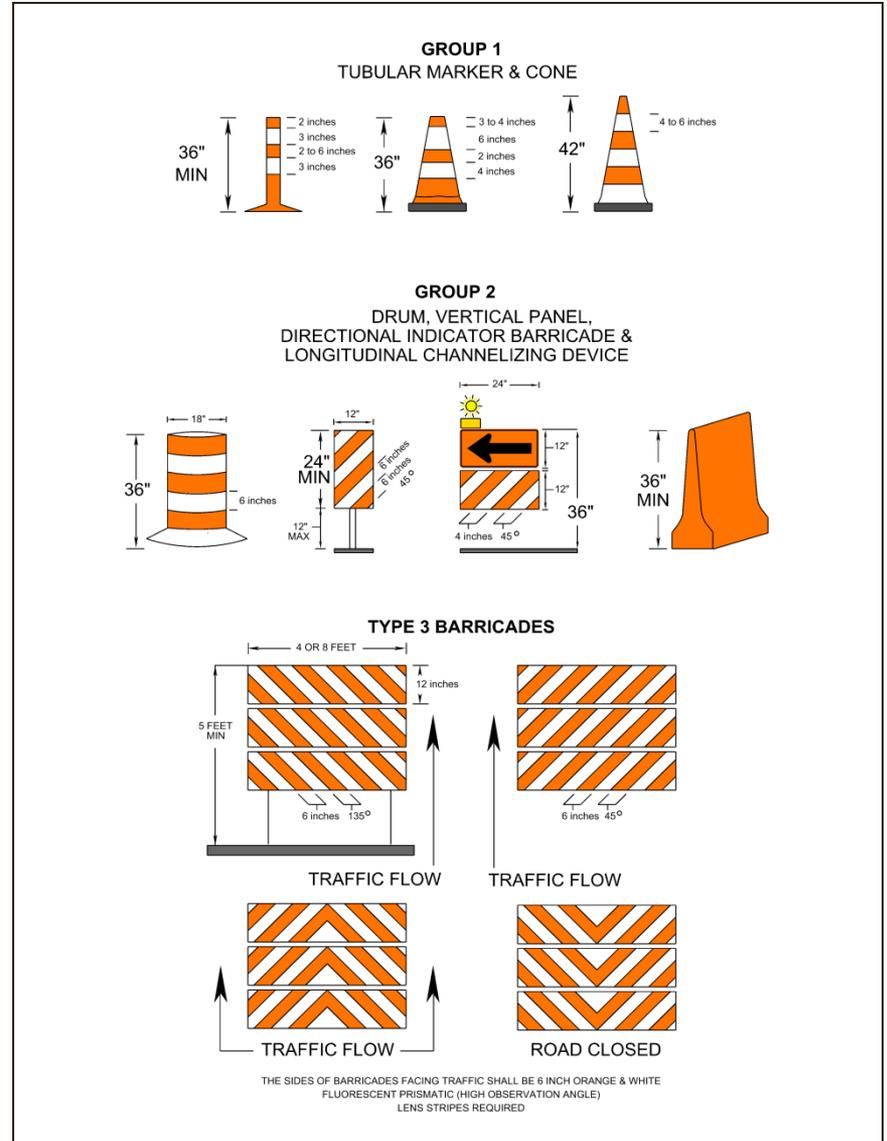
## Section 6F.71 - 81 Group 1 and Group 2 Channelizing Devices

### Updated - CHANNELIZING DEVICES

### New Group 2 Channelizing Devices

### Directional Indicator Barricade

### Longitudinal Channelizing Device



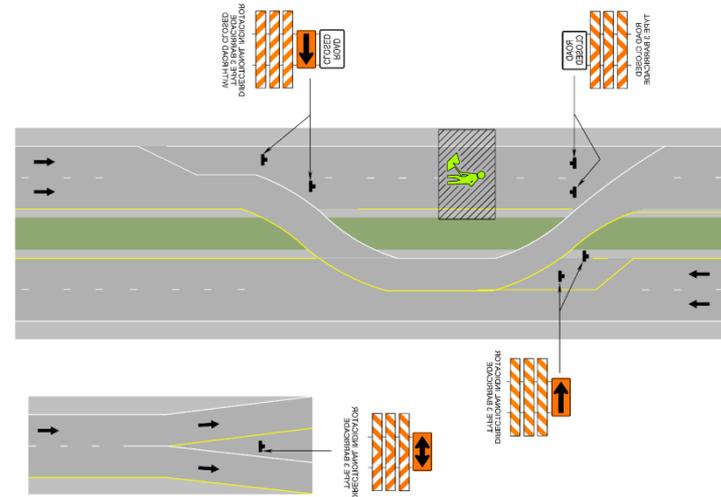
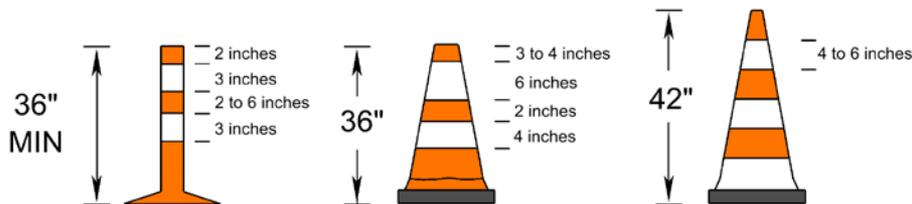
# Chapter 6F – TTC Zone Devices

## Section 6F.71 - 81

### Group 1 and Group 2 Channelizing Devices

- Group 1 devices require retroreflective sheeting
- Sheeting 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

**GROUP 1  
TUBULAR MARKER & CONE**



## Chapter 6F – TTC Zone Devices

### 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.*

## Chapter 6F – TTC Zone Devices

### 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.



## Chapter 6F – TTC Zone Devices

### Section 6F.71 - 81

### Group 1 and Group 2 Channelizing Devices

#### Temporary Raised Islands

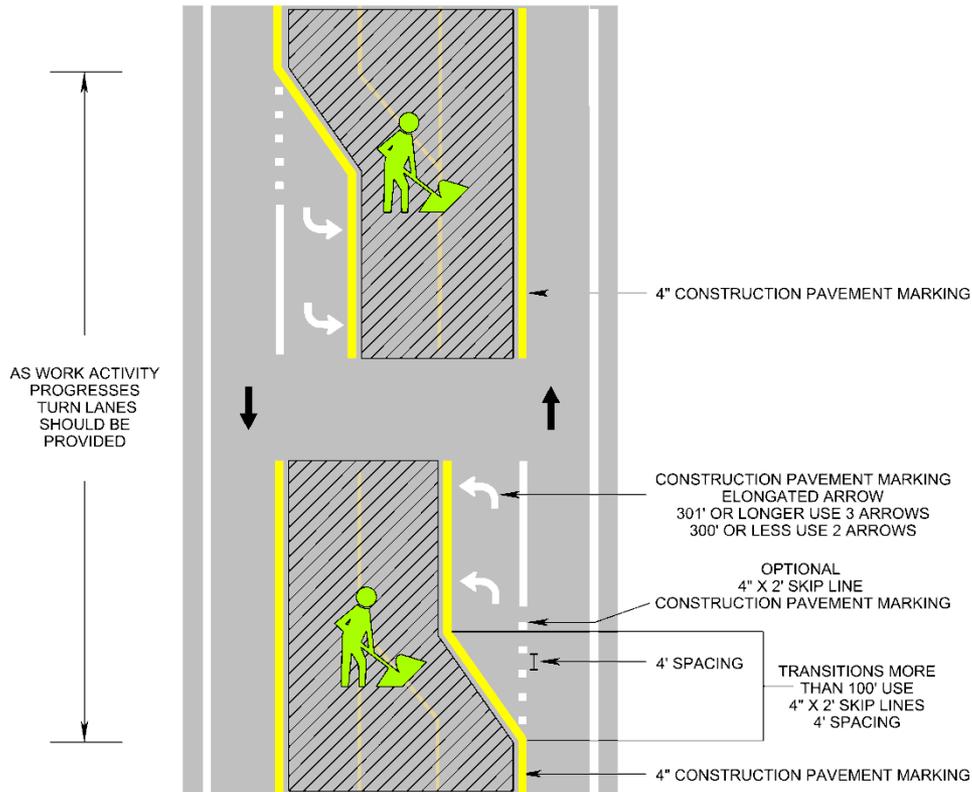
- Requires to be painted with Type A Paint matching pavement marking
- Used to separate traffic on 2-lane, 2-way operations on roadways having up to 15,000 ADT
- Requires retroreflective flex-post delineators (orange)
  - Height 36 to 42 inches by minimum 2 inches wide
  - Requires two 3 inch white retroreflective bands



# Chapter 6F – TTC Zone Devices

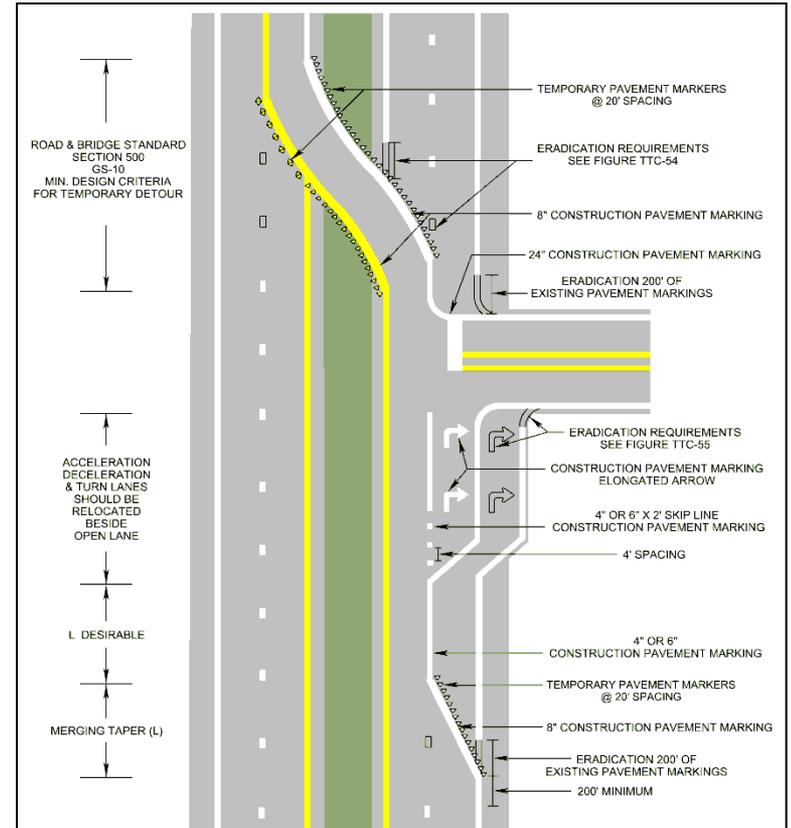
## NEW - Figures 6F-10 & 11

### Construction Pavement Marking for Tapers and Turn Lanes



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

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



NOTE: FOR ELONGATED ARROW AND SKIP LINE DETAILS SEE ROAD AND BRIDGE STANDARDS PM-3 TO PM-6

## Chapter 6F – TTC Zone Devices

### 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.**



## Chapter 6F – TTC Zone Devices

### 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'.**

## Chapter 6G - Type of TTC Zone Activities

**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

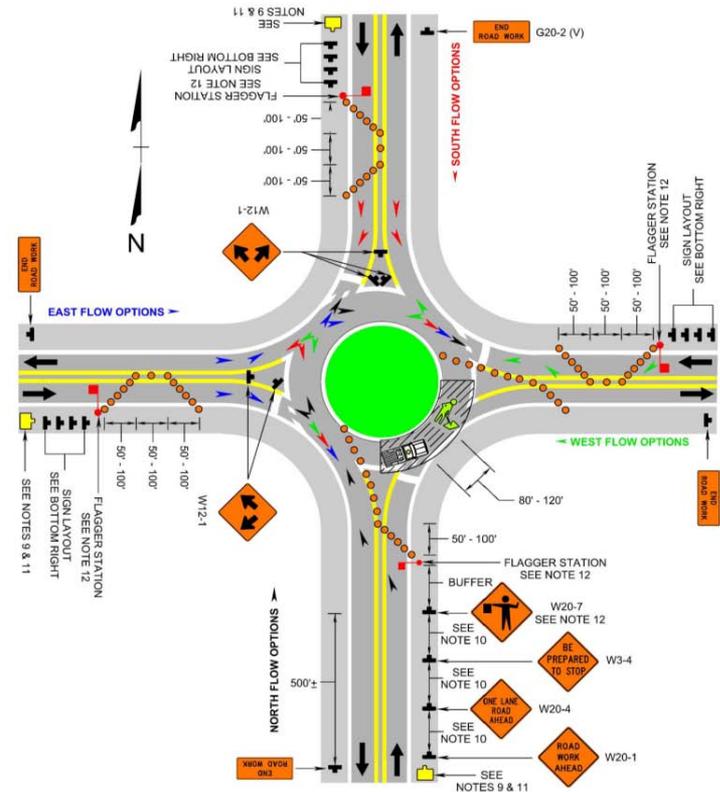
- Detours and diversions shall be reviewed and approved by the Regional Traffic Engineer prior to implementation



## 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.

Flagging Operation on a Single Lane Roundabout  
(Figure TTC-31.0)



# Chapter 6G - Type of TTC Zone Activities

**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

Posted Speed (mph)	20	25	30	35	40	45	50	55	60	65	70
Minimum ISD (Feet)	195	240	290	335	385	430	480	530	575	625	670
Height of eye – 3.5 ft. Height of object – 3.5 ft.											

# Chapter 6H – Typical Applications

## 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.

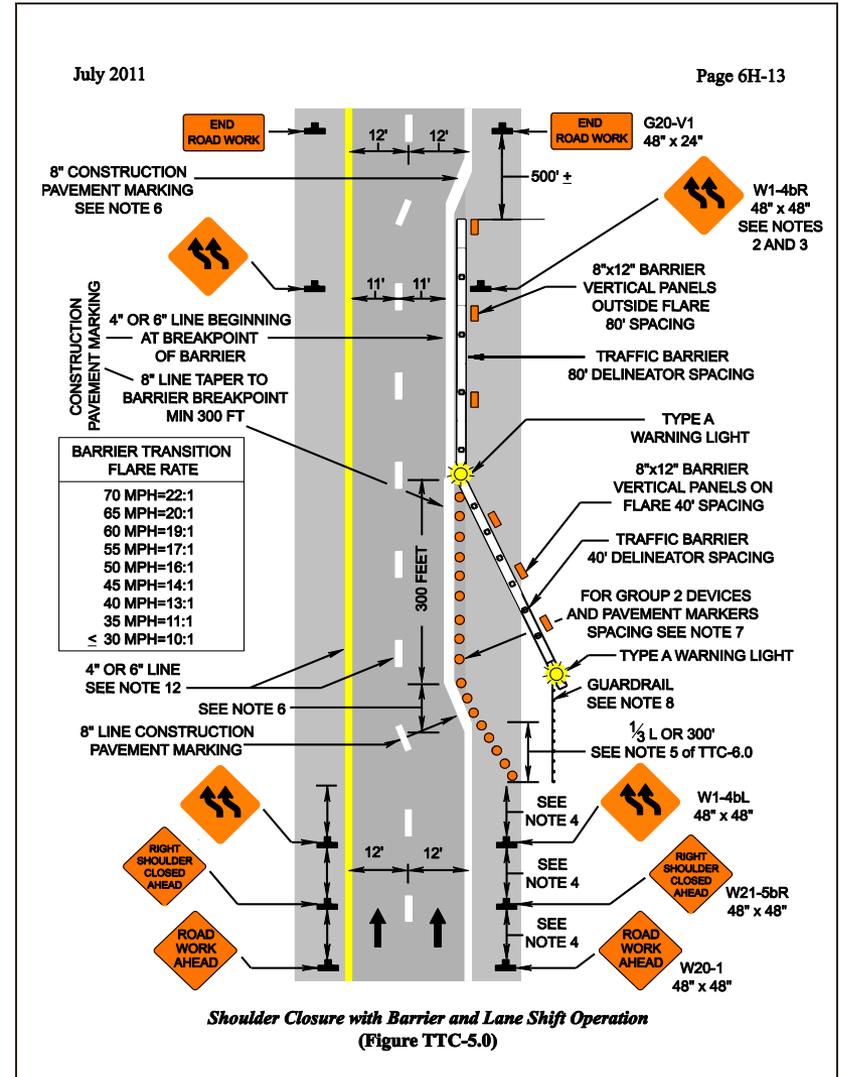
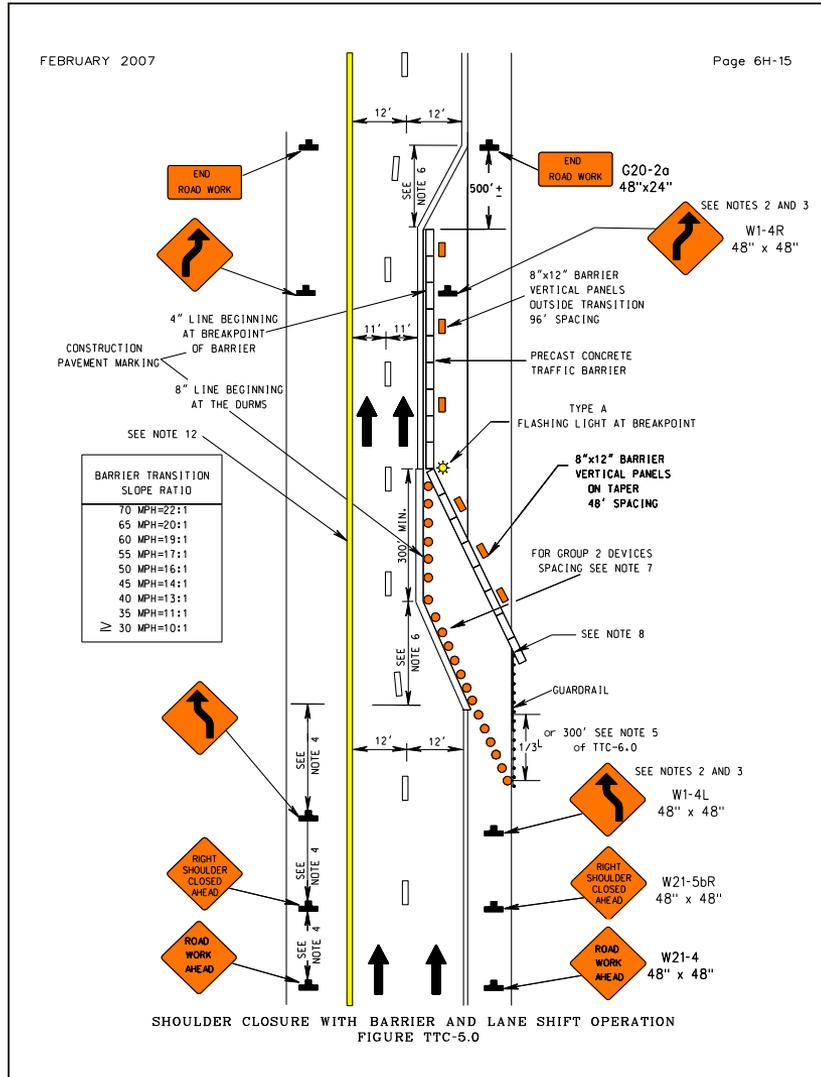
	ARROW BOARD		CHANGEABLE MESSAGE SIGN SUPPORT OR TRAILER
	ARROW BOARD ON TRAILER		ARROW BOARD ON VEHICLE
	CHANNELIZING DEVICE		TEMPORARY CONCRETE BARRIER
	ACTIVE TRAFFIC SIGNAL		LONGITUDINAL CHANNELIZING DEVICE
	INACTIVE TRAFFIC SIGNAL		TYPE 3 BARRICADE
	TRAFFIC OR PEDESTRIAN SIGNAL		SIGN
	FLAGGER		HIGH-LEVEL WARNING DEVICE (FLAG TREE)
	1 WAY PAVEMENT MARKER		2 WAY PAVEMENT MARKER
	WORK VEHICLE		TRACTOR
	TRUCK MOUNTED ATTENUATOR		SLOW MOVING VEHICLE EMBLEM
	LAW ENFORCEMENT VEHICLE		WARNING LIGHT
	WORK SPACE		MILLED PAVEMENT
	RUMBLE STRIPS		DIRECTION OF TRAFFIC
	IMPACT ATTENUATOR		AUTOMATED FLAGGER ASSISTANCE DEVICE

## Chapter 6H – Typical Applications

### 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





## 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**

**Standard:**

- 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.
- 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.
- When the TTC signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.
- 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.
- Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.
- A RESTRICTED WIDTH ROUTE (R5-V1) 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.
- The Regional Traffic Engineer shall determine speed reductions.
- 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 barrier versus channelizing devices shall be determined. Group 2 channelizing device spacing shall be at the following:

Location	Posted Speed Limit (mph)	
	0 - 35	36 +
Transition Spacing	20'	40'
Travelway Spacing	40'	80'
Construction Access*	80'	120'

\* Spacing may be increased to this distance, but shall not exceed one access per ¼ mile.

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

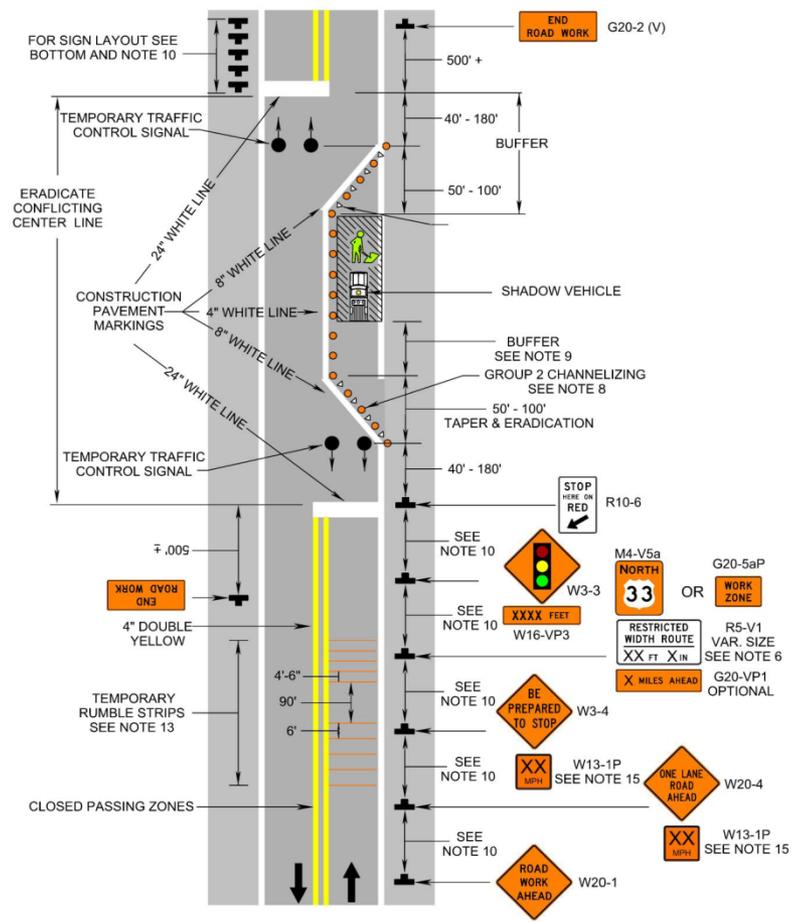
**Guidance:**

- Sign spacing distance should be 350'-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 sign 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.
- Where no-passing lines are not already in place, they should be added.
- Additional RESTRICTED WIDTH ROUTE (R5-V1) signs should be installed on the approaches of the alternate route to alert traffic intending to turn onto the restricted route.

**Option:**

- Temporary rumble strips may be used to enhance the work zone.
- Flashing warning lights may be used on advance warning signs.
- Advisory Speed (W13-1P) plaques may be added to the ONE LANE ROAD AHEAD (W20-4) and BE PREPARED TO STOP (W3-4) signs as directed by the Regional Traffic Engineer.
- Temporary Signals may be replaced with either a STOP (R1-1) condition or YIELD (R1-2) condition based on an engineering study and approval of the Regional Traffic Engineer.

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







# Chapter 6H – Typical Applications

## Temporary Traffic Control Figure TTC-34 Street Closure Operation with Detour

- New TTC Figure

**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 used in advance of a turn.
3. Sign spacing distance should be 225'-275' where the posted speed limit is 30 to 35 mph, and 100' -200' where the posted speed limit 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 (M4-10) signs on Type 3 Barricades should be located at the corners of intersecting closed roadway or the traveled way.

Option:

5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
6. Flashing warning lights may be used on Type 3 Barricades.
7. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
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.

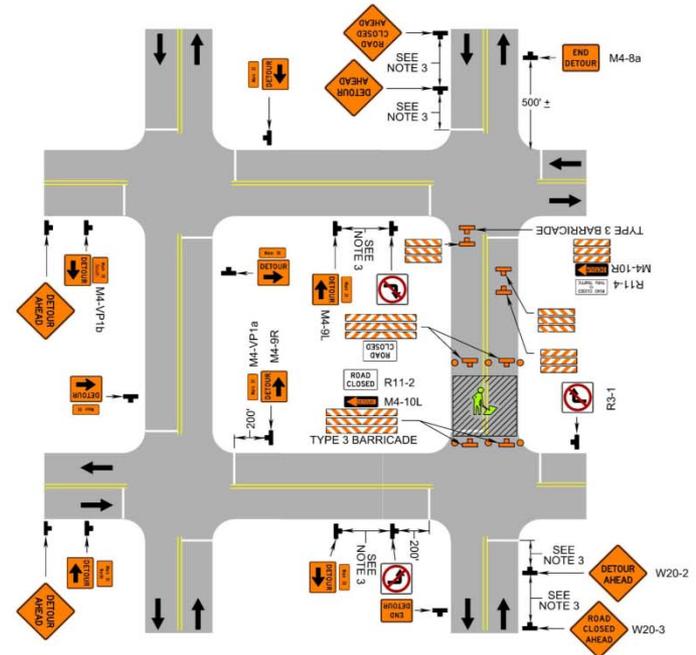
**Standard:**

9. When used, the Street Name plaque shall be placed above the Detour sign.

**Support:**

10. See Chapter 6I for additional information on incident management traffic control.

**Street Closure Operation with Detour**  
(Figure TTC-34.0)



# 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'-800' 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 in advance of the lane shift, 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 curved alignment should meet the design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) and current Virginia Road and Bridge Standard GS-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:
 

Location	Posted Speed Limit (mph)	
	0 - 35	36 +
Transition Spacing	20'	40'
Travelway Spacing	40'	80'
Construction Access*	80'	120'

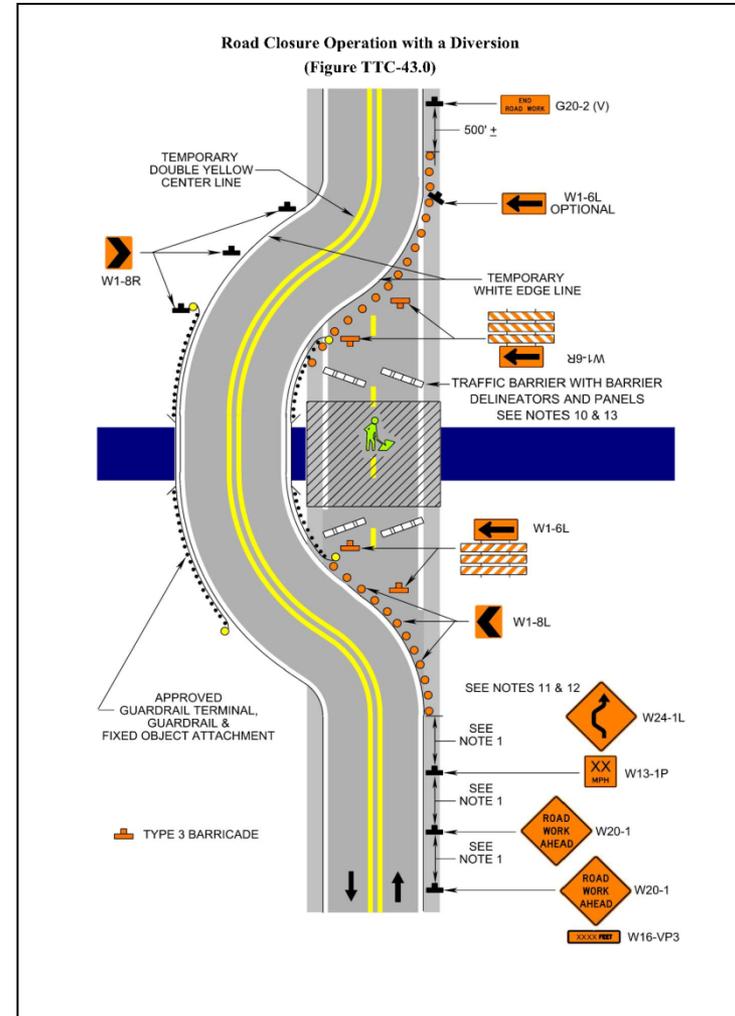
 \* Spacing may be increased to this distance, but shall not exceed one access per ¼ mile.
9. Pavement markings and markers no longer applicable to the traffic pattern of the roadway shall be removed or obliterated before any new traffic patterns are open to traffic (see Figure TTC-60).

**Guidance:**

10. Temporary barrier should be placed at a 45° angle to the travelway a sufficient distance beyond the Type 3 Barricade but before the work space while providing equipment 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 30 mph or less, Reverse Turn (W1-3) 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. ReflectORIZED 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-46

### Limited Access Highway Closure Operation with an Off Site Short Term Detour

- New TTC Figure

**Typical Traffic Control**  
**Limited Access Highway Closure Operation with a Short Term Detour**  
**(Figure TTC-46.0)**

**NOTES**

*Guidance:*

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 (M4-V3) should have a spacing distance of 300' minimum in advance of the intersection. The Detour signs with the Point of Turn Arrow (M4-9) should be placed at the intersection.
4. When closing a ramp, the channelizing device spacing should be a maximum of 10'.

*Option:*

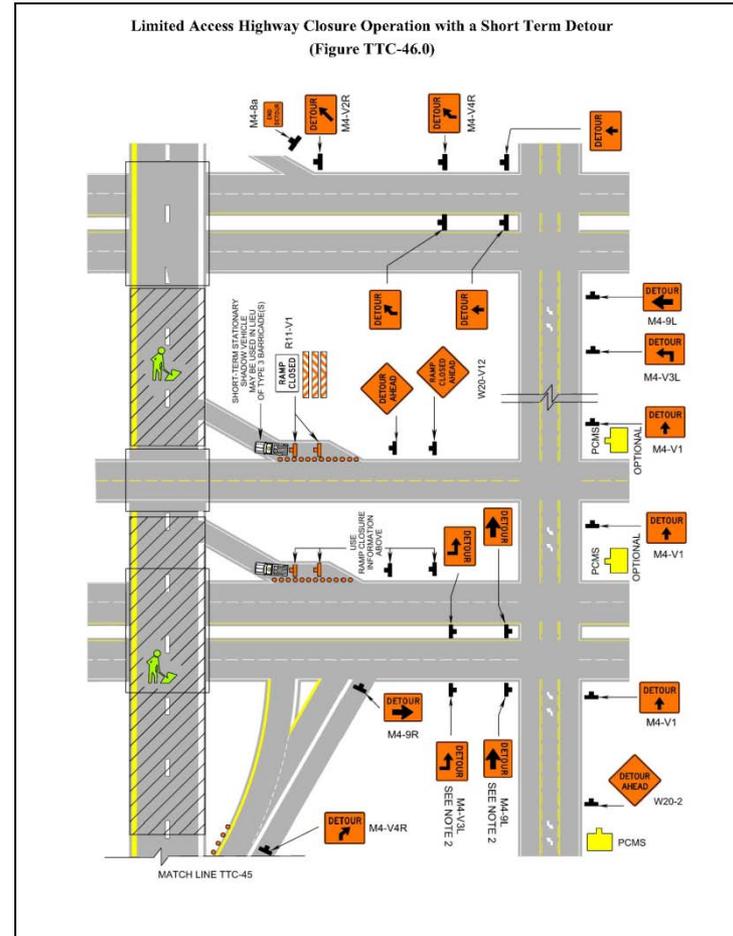
5. Other sign layouts may be substituted as directed by the Regional Traffic Engineer.
6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

**Standard:**

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 6F-6).

*Support:*

9. Short-term stationary operation is daytime work that occupies a location for more than 1 hour within a single daylight period.
10. See Chapter 6I for additional information on 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**  
*Limited Access Highway Closure Operation with a Long Term Detour*  
**(Figure TTC-47.0)**

**NOTES**

*Guidance:*

1. Regulatory traffic control devices should be modified as needed for the duration of the detour.
2. Figure TTC-47 illustrates a general layout of detour signs. Additional detour signs should be erected at all connecting roadways.
3. The detour sign assemblies with the Advanced Turn Arrow (MS-1) sign should have a spacing distance of 300' minimum in advance of the intersection. The detour sign assemblies with the Point of Turn arrow (M5-3 and M6-1) signs should be placed at the intersection.
4. When closing a ramp, the channelizing device spacing should be a maximum of 10'.

*Option:*

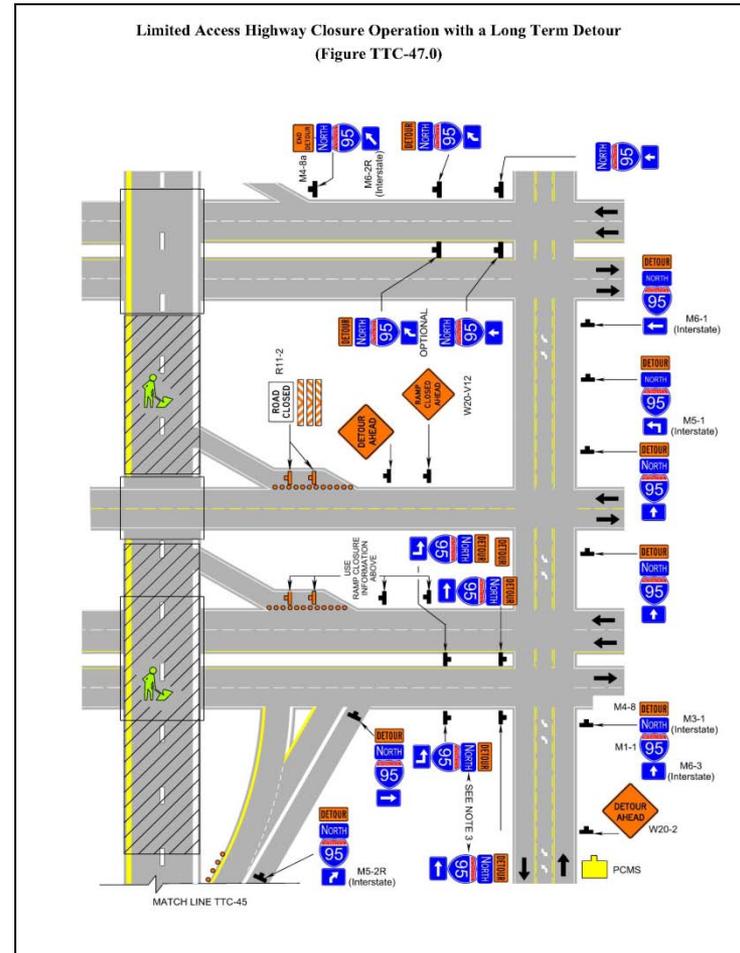
5. Other sign layouts may be substituted as directed by the Regional Traffic Engineer.
6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
7. Cardinal direction plaques may be used with route signs.

**Standard:**

8. On divided highways having a median wider than 8', right and left sign assemblies shall be required.
9. 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 6F-6).

*Support:*

10. Long-term stationary operation is work that occupies a location more than 3 days.
11. See Chapter 6I for additional information on incident management traffic control.



## Temporary Traffic Control Figure TTC-48 Road Closure Operation with a Detour

- New TTC Figure

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

**NOTES**

*Guidance:*

- Regulatory traffic control devices should be modified as needed for the duration of the detour.
- Sign spacing distance should be 500'-800' 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.
- If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED LOCAL TRAFFIC ONLY (R11-3a) and DETOUR (M4-10) signs on Type 3 Barricades should be located at the corners of intersecting closed roadway or the traveled way.

**Option:**

- If the road is open for some distance beyond the intersection the Route Sign Directional assembly may be placed in the travelway as shown to augment or replace the one shown on the corners.
- Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- Cardinal direction plaques may be used with route signs.

**Standard:**

- On divided highways having a median wider than 8', right and left sign assemblies shall be required.
- 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:**

- Long-term detours may be signed with a street name (M4-VP1a or M4-Vp1b) plaque above the DETOUR (M4-9 or M4-V4 series) sign (see Figure TTC-34).

**Support:**

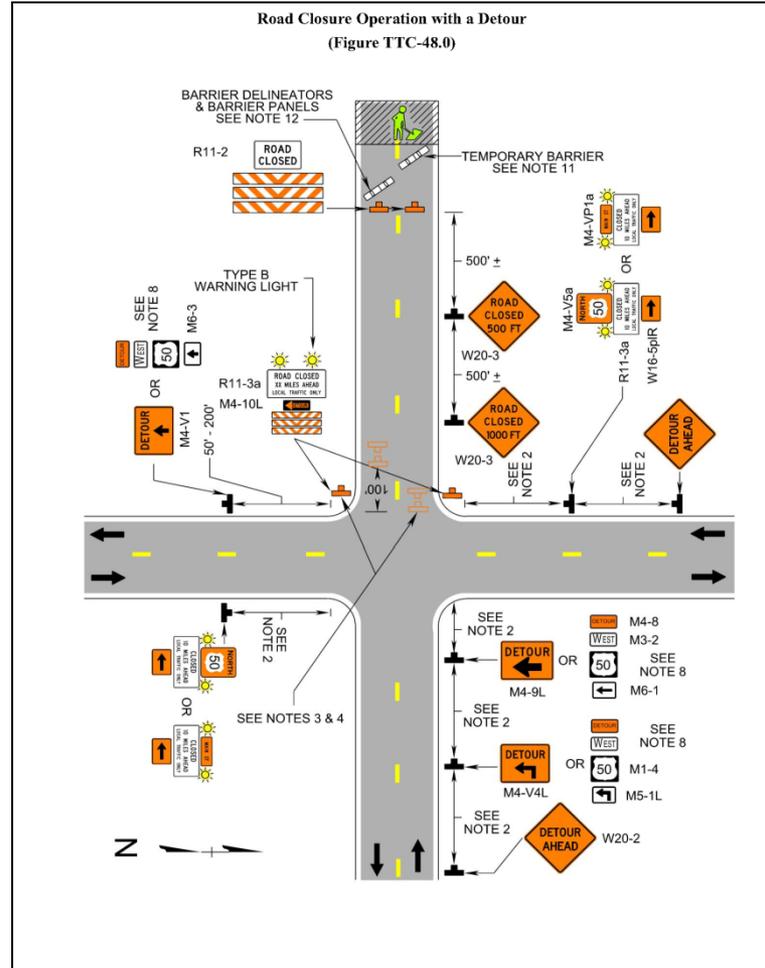
- See Chapter 61 for additional information on incident management traffic control.

*Guidance:*

- Temporary barrier should be placed at a 45° angle to the travelway a sufficient distance beyond the Type 3 Barricade but before the work space while providing equipment access to the work space.

**Standard:**

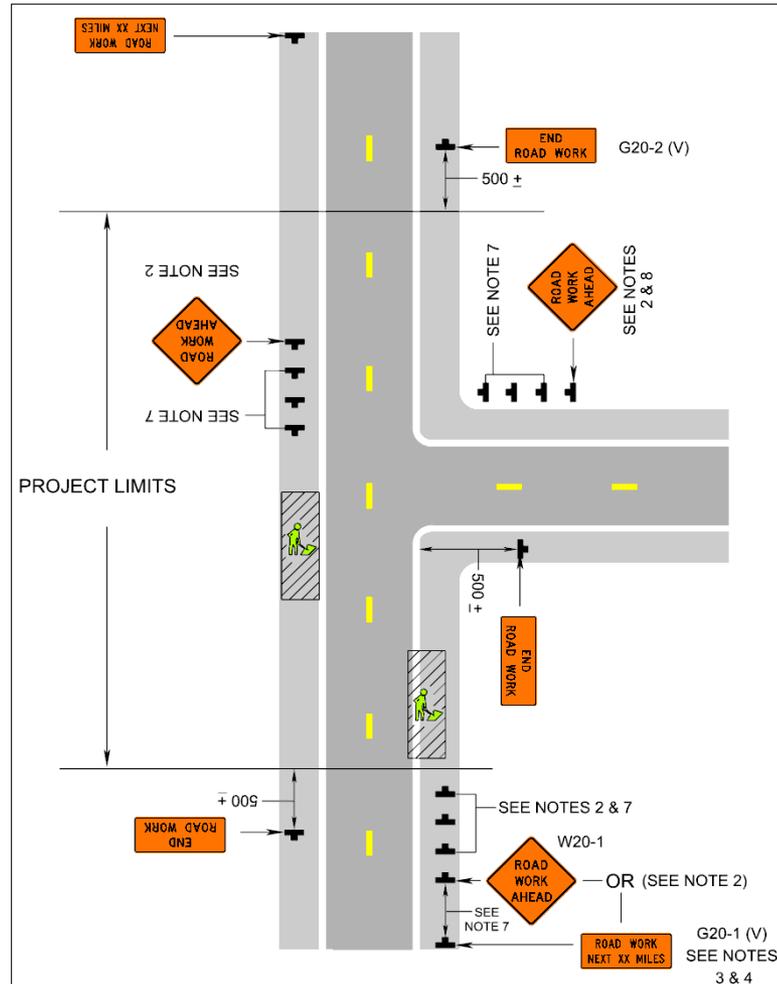
- Barrier panels 8 inches in width and 12 inches in height shall be placed on top of the temporary concrete barrier, perpendicular to traffic, and spaced 20' on centers along the taper sections. ReflectORIZED surface shall be fluorescent orange prismatic lens sheeting. Barrier delineators shall be installed 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.
- 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 Traffic Control Figure TTC-60 Temporary Pavement Marking and Marker Guidelines

- New TTC Figure

**Typical Traffic Control**  
*Temporary Pavement Marking and Marker Guidelines*  
(Figure TTC-60.0)

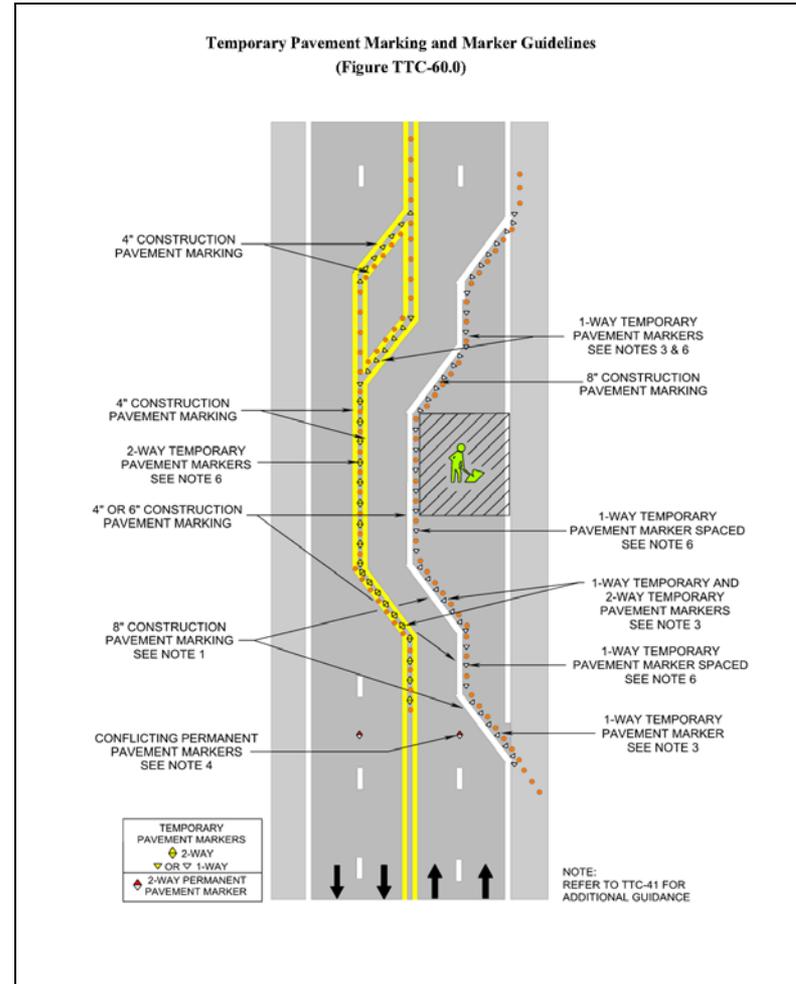
NOTES

**Standard:**

1. Unless otherwise noted, construction pavement marking lane lines in transitions shall be 8 inches in width.
2. For long-term stationary work (more than 3 days duration), existing conflicting pavement markings shall be removed and temporary markings shall be installed.
3. Temporary pavement markers, on 20 foot center to center spacing, shall be installed in transitions.
4. Conflicting permanent pavement markers shall be covered or removed.
5. Eradication of existing pavement markings shall be as shown in Figure TTC-55.

**Option:**

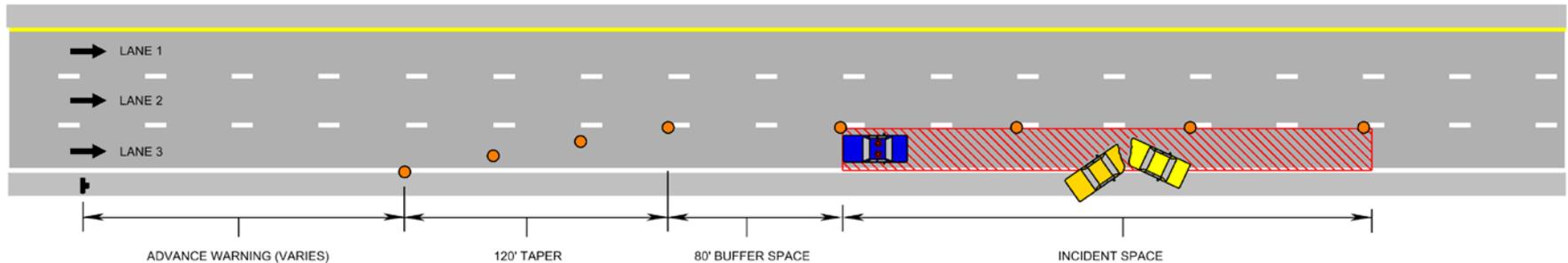
6. Temporary pavement markers, on a 40' center to center spacing, may be added between transitions/shifting tapers as directed by the engineer.
7. For short-term stationary work (less than 3 days duration), lanes may be delineated by retroreflectORIZED channelizing devices or removable pavement marking instead of temporary pavement markings.





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

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





## Updated Chapter 6I -

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



M4-9L (V)  
36" X 30"



M4-9R (V)  
36" X 30"



M4-V1  
36" x 30"



W20-V25



W20-2



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

Traffic Incident Levels (Based on Traffic Impact)		
Level 1	Minor	Impact to the traveled roadway is estimated to be less than 30 minutes with no lane blockage or with minor lane blockage
Level 2	Intermediate	Impact to the traveled roadway is estimated to be between 30 minutes and 2 hours with lane blockages, but not full closure of the roadway
Level 3	Major	Impact to the traveled roadway is estimated to be more than 2 hours, OR the roadway is closed in any single direction; significant area-wide congestion is expected



## Updated Chapter 6I -

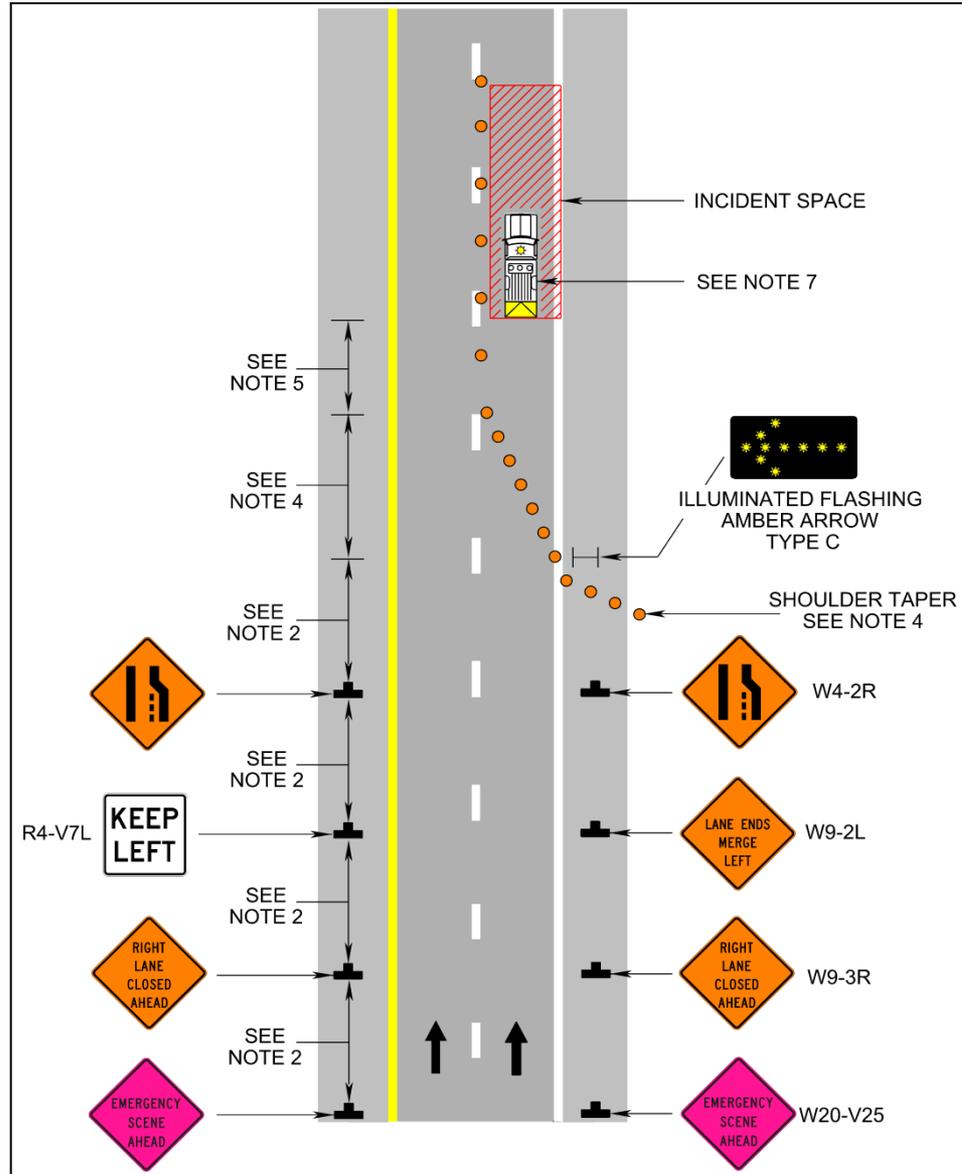
Table 6I-2, Index to Traffic Incident Management Control Figures and Notes

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

# Chapter 6I



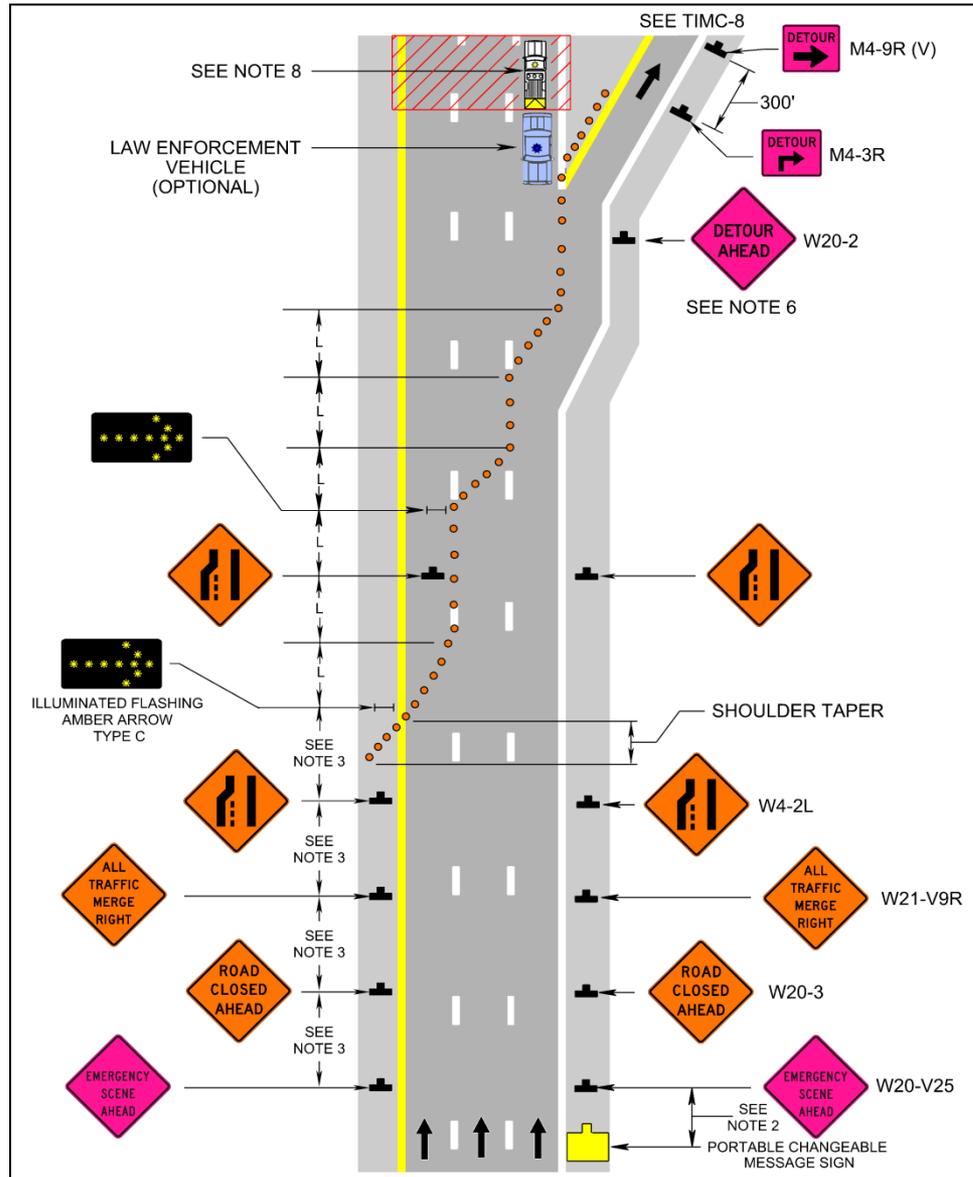
## TIMC-2.0



# Chapter 6I



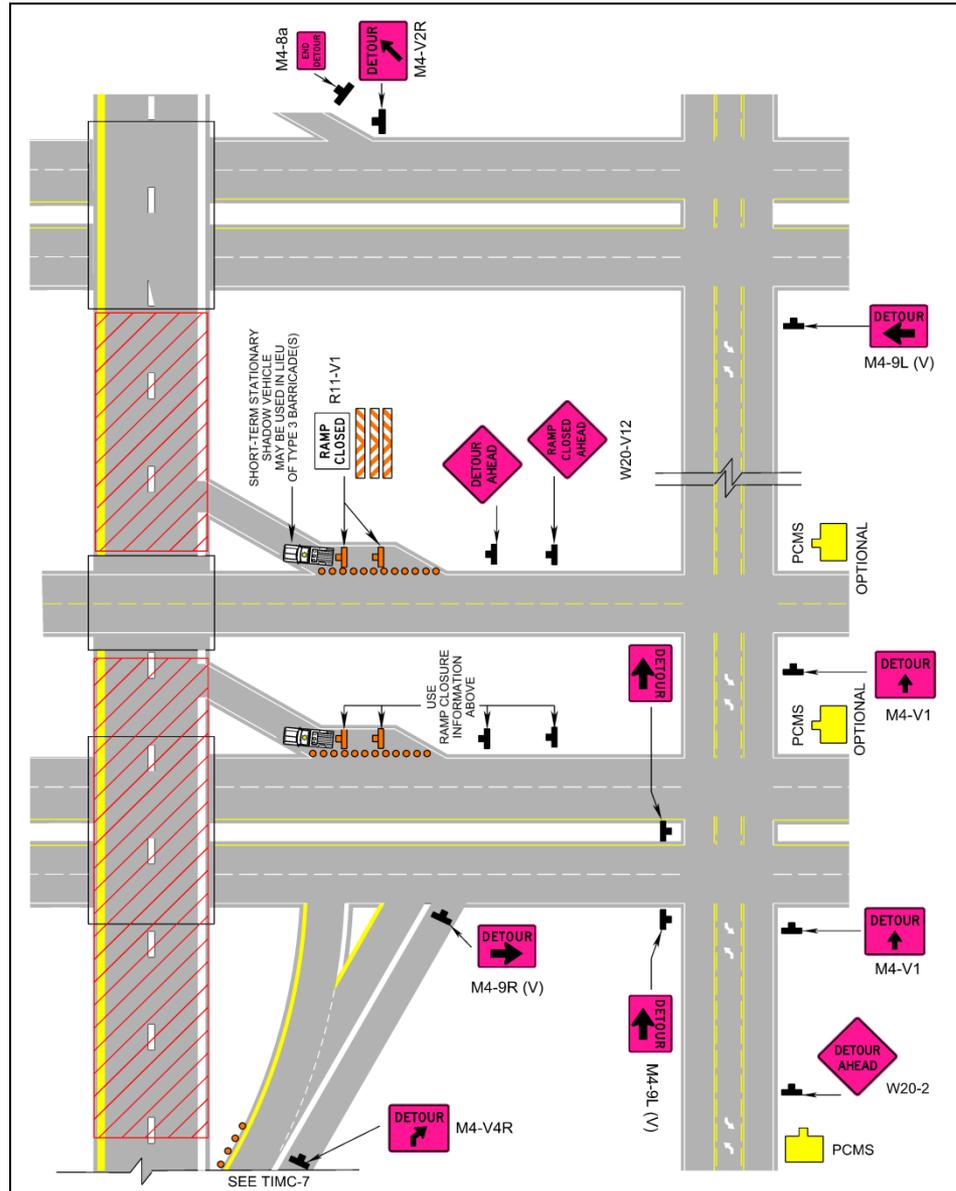
## TIMC-7.0



# Chapter 6I



## TIMC-8.0



# Appendix A

## Appendix A – Major Changes GUIDELINES FOR THE USE OF BARRIER/CHANNELIZING DEVICES IN WORK ZONES



## Appendix A - GUIDELINES FOR THE USE OF BARRIER/CHANNELIZING DEVICES IN WZs

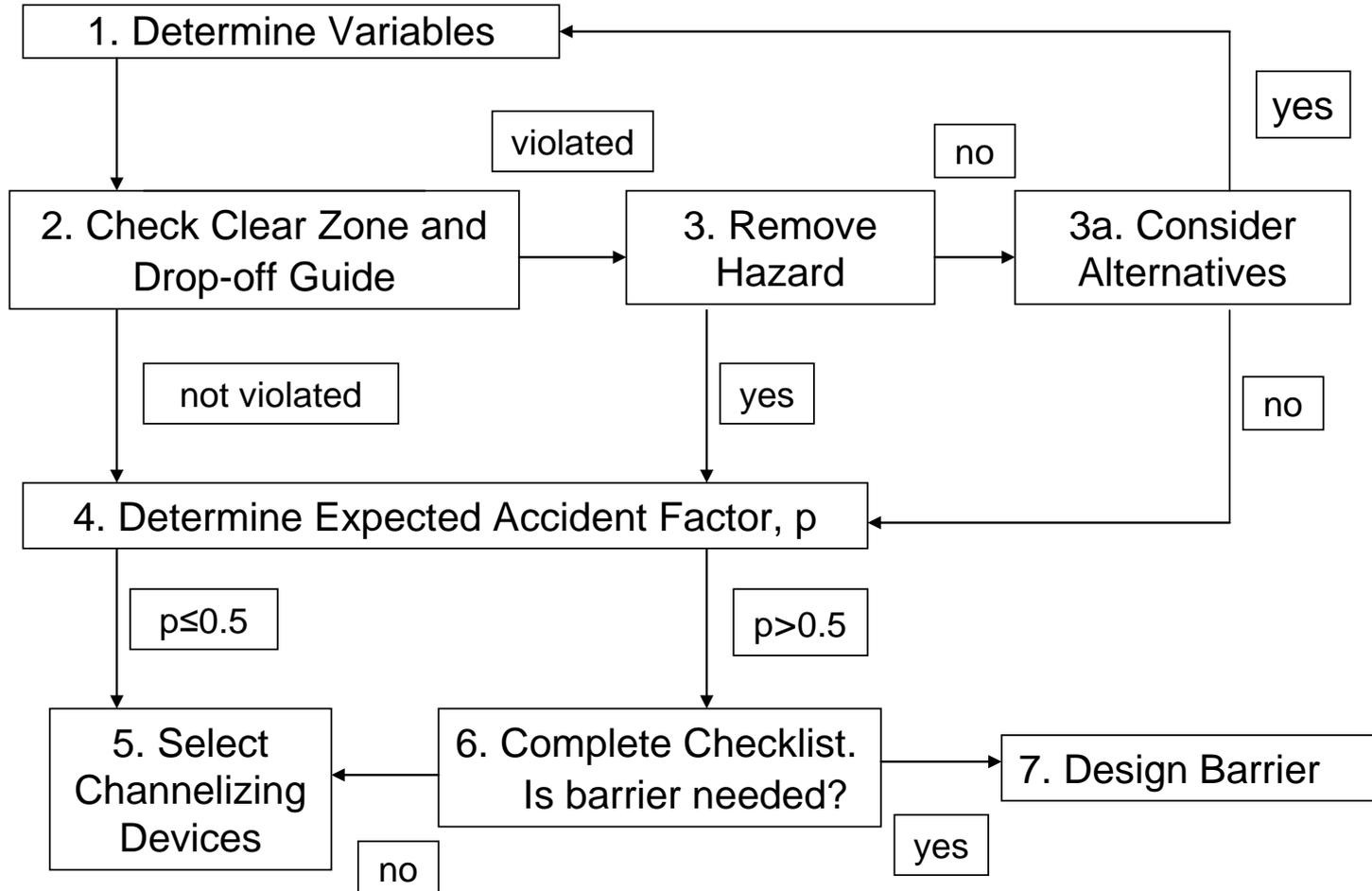
**This is a complete revision on the guidance on the selection and use of channelization and barrier devices. Defined the process on the selection and use of channelization and barrier devices.**

### **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

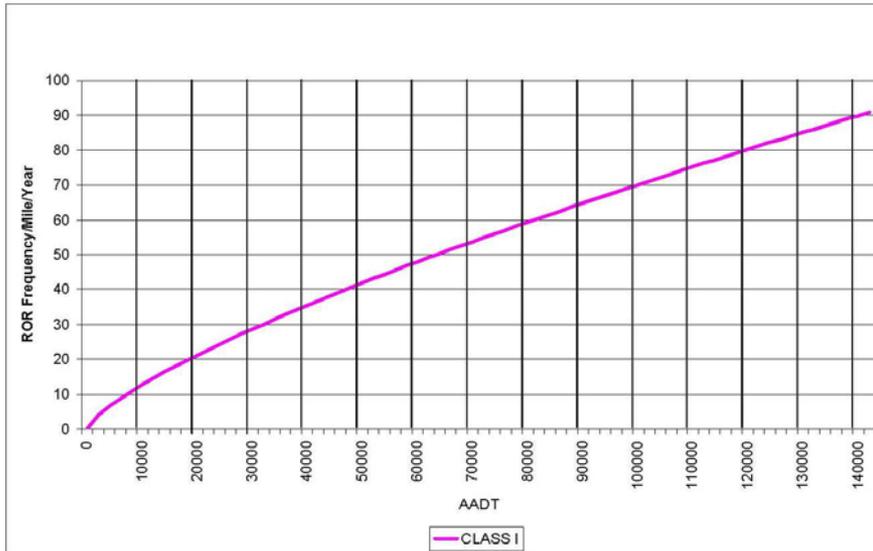
## 7 Step Flow Chart Selection Process





## New Run off Road Frequency Factor Charts for Limited Access Highways & Example

Figure 3a. ROR Frequency Factor Chart for Limited Access Highways



### 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.

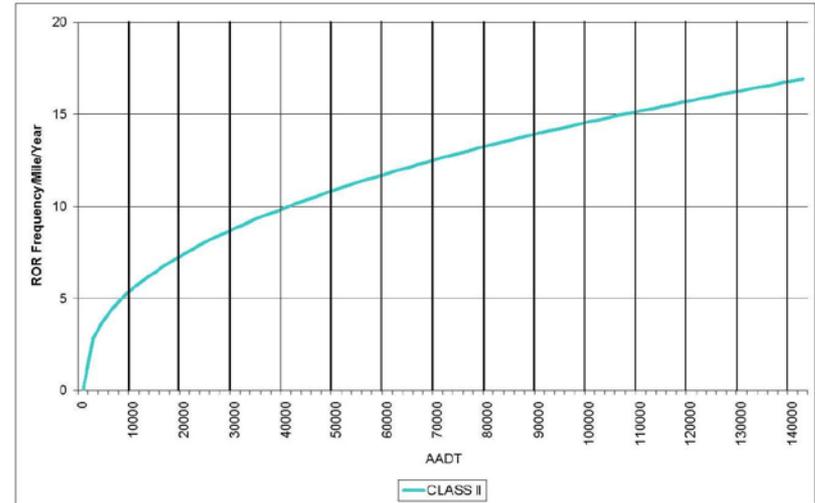
A bridge deck on an Interstate highway with 3 lanes in each direction will require patching, milling of the deck and placement of a Latex overlay.  
 ADT = 50,000 (the ADT is for one direction only). However, the volume required all work to be performed between 9:00 pm and 6:00 am each day. Therefore, the volume to be used will be between these hours, 6,000 vehicles for the 9-hour period.  
 Length of Construction = Bridge length is 550 Ft., therefore, 0.2 mile will be used.  
 Construction time = 9 hours This is the actual time traffic is exposed to the hazard. {9 hrs ÷ (365d/yr x 24 hrs/d) = 0.001 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.

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

Figure 3b. 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) =  $f \times L \times T = 5 \times 0.5 \times 0.4 = 1.0$

If the expected ROR frequency is greater than 0.5, go to Table 1, Barrier-Channelizing Device Chart, to determine type needed.

## Appendix A

### 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

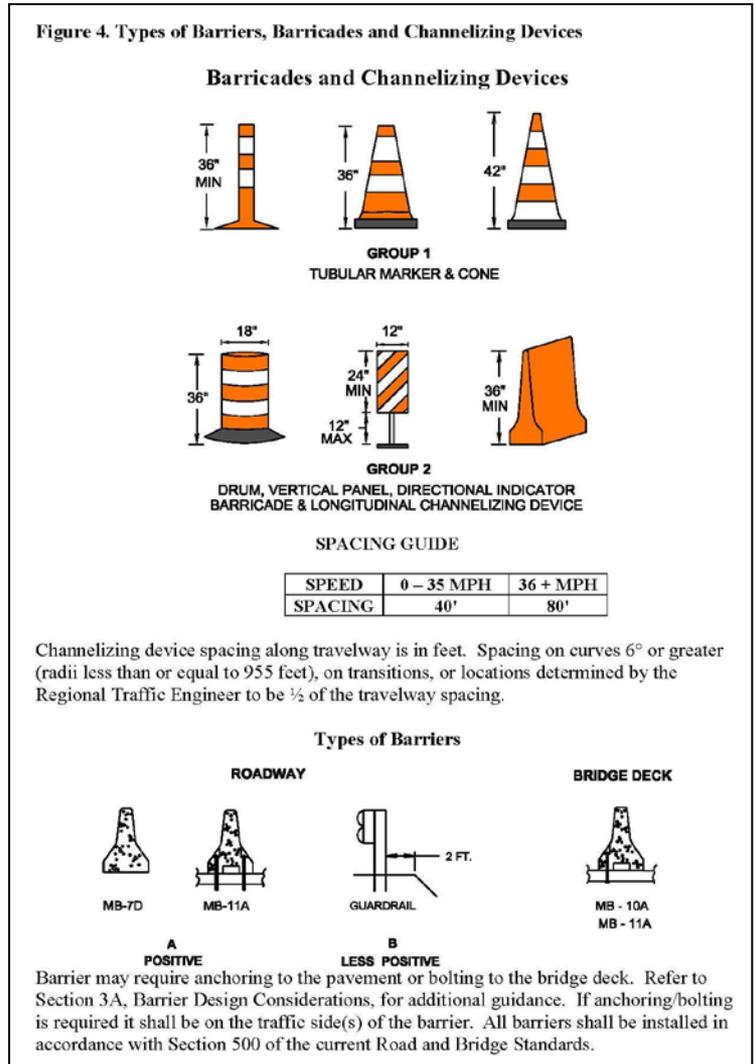
If barrier is warranted it provides guidance:

- 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



# Appendix A

## NEW

### Checklist for Guidelines of Channelizing Devices/Barrier Selection

August 2011 Page A-9

**ENGINEERING AND TRAFFIC INVESTIGATION  
WORK ZONE CHANNELIZATION/BARRIER ANALYSIS  
SECTION A**

Project No.:	Project's TMP Category:
Review Requested By:	Date of Request:
Project Scope:	Starting MP:
	Ending MP:
VDOT Project/Contract Manager:	Date of Review:

**SECTION B – ENGINEERING INVESTIGATION RESULTS**

<p><b>Reviewer(s):</b></p>    <p>Channelization/Barrier Device Selected (Check all that apply):</p> <p><input type="checkbox"/> Cones   <input type="checkbox"/> Drums   <input type="checkbox"/> Temporary Asphalt Median</p> <p><input type="checkbox"/> Guardrail   <input type="checkbox"/> Traffic Barrier Service Concrete</p>	
<p>Decision Justification (What was decided and why):</p>   	<p>(Office) (Office Location) (Title)</p>

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

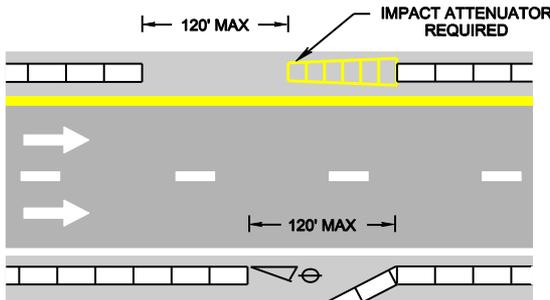
Page A-10 August 2011

<b>Checklist for Guidelines of Channelizing Device/Barrier Selection</b>	
<b>Information (Inputs)</b>	<b>Answers</b>
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: Density: 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?	
How long will they be exposed 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
<b>Decision Process (channelizing devices vs barrier)</b>	<b>Answers</b>
What is the expected ROR frequency, $p$ ( $p=f \times L \times T$ )?	
If the expected ROR frequency is greater than 0.5, does Table 1, "Channelizing Device/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.)	
Consider that barriers may allow the contractor to work anytime, which may reduce construction time. However, use of Group II's 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 4'? 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.)	
What is the installation time? (in hours or days)	

## Figure 5. Construction Access Technique and Introduced Barrier

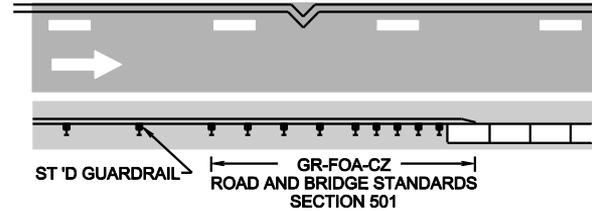
### CONSTRUCTION ACCESS TECHNIQUES

\*\*\* IMPACT ATTENUATORS USED WITH BARRIER OPENINGS FOR EQUIPMENT ACCESS WILL NOT BE MEASURED FOR SEPARATE PAYMENT; SECTION 512 ROAD AND BRIDGE SPECIFICATIONS.

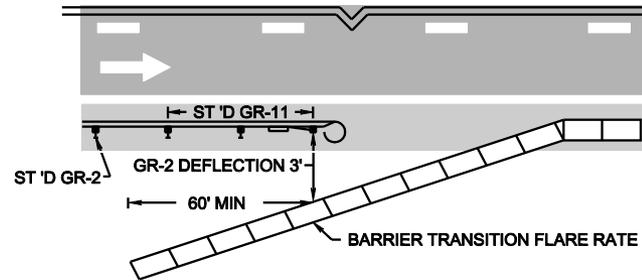


\*\*\* ATTENUATOR NOT REQUIRED IF  $\theta$  IS EQUAL TO OR GREATER THAN 20 DEGREES.  
SEE BARRIER TRANSITION FLARE RATE

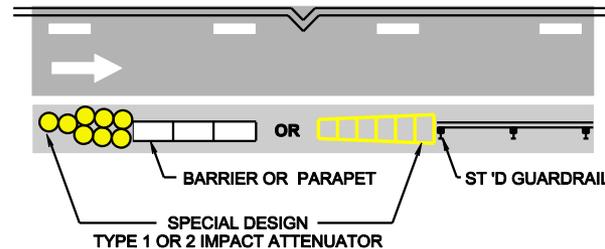
### INTRODUCED BARRIER (FIXED OBJECT)



OR



OR



### BARRIER TRANSITION FLARE RATE

70 MPH	= 22:1
65 MPH	= 20:1
60 MPH	= 19:1
55 MPH	= 17:1
50 MPH	= 16:1
45 MPH	= 14:1
40 MPH	= 13:1
35 MPH	= 11:1
30 MPH & BELOW	= 10:1

WHEN THE BARRIER TRANSITION SLOPE IS ON HORIZONTAL ALIGNMENT THE TOTAL OFFSET SHALL BE PRORATED AROUND THE CURVE IN LIEU OF A STRAIGHT LINE SLOPE.

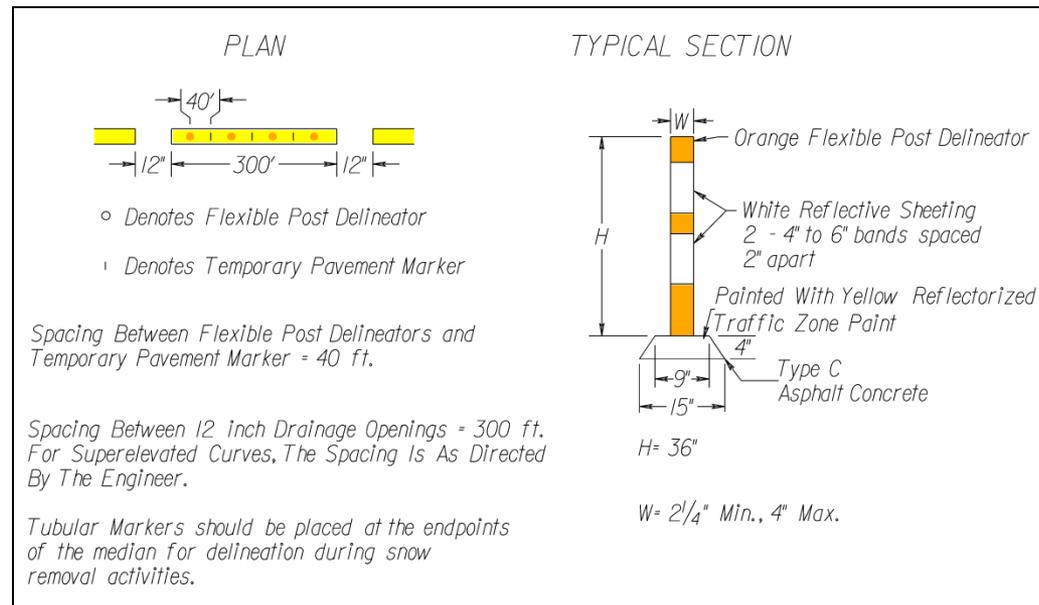
# Appendix A

## 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**

# The 2011 Edition of the Virginia Work Area Protection Manual

Available On-Line At:  
[www.virginiadot.org/business/trafficeng-WZS.asp](http://www.virginiadot.org/business/trafficeng-WZS.asp)

The screenshot shows a Windows Internet Explorer browser window displaying the Virginia DOT website. The address bar shows the URL <http://www.virginiadot.org/business/trafficeng-WZS.asp>. The page header includes the VDOT logo and navigation links for Online Services, Commonwealth Sites, and Help. The main content area is titled "Business Center" and "Traffic Engineering". A sidebar on the left contains navigation links such as Travel Center, Newsroom, Info Center, Business Center, Programs, Projects and Studies, About VDOT, Jobs, and Site Map. The main text describes the Virginia Department of Transportation's commitment to maintaining safe work zones and lists several key activities: developing safety policies, providing technical guidance, and interpreting regulations. A prominent orange diamond-shaped sign reads "VIRGINIA Give 'em a BRAKE HIGHWAY WORKERS". Below the text, there is a section for the "2011 Virginia Work Area Protection Manual" and a "Learn More On YouTube" section with a link to a "2010 Work Zone Safety Playlist".



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

**October 07, 2011  
VDOT Traffic Engineering Division**