CHAPTER 6F. TEMPORARY TRAFFIC CONTROL ZONE DEVICES

Section 6F.01 Types of Devices

Guidance:

01 *The design and application of TTC devices used in TTC zones should consider the needs of all road users (motorists, bicyclists, and pedestrians), including those with disabilities. The special needs and control of motorcyclists should also be considered through a TTC zone.*

Support:

02 FHWA policy requires that all roadside appurtenances such as traffic barriers, barrier terminals and crash cushions, bridge railings, sign and light pole supports, and work zone hardware used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" and/or the 2009 AASHTO "Manual for Assessing Safety Hardware (MASH)" report. The FHWA website at http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/ identifies all such hardware and includes copies of FHWA acceptance letters for each of them. In the case of proprietary items, links are provided to manufacturers' websites as a source of detailed information on specific devices. The website also contains an "Ask the Experts" section where questions on roadside design issues can be addressed.

03 Various Sections of the 2009 MUTCD and 2011 WAPM require certain traffic control devices, their supports, and/or related appurtenances to be crashworthy. Such 2009 MUTCD and 2011 WAPM crashworthiness provisions apply to all streets, highways, and private roads open to public travel. A listing of approved NCHRP Report 350 products used on state maintained roadways is available on VDOT's website at

http://www.virginiadot.org/business/locdes/nchrp350-index.asp

04 Crashworthiness and crash testing information on devices described in 2009 MUTCD Part 6 and the 2011 WAPM are found in AASHTO's "Roadside Design Guide" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD).

05 As defined in Section 6A.02 of this Manual, "crashworthy" is a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the NCHRP Report 350 and MASH.

Standard:

06 **Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide road users, placed on, over, or adjacent to a street, highway, private roads open to public travel (see definition in Section 6A.03) pedestrian facility, or bikeway by authority of a public body or official having jurisdiction.**

07 **All traffic control devices used for construction, maintenance, utility, or incident management operations on a street, highway, or private road open to public travel (see definition in Section 6A.03) shall comply with the applicable provisions of this Manual.**

Section 6F.02 General Characteristics of Signs

Support:

01 TTC zone signs convey both general and specific messages by means of words, symbols, and/or arrows and have the same three categories as all road user signs: regulatory, warning, and guide.

Standard:

02 **Regulatory, warning, guide, and incident management signs used in TTC zones, shall be in compliance with Section 247 of the Road and Bridge Specifications. Reflective sheeting used for all TTC zone signs shall be fluorescent prismatic (high observation angle) lens.**

03 **The colors for regulatory signs shall follow the Standards for regulatory signs in Table 2A-5 and Chapter 2B of the 2009 MUTCD. Warning signs in TTC zones shall have a black legend and border on a fluorescent orange background, except for the Grade Crossing Advance Warning (W10-1) sign which shall have a black legend and border on a yellow background, and except for signs that are required or recommended in Parts 2 or 7 of the 2009 MUTCD to have fluorescent yellow-green backgrounds. Colors for guide signs shall follow the Standards in Table 2A-5 and Chapter 2D of the 2009 MUTCD, except for guide signs as otherwise provided in Section 6F.60.**

Support:

04 The fluorescent (high observation angle) versions of reflective sign sheeting provide higher conspicuity especially during twilight.

Option:

05 Warning and guide signs used for TCC incident management situations (see Chapter 6I) may have a black legend and border on a fluorescent pink background.

06 Existing warning and guide signs that are still applicable may remain in place.

07 In order to maintain the systematic use of yellow or fluorescent yellow-green backgrounds for pedestrian, bicycle, and school warning signs in a jurisdiction, fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.

08 Standard fluorescent orange flags or Type B flashing warning lights may be used in conjunction with signs.

Standard:

09 **When standard orange flags or Type B flashing warning lights are used in conjunction with signs, they shall not block the sign face. When flags become faded they shall be removed or replaced.**

10 **Except as provided in Section 2A.11 of the 2009 MUTCD, the sizes for TTC signs and plaques shall be as shown in Table 6F-1. Signs found in the Non-Restricted Right-of-Way Roadway column shall be used unless there is a restricted right-of-way or if smaller signs are needed on low volume, low speed residential and urban roadways (under 500 vehicles per day and the posted speed limit is 30 mph or less). Smaller sign sizes are found under the headings of Restricted Right-of-Way Roadway and Residential & Urban < 500 ADT & ≤ 30 MPH columns.**

Guidance:

11 *Sign design details are contained in the 2009 MUTCD's "Standard Highway Signs and Marking" (SHSM) book and the Virginia Supplement to the 2009 MUTCD's "Standard Highway Signs" (VSHS) book. These books should be used to fabricate signs.*

Standard:

12 **Any proposed or modified Regulatory or Warning signs not in the 2009 MUTCD, the Virginia Supplement to the 2009 MUTCD, or this Manual shall be submitted for review and approval by VDOT's Office of the State Traffic Engineer prior to submission to FHWA.**

13 **Deviations from standard sizes as prescribed in these Manuals shall be in 6-inch increments.**

Support

14 Section 2A.06 of the Virginia Supplement to the 2009 MUTCD contains additional information regarding the design of signs, including an Option allowing the development of special word message signs if a standard word message or symbol sign is not available to convey the necessary regulatory, warning, or guidance information.

Guidance:

15 *Signs used for advance warning should be 48 inch by 48 inch, unless prevented by right-of-way restrictions or approved by the Regional Traffic Engineer.*

Option:

16 The dimensions of signs and plaques shown in Table 6F-1 may be increased wherever necessary for greater legibility or emphasis.

17 Signs may be made of rigid or flexible material.

Standard:

18 **All non-retroreflective signs, including mesh signs, are not allowed and shall not be used due to fading, sunlight shining through, and lack of visibility during hours of darkness.**

19 **All signs used day or night, shall be retroreflective with a material that has a smooth, sealed outer surface.**

20 **Sign substrates for signs mounted on plastic drums, Type 3 Barricades, and portable sign stands shall be either a flexible retroreflective roll-up material, or a 0.4 inch thick corrugated polypropylene or polyethylene plastic material, or a 0.079 inch thick aluminum/plastic laminate material, shall be in compliance with**

Section 512 of the Road and Bridge Specifications. The sign substrate shall be the same material that was used when the device was tested and found to be in compliance with NCHRP Report 350, Test Level 3 or MASH requirements.

21 **Rollup signs shall only be used on temporary sign supports and shall not be post-mounted.**

22 **Post-mounted signs shall be made of rigid material (aluminum 0.080-inch thickness[1]) or sign substrates (0.4 inch thick corrugated polypropylene or polyethylene plastic material, or a 0.079 inch thick aluminum/plastic laminate material) and shall be in compliance with Sections 512 and 701 of the Road and Bridge Specifications.**

Section 6F.03 Sign Placement

Guidance:

01 *Signs should be located on the right-hand side of the roadway unless otherwise provided in this Manual.*

Standard:

02 **On roadways having a median wider than 8 feet, right and left sign assemblies shall be required.**

03 **For the purpose of temporary sign installation, the median barrier is considered to be part of the shoulder and its measurement shall be used to determine the total width of the shoulder.**

Option:

04 Smaller sign sizes may be used in the median when the median width is between 6.5 feet and 8 feet to provide left sign assemblies on a multilane roadway.

Guidance:

05 *Portable barrier mounted sign stands should be considered for use on median barrier to meet the requirements for double indicating signs.*

Support:

06 The provisions of this Section regarding mounting height apply unless otherwise provided for a particular sign elsewhere in this Manual.

07 Guidelines for height and lateral clearance of temporary ground-mounted signs are shown in Figure 6F-1.

Standard:

08 **The height of ground-mounted signs, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement shall be a minimum of 7 feet and a maximum of 8 feet[1] (see Figure 6F-1).**

09 **The minimum height of ground-mounted signs, measured vertically from the bottom of the sign to the top of the curb, or in the absence of curb, measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way, of signs installed at the side of the road in business, commercial, or residential areas where parking and/or bicycle or pedestrian movements are likely to occur, or where the view of the sign might be obstructed, shall be a minimum of 7 feet and a maximum of 8 feet[1] (see Figure 6F-1).**

10 **The height of ground-mounted signs, measured vertically from the bottom of the sign to the sidewalk, shall be a minimum of 7 feet and a maximum of 8 feet [1].**

11 **Ground-mounted sign panels shall be securely fastened to posts or supports and erected plumb and maintained in plumb condition.**

Option:

12 The height to the bottom of a secondary sign mounted below another sign may be 1 foot less than the height provided in Paragraphs 6 through 10.

Guidance:

13 *Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic. If the bottom of a secondary sign that is mounted below another sign is mounted lower than 7 feet above a pedestrian sidewalk or pathway (see Section 6D.02) the secondary sign should not project more than 4 inches into the pedestrian facility.*

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

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	* Restricted Right-of - Way Roadway	* Residential & Urban – < 500 ADT & ≤ 30 MPH
Stop	R1-1	6F.06	48 x 48	36 x 36	36 x 36
Stop (On Stop/Slow Paddle)	R1-1	6E.03	24 x 24	24 x 24	24 x 24
Stop (AFAD)	R1-1	6E.05	36 x 36	36 x 36	36 x 36
Yield	R1-2	6F.06	48 x 48 x 48	36 x 36 x 36*	36 x 36 x 36*
To Oncoming Traffic (Plaque)	R1-2aP	6F.06	48 x 36	36 x 30	36 x 30
Yield Here To Pedestrians	R1-5L, 5R	6F.06	36 x 36	30 x 30	30 x 30
Wait on Stop (AFAD)	R1-7	6E.05	24 x 30	24 x 30	24 x 30
Go on Slow (AFAD)	R1-8	6E.05	24 x 30	24 x 30	24 x 30
PROCEED WHEN WAY IS CLEAR[1]	R1-V1	6F.17	48 x 18	48 x 18	48 x 18
Speed Limit	R2-1	6F.14	48 x 60	36 x 48	36 x 48
Fines Higher (Plaque)	R2-6P	6F.14	48 x 36	36 x 24	36 x 24
End Work Zone Speed Limit	R2-12	6F.14	48 x 60	36 x 54[1]	24 x 30[1]
WORK ZONE $500 MAX. FINE FOR EXCEEDING SPEED LIMIT WHEN FLASHING[1]	R2-V1	6F.13	108 x 54	66 x 42	66 x 42
Movement Prohibition	R3-1,2,3,4,18,27	6F.06	48 x 48	36 x 36	36 x 36
Right Lane Must Exit	R3-33		78 X 36		
Mandatory Movement (1 lane)	R3-5L, 5R	6F.06	30 x 36	30 x 36	30 x 36
Optional Movement (1 lane)	R3-6L, 6R	6F.06	30 x 36	30 x 36	30 x 36
Mandatory Movement (text)	R3-7L, 7R	6F.06	30 x 30	30 x 30	30 x 30
Advance Intersection Lane Control	R3-8	6F.06	Var. x 30	Var. x 30	Var. x 30
Begin Right Turn Lane w/ Arrow[1]	R3-20L, R3-20R	TTC-26 TTC-27	24 x 36	24 x 36	24 x 36
Do Not Pass	R4-1	6F.12	48 x 60	36 x 48	36 x 48
Pass With Care	R4-2	6F.86	48 x 60	36 x 48	36 x 48
Trucks Use Right Lane	R4-5	6F.06	48 x 60	36 x 48	36 x 48
Keep Right	R4-7, 7a, 7b	6F.06	48 x 60	36 x 48	36 x 48
Narrow Keep Right	R4-7c	6F.06	18 x 30	18 x 30	18 x 30
Stay in Lane	R4-9	6F.12	48 x 60	36 x 48	36 x 48
Do Not Drive On Shoulder	R4-17		48 x 60	36 x 48	36 x 48
Lane Closed Do Not Pass (Vehicle-Mounted Sign)	R4-V6	6F.34	84 x 36	84 x 36	84 x 36
Keep Left (Right)	R4-V7L, V7R	6F.29	48 x 48	36 x 36	48 x 48
Do Not Enter	R5-1	6F.06	48 x 48	36 x 36	36 x 36
Wrong Way	R5-1a	6F.06	42 x 30	36 x 24	36 x 24
Restricted Width Route	R5-V1	6F.11	108 x 60	66 x 36	42 x 30
One Way	R6-1L, 1R	6F.06	54 x 18	36 x 12	36 x 12
One Way	R6-2R, 2L	6F.06	48 x 60	36 x 48	24 x 30
No Parking (Symbol)	R8-3a	6F.06	48 x 48	36 x 36	24 x 24
Do Not Stop On Tracks	R8-8	TTC-56	48 x 60	36 x 48	36 x 48
Pedestrian Crosswalk	R9-8	6F.15	36 x 18	36 x 18	36 x 18
Sidewalk Closed	R9-9	6F.16	30 x 18	30 x 18	30 x 18
Sidewalk Closed, Use Other Side	R9-10	6F.16	48 x 24	48 x 24	48 x 24
Sidewalk Closed Ahead, Cross Here	R9-11L, 11R	6F.16	48 x 36	48 x 36	48 x 36
Sidewalk Closed, Cross Here	R9-11aL, 11aR	6F.16	48 x 24	48 x 24	48 x 24
Stop Here On Red with Arrow	R10-6	6F.06	24 x 36	24 x 36	24 x 36

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).**

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Table 6F-1, Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 2 of 6)

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of - Way Roadway	*Residential & Urban – < 500 ADT & ≤ 30 MPH
Turning Vehicles Yield to Pedestrians[1]	R10-15	6F.17	30 x 30	30 x 30	30 x 30
Road Closed	R11-2	6F.08	48 x 30	48 x 30	48 x 30
Road Closed - Local Traffic Only	R11-3a,3b,4	6F.09	60 x 30	60 x 30	60 x 30
Ramp Closed	R11-V1	6F.08	48 x 30	48 x 30	48 x 30
Closed - Local Traffic Only	R11-V2	6F.09	60 x 30	60 x 30	60 x 30
Weight Limit	R12-1, 2	6F.10	36 x 48	36 x 48	36 x 48
Weight Limit Symbol	R12-V1	6F.10	48 x 54	36 x 42	36 x 42
Fender Bender Move Vehicles	R16-4 (V)	6F.17	120 x 60	60 x 48	48 x 36
Crash Area Keep Clear[1]	W0-V1	6F.95	36 x 24	36 x 24	36 x 24
Turn and Curve Signs	W1-1L,1R,2L, 2R, 3L, 3R, 4L, 4R	6F.18	48 x 48	36 x 36	48 x 48
Reverse Curve (2 or more lanes)	W1-4bL,4bR, 4cL, 4cR	6F.54	48 x 48	36 x 36	48 x 48
One-Direction Large Arrow (Post-Mounted)	W1-6L, 6R	6F.77	60 x 30	48 x 24	48 x 24
One-Direction Large Arrow (On 4' Type 3 Barricade)	W1-6L, 6R	6F.77	48 x 24	48 x 24	48 x 24
One-Direction Large Arrow (On 8' Type 3 Barricade)	W1-6L, 6R	6F.77	60 x 30	60 x 30	60 x 30
Two-Direction Large Arrow (Post-Mounted)	W1-7	6F.77	60 x 30	48 x 24	48 x 24
Two-Direction Large Arrow (On 4' Type 3 Barricade)	W1-7	6F.77	48 x 24	48 x 24	48 x 24
Two-Direction Large Arrow (On 8' Type 3 Barricade)	W1-7	6F.77	60 x 30	60 x 30	60 x 30
Chevron (Post-Mounted)	W1-8L, 8R	6F.18	36 x 48	30 x 36	18 x 24
Chevron (On Channelizing Device)	W1-8L, 8R	6F.18	18 x 24	18 x 24	18 x 24
One-Direction Large Arrow	W1-V1L, V1R	6F.30	96 x 48	96 x 48	96 x 48
Stop Ahead	W3-1	6F.18	48 x 48	36 x 36	48 x 48
Yield Ahead	W3-2	6F.18	48 x 48	36 x 36	48 x 48
Signal Ahead	W3-3	6F.18	48 x 48	36 x 36	48 x 48
Be Prepared to Stop	W3-4	6F.18	48 x 48	36 x 36	48 x 48
Reduced Speed Limit Ahead	W3-5	6F.20	48 x 48	36 x 36	48 x 48
Merging Traffic	W4-1L, 1R, 6L, 6R	6F.18	48 x 48	36 x 36	48 x 48
Lane Ends (Symbol)	W4-2L, 2R	6F.29	48 x 48	36 x 36	48 x 48
Added Lane	W4-3L, 3R	6F.18	48 x 48	36 x 36	48 x 48
No Merge Area (Plaque)	W4-5P	6F.18	24 x 30	18 x 24	24 x 30
Road Narrows	W5-1	6F.18	48 x 48	36 x 36	48 x 48
Narrow Bridge	W5-2	6F.18	48 x 48	36 x 36	48 x 48
One Lane Bridge	W5-3	6F.18	48 x 48	36 x 36	48 x 48
Ramp Narrows	W5-4	6F.33	48 x 48	36 x 36	48 x 48
Lane Width (Plaque)	W5-VP1	6F.33	60 x 18	48 x 18	48 x 18
Divided Highway	W6-1	6F.18	48 x 48	36 x 36	48 x 48
Divided Highway Ends	W6-2	6F.18	48 x 48	36 x 36	48 x 48
Two-Way Traffic	W6-3	6F.39	48 x 48	36 x 36	48 x 48
Two-Way Traffic	W6-4	6F.39	12 x 18	12 x 18	12 x 18
Parallel Road Closed (Plaque)	W6-VP1	6F.39	48 x 36	48 x 36	48 x 36
Hill (Symbol)	W7-1	6F.18	48 x 48	36 x 36	48 x 48
Bump	W8-1	6F.18	48 x 48	36 x 36	48 x 48
Dip	W8-2	6F.18	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).**

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Table 6F-1, Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 3 of 6)

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of - Way Roadway	*Residential & Urban – < 500 ADT & ≤ 30 MPH
Pavement Ends	W8-3	6F.18	48 x 48	36 x 36	48 x 48
Soft Shoulder	W8-4	6F.50	48 x 48	36 x 36	48 x 48
Slippery When Wet	W8-5	6F.18	48 x 48	36 x 36	48 x 48
Truck Crossing	W8-6	6F.40	48 x 48	36 x 36	48 x 48
Loose Gravel	W8-7	6F.18	48 x 48	36 x 36	48 x 48
Rough Road	W8-8	6F.41	48 x 48	36 x 36	48 x 48
Low Shoulder	W8-9	6F.50	48 x 48	36 x 36	48 x 48
Uneven Lanes	W8-11	6F.51	48 x 48	36 x 36	48 x 48
No Center Line	W8-12	6F.53	48 x 48	36 x 36	48 x 48
Fallen Rocks	W8-14	6F.18	48 x 48	36 x 36	48 x 48
Motorcycle (Plaque)	W8-15P	6F.41	30 x 24	24 x 18	30 x 24
Shoulder Drop Off (Plaque)	W8-17P	6F.50	30 x 24	24 x 18	30 x 24
Road May Flood	W8-18	6F.18	48 x 48	36 x 36	48 x 48
No Shoulder	W8-23	6F.18	48 x 48	36 x 36	48 x 48
Steel Plate Ahead	W8-24	6F.52	48 x 48	36 x 36	48 x 48
Shoulder Ends	W8-25	6F.18	48 x 48	36 x 36	48 x 48
Unmarked Pavement Ahead	W8-V4	6F.53	48 x 48	36 x 36	48 x 48
Shoulder Drop Off	W8-V5	6F.50	48 x 48	36 x 36	48 x 48
Lane Ends	W9-1L, 1R	6F.18	48 x 48	36 x 36	48 x 48
Lane Ends Merge Left	W9-2L, 2R	6F.29	48 x 48	36 x 36	48 x 48
Center Lane Closed Ahead	W9-3C, 3L, 3R	6F.28	48 x 48	36 x 36	48 x 48
Grade Crossing Advance Warning (Railroad)	W10-1	TTC-56	36 dia.	36 dia.	36 dia.
Truck (Symbol)	W11-10	6F.40	48 x 48	36 x 36	48 x 48
Construction Entrance	W11-V2	6F.40	48 x 48	36 x 36	48 x 48
Watch for Turning Vehicles	W11-V3	6F.40	48 x 48	36 x 36	48 x 48
Trucks Entering Highway	W11-V4	6F.40	48 x 48	36 x 36	48 x 48
Double Arrow	W12-1	6F.18	48 x 48	36 x 36	48 x 48
Low Clearance	W12-2	6F.18	48 x 48	36 x 36	48 x 48
Advisory Speed (Plaque)	W13-1P	6F.58	30 x 30	24 x 24	30 x 30
On Ramp (Plaque)	W13-4P	6F.31	36 x 36	36 x 36	36 x 36
No Passing Zone (Pennant)	W14-3	6F.18	64 x 64 x 48	48 x 48 x 36	48 x 48 x 36
Arrow (Plaque)	W16-5plL, 5plR	6F.11	24 x 18	24 x 18	24 x 18
Next XX Miles (Plaque)	W16-VP1	6F.59	60 x 18	48 x 12	60 x 18
Every 1 (1/2) (3/4) Mile (Plaque)	W16-VP2	6F.43	60 x 18	48 x 12	60 x 18
XX FEET (Plaque)	W16-VP3	6F.38	60 x 18	48 x 12	60 x 18
Next Exit (Left) (Right) (Plaque)	W16-VP4E, VP4L, VP4R	6F.43	60 x 18	48 x 12	60 x 18
Exit Number (Plaque)	W16-VP5	6F.43	60 x 18	48 x 12	60 x 18
Road Work Ahead	W20-1	6F.21	48 x 48	36 x 36	48 x 48
Detour Ahead	W20-2	6F.23	48 x 48	36 x 36	48 x 48
	W20-2	6I TCMI-7 & 8	48 x 48	36 x 36	48 x 48
Road (Street) Closed Ahead	W20-3	6F.24	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).**

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

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of - Way Roadway	*Residential & Urban – < 500 ADT & ≤ 30 MPH
One Lane Road Ahead	W20-4	6F.25	48 x 48	36 x 36	48 x 48
Lane(s) Closed Ahead	W20-5C, 5L, 5R, 5aL, 5aR	6F.26	48 x 48	36 x 36	48 x 48
Flagger (Symbol)	W20-7	6F.38	48 x 48	36 x 36	48 x 48
VEHICLE-MOUNTED SIGNS					
Slow (On Stop/Slow Paddle)	W20-8 (V)	6E.03	24 x 24	24 x 24	24 x 24
Slow (AFAD)	W20-8 (V)	6E.05	36 x 36	36 x 36	36 x 36
Road Work Ahead – Left (Right) Shoulder Closed	W20-V1L,V1R	6F.34	84 x 36	84 x 36	84 x 36
Road Work Ahead – Center Lane Closed Road Work Ahead – Left (X Left) Lane(s) Closed Road Work Ahead – Right (X Right) Lane(s) Closed	W20-V2C, V2L,V2aL, V2R, V2aR	6F.34	84 x 36	84 x 36	84 x 36
Mowing Ahead – Left (Right) Shoulder Closed	W20-V3L, V3R	6F.34	84 x 36	84 x 36	84 x 36
Mowing Ahead – Left (Right) Lane Closed	W20-V4L, V4R	6F.34	84 x 36	84 x 36	84 x 36
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,V5aL, V5R, V5aR	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,V8aL, V8R, V8aR	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
RESUME GROUND MOUNTED SIGNS UNLESS OTHERWISE NOTED					
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
	W20-V12	6I TIMC-8	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
Grooved Pavement Ahead [1]	W20-V14	6F.26	48 x 48	36 x 36	48 x 48
Median Crossover Closed Ahead [1]	W20-V15	6F.26	48 x 48	36 x 36	48 x 48
Median Crossover Closed [1]	W20-V16	6F.26	48 x 36	48 x 36	48 x 36
Emergency Scene Ahead	W20-V25	6F.27	48 x 48	36 x 36	48 x 48
Rumble Strips Ahead [1]	W20-V26	TTC-23	48 x 48	36 x 36	48 x 48
Emergency Work Ahead [1]	W20-V27	6F.21	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
Shoulder Closed	W21-5aL, 5aR	6F.42	48 x 48	36 x 36	48 x 48
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

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.**

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

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of - Way Roadway	*Residential & Urban – < 500 ADT & ≤ 30 MPH
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
Road Patching Ahead [1]	W21-V18	TTC-65	48 x 48	36 x 36	48 x 48
Road Patching Next X Miles [1]	W21-V19	TTC-65	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
New Traffic Pattern Ahead	W23-2	6F.37	48 x 48	36 x 36	48 x 48
Double Reverse Curve	W24-1L, 1R	6F.55	48 x 48	36 x 36	48 x 48
Double Reverse Curve	W24-1aL, 1aR	6F.55	48 x 48	36 x 36	48 x 48
Double Reverse Curve	W24-1bL, 1bR	6F.55	48 x 48	36 x 36	48 x 48
All Lanes	W24-1cP	6F.55	30 x 30	24 x 24	30 x 30
Road Work Next XX Miles	G20-1 (V)	6F.61	60 x 24	48 x 24	48 x 24
End Road Work (Post-Mounted)	G20-2 (V)	6F.62	60 x 24	48 x 24	48 x 24
End Road Work (On Portable Sign Stand)	G20-2 (V)	6F.62	48 x 24	48 x 24	48 x 24
Pilot Car Follow Me (Vehicle-Mounted Sign)	G20-4	6F.63	36 x 18	36 x 18	36 x 18
Work Zone (Plaque) [1]	G20-5aP	6F.11 6F.14	48 x 36	36 x 24	36 x 24
Work Vehicle Do Not Follow (Vehicle-Mounted Sign)	G20-V1	6F.64	48 x 18	48 x 18	48 x 18
Work Vehicle Frequent Turns (Vehicle-Mounted Sign)[1]	G20-V1a	6F.64	48 x 18	48 x 18	48 x 18
End Mowing (Post-Mounted)	G20-V2	6F.62	60 x 24	48 x 24	48 x 24
End Mowing (On Portable Sign Stand)	G20-V2	6F.62	48 x 24	48 x 24	48 x 24
End Survey (Post Mounted)	G20-V3	6F.62	60 x 24	48 x 24	48 x 24
End Survey (On Portable Sign Stand)	G20-V3	6F.62	48 x 24	48 x 24	48 x 24
Caution Frequent Stops (Vehicle-Mounted Sign)	G20-V4a, V4b, V4c	6F.65	Var.	Var.	Var.
XX Miles Ahead (Plaque)	G20-VP1	6F.11	108 x 18	66 x 18	42 x 12
Exit Open	E5-2	6F.35	48 x 36	48 x 36	48 x 36
Exit Closed	E5-2a	6F.35	48 x 36	48 x 36	48 x 36
Exit Only	E5-3	6F.36	48 x 36	48 x 36	48 x 36
Exit	E5-V1L, V1R	6F.36	48 x 48	48 x 48	48 x 48
Pull-Off Area Entrance	E5-V2L, V2R	6F.43	48 x 48	48 x 48	48 x 48
Left (Right) Turn Lane Open[1]	E5-V3L, V3R		48 x 48	36 x 36	48 x 48
Left (Right) Turn Lane Closed [1]	E5-V4L, V4R		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).**

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

Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of - Way Roadway	*Residential & Urban – < 500 ADT & ≤ 30 MPH
Interstate Route Shield for Independent Use (1 or 2 digits)[1]	M1-1	TTC-47	36 x 36	24 x 24	24 x 24
Interstate Route Shield for Independent Use (3 digits)[1]	M1-1	TTC-47	45 x 36	30 x 24	30 x 24
U.S. Route Marker for Independent Use (1 or 2 digits)[1]	M1-4	TTC-48	36 x 36	24 x 24	24 x 24
U.S. Route Marker for Independent Use (3 digits)[1]	M1-4	TTC-48	45 x 36	30 x 24	30 x 24
VA Primary Route Marker for Independent Use (1 or 2 digits)[1]	M1-V1a, V1b	TTC-48	36 x 36	24 x 24	24 x 24
VA Primary Route Marker for Independent Use (3 digits)[1]	M1-V1c, V1d	TTC-48	45 x 36	30 x 24	30 x 24
VA Circular Sec. Route Marker for Independent Use (3 digits)[1]	M1-V2a, V2b, V2c, V2d, V2e, V2f	TTC-48	36 x 36	24 x 24	24 x 24
Cardinal Directional Auxiliary[1] (North, East, South, West)	M3-1, M3-2, M3-3, M3-4	TTC-47 TTC-48	18 X 36	24 x 12	24 x 12
Directional Arrow Auxiliary[1]	M5-1(V), M5-2(V), M6-1(V), M6-2(V), M6-3(V), M6-4(V), M6-5(V)	TTC-47 TTC-48	30 x 21	21 x 15	21 x 15
	M5-1(V), M5-2(V), M6-1(V), M6-2(V), M6-3(V), M6-4(V), M6-5(V),	TTC-48	30 x 21	21 x 15	21 x 15
Detour	M4-8	6F.66	30 x 15	24 x 12	24 x 12
End Detour	M4-8a	6F.66	24 x 18	24 x 18	24 x 18
	M4-8a	6I – TIMC-8	24 x 18	24 x 18	24 x 18
Detour with Horizontal Arrow	M4-9L, 9R,	6F.66	60 x 48	48 x 36	36 x 30
	M4-9L (V), 9R (V)				
Bike/Pedestrian Detour	M4-9aL, 9aR	6F.66	60 x 48	48 x 36	30 x 24
Pedestrian Detour	M4-9bL, 9bR	6F.66	60 x 48	48 x 36	30 x 24
Bike Detour	M4-9cL, 9cR	6F.66	60 x 48	48 x 36	30 x 24
Detour	M4-10	6F.66	48 x 18	48 x 18	48 x 18
Detour – Up Arrow	M4-V1	6F.66	60 x 48	48 x 36	36 x 30
Detour – 45° Arrow	M4-V2L, V2R	6F.66	60 x 48	48 x 36	36 x 30
Detour – Advance Turn 90° Arrow	M4-V3L, V3R	6F.66	60 x 48	48 x 36	36 x 30
Detour – Advance Turn Diagonal Arrow	M4-V4L, V4R	6F.66	60 x 48	48 x 36	36 x 30
Cardinal Direction / Route Shield (Plaque)	M4-V5a, V5b	6F.9 6F.11	66 x 84	36 x 42	48 x 60
TTC Business Entrance (One Line)	M4-V6aL, V6aR	6F.67	Var. x 24	Var. x 24	Var. x 24
TTC Business Entrance (Two Lines)	M4-V6bL, V6bR	6F.67	Var. x 30	Var. x 30	Var. x 30
Street Name (Plaque) (One Line)	M4-VP1a	6F.09 6F.66	Var. x 18	Var. x 15	Var. x 12
Street Name (Plaque) (Two Lines)	M4-VP1b		Var. x 30	Var. x 24	Var. x 18
TTC Business Entrance (One Line)	M4-V6aL, V6aR	6F.67	Var. x 24	Var. x 24	Var. x 24
TTC Business Entrance (Two Lines)	M4-V6bL, V6bR	6F.67	Var. x 30	Var. x 30	Var. x 30
Street Name (Plaque) (One Line)	M4-VP1a	6F.09 6F.66	Var. x 18	Var. x 15	Var. x 12
Street Name (Plaque) (Two Lines)	M4-VP1b		Var. x 30	Var. x 24	Var. x 18
Incident Management Detour (M4-V1, M4-V2L, M4-2R, M4-3L, M4-3R, M4-9L (V), M4-9R (V)) sign size shall be 36 x 30					

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).**

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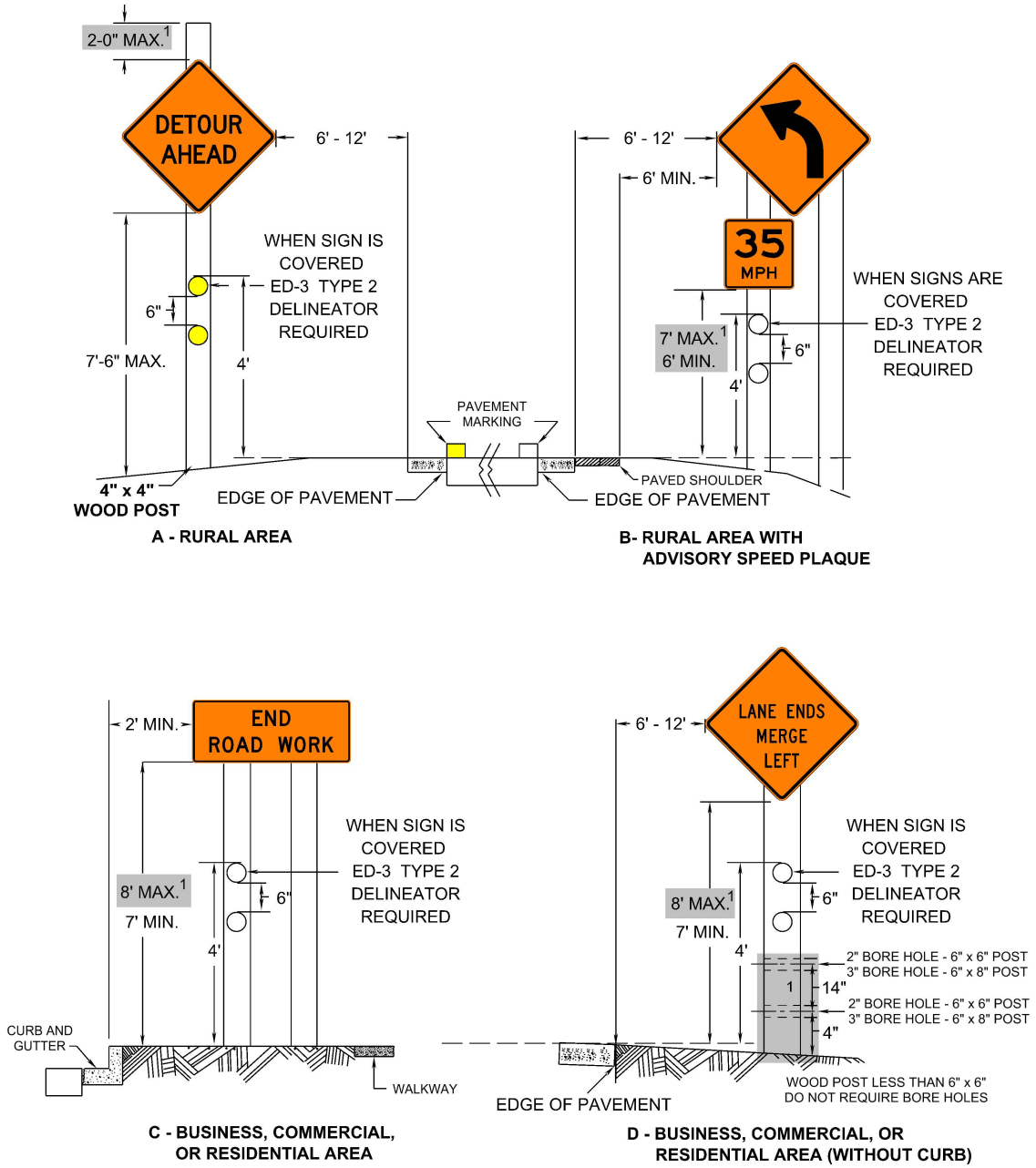
Figure 6F-1, Height and Lateral Location of Signs – Typical Post-Mounted Installations



NOTE: FOR POST SIZE & INSTALLATION PROCEDURES SEE EITHER THE PLAN INSERTABLE SHEET OR VIRGINIA ROAD AND BRIDGE STANDARDS WSP-1 & ED-3 OR TEMPORARY SIGNS. [1]

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Support:

14 In Table 6F-1, standard MUTCD signs are highlighted in either gray or white, while Virginia specific signs are highlighted in orange or pink.

Standard:

15 **Where it has been determined that the accommodation of pedestrians with disabilities is necessary, signs shall be mounted and placed in accordance with Section 4.4 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)".**

16 **Signs mounted on Direction Indicator Barricades, Type 3 Barricades and Type 3 Barricade/sign combinations shall be crashworthy.**

Guidance:

17 *Except as provided in Paragraph 18* [1] *or Figures TTC-57 through TTC-59, signs mounted on portable sign supports should not be used for a duration of more than 3 consecutive days (72 consecutive hours).*

Option:

18 The R9-8 through R9-11a (pedestrian signs) series, R11 (road closed signs) series, W1-6 through W1-8 (arrow and chevron signs) series, M4-10 (detour arrow), E5-V1 (exit sign), or other similar type signs (see Figures 6F-2, 6F-3 and 6F-5) may be used on portable sign supports that do not meet the minimum mounting heights provided in Paragraphs 6 through 8 for longer than 3 days.

Option:

Standard:

19 **Sign supports shall be crashworthy. Where large signs having an area exceeding 50 square feet are installed on multiple breakaway posts, the clearance from the ground to the bottom of the sign shall be at least 7 feet.**

Guidance:

20 *The legs of portable sign supports should be fully extended and* [1] *flush as possible to the ground or roadway surface for stability. If the legs cannot be fully extended then they should be weighted per Paragraph 26.*[1]

21 *Portable sign supports used for signs found in Paragraph 18* [1]*, or shown in the typical traffic control figures in Chapter 6H, should be supported with a sand bag weighting approximately 25 pounds on each leg or two (2) drum collar weights*[1] *when they are used on long-term projects.*

Standard:

22 **The bottom of a sign mounted on a barricade, or other portable support, shall be at least 1 foot above the traveled way.**

23 **Portable sign stands shall be self-erecting and support a 20 square-foot sign panel in sustained winds of 50 miles per hour without tipping over, walking, or rotating more than ± 5 degrees about its vertical axis. When used on uneven surfaces, the portable sign stand shall be capable of adjusting to those surfaces to allow the signs to be installed in their normal upright position ± 15 degrees.**

24 **Tripod type portable sign stands, regardless of their crashworthiness, shall not be used on any roadway.**

Support:

25 A tripod type sign stand reduces the sign's retroreflectivity and visibility because it does not allow the sign to be installed perpendicular to the roadway.

Option:

26 Additional weight consisting of one 25 pound sand bag may be placed on each leg of a sign stand or no more than two (2) drum collar weights[1] positioned on the center of the sign stand and around the mast may be used to comply with the portable sign requirement.

27 For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, a portable sign support, or a trailer stationed in advance of the TTC zone or moving along with it.

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Support:

28 If alterations are made to specific traffic control device supports that have previously been successfully crash tested in accordance with NCHRP Report 350 or MASH prior to the alteration, the altered supports might not be considered to be crashworthy.

Section 6F.04 Sign Maintenance

Standard:

01 **All signs shall be reviewed after the initial setup and periodically during every work shift to ensure they are functioning properly and they shall be properly maintained for cleanliness, visibility and correct positioning.**

02 **When TTC signs are covered to prevent the display of the message, the entire sign shall be covered with silt fence or other materials approved by the Engineer such that no portion of the message side of the sign shall be visible. Tape, such as duct tape, shall not be used on the signs face.**

03 **When used[1], plywood shall only be attached to[1] ground-mounted TTC signs. Attachment methods used to attach the covering material to the signs shall be of a durable construction that will prevent the unintentional detachment of the material from the sign.**

04 **In addition, the posts where the signs are being covered shall have two ED-3 Type 2 delineators mounting vertically on the post below the signs at a height of 4 feet to the top of the topmost delineator. The bottom delineator shall be mounted 6 inches below the top delineator (see Figure 6F-1).**

05 **At no time shall a TTC sign on a post or portable sign stand be rotated to prevent the display of the message.**

06 **Signs and their portable sign stands shall be removed from the roadway when not in use.**

Option:

07 Advance warning signs and their portable supports may be disassembled and stored behind barrier or guardrail.

Standard:

08 **Signs that have lost significant legibility shall be promptly replaced in accordance with the American Traffic Safety Service Association's (ATSSA) "Quality Standards for Work Zone Traffic Control Devices" publication.**

Support:

09 Section 2A.08 of the 2009 MUTCD contains information regarding the retroreflectivity of signs, including the signs that are used in TTC zones.

Section 6F.05 Regulatory Sign Authority

Support:

01 Regulatory signs such as those shown in Figure 6F-2 inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

Section 6F.06 Regulatory Sign Design

Standard:

01 **TTC regulatory signs shall comply with the Standards for regulatory signs presented in Part 2 of the 2009 MUTCD and its SHSM (see Section 1A.11 of the 2009 MUTCD) or Virginia Supplement to the 2009 MUTCD and its VSHS book.**

02 **Reflective sheeting used on regulatory signs shall be in compliance with Section 247 of the Road and Bridge Specifications.**

Support:

03 Regulatory signs are generally rectangular with a black legend and border on a white background. Exceptions include the STOP, YIELD, DO NOT ENTER, WRONG WAY, and ONE WAY signs.

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Standard:

04 **Regulatory signs shall be authorized by the public agency or official having jurisdiction and shall conform with Chapter 2 of the 2009 MUTCD and its SHSM, or Virginia Supplement to the 2009 MUTCD and its VSHS book.**

Section 6F.07 Regulatory Sign Applications

Standard:

01 **If a TTC zone requires regulatory measures different from those existing, the existing permanent regulatory devices shall be removed or covered and superseded by the appropriate temporary regulatory signs. This change shall be made in compliance with applicable ordinances or statutes of the jurisdiction.**

Section 6F.08 Road (Street) Closed Sign (R11-2) and Ramp Closed Sign (R11-V1)

Guidance:

01 *The ROAD (STREET) CLOSED (R11-2) sign (see Figure 6F-2) should be used when the roadway is closed to all road users except contractors' equipment or officially authorized vehicles. The R11-2 sign should be accompanied by appropriate warning and detour signing.*

Option:

02 The words BRIDGE OUT (or BRIDGE CLOSED), RAMP CLOSED (R11-V1) may be substituted for ROAD (STREET) CLOSED where applicable.

Guidance:

03 *The ROAD (STREET) CLOSED and DETOUR signs on Type 3 Barricades should be located at the corners of intersecting closed roadway or in the traveled way (see Section 6F.76 and Figures TTC-34, TTC-46 to TTC-48).*

Standard:

04 **The ROAD (STREET) CLOSED sign shall not be used where road user flow is maintained through the TTC zone with a reduced number of lanes on the existing roadway or where the actual closure is some distance beyond the sign.**

05 **The RAMP CLOSED sign shall be installed above a Type 3 Barricade on short-term and long-term projects.**

Option:

06 The Type 3 Barricade with RAMP CLOSED sign may be replaced with a shadow vehicle on short-term projects.

Section 6F.09 Local Traffic Only Signs (R11-3a, R11-4, R11-V2)

Guidance:

01 *The Local Traffic Only signs (see Figure 6F-2) should be used where road user flow detours to avoid a closure some distance beyond the sign, but where local road users can use the roadway to the point of closure. These signs should be accompanied by appropriate warning and detour signing.*

02 *In rural applications, the Local Traffic Only sign should have the legend ROAD CLOSED XX MILES AHEAD LOCAL TRAFFIC ONLY (R11-3a) or CLOSED - LOCAL TRAFFIC ONLY (R11-V2).*

Standard:

03 **When the CLOSED - LOCAL TRAFFIC ONLY sign is used, a STREET NAME (M4-VP1a or M4-VP1b) plaque or CARDINAL DIRECTION/ROUTE SHIELD (M4-V5a or M4-V5b) plaque shall be installed above the CLOSED - LOCAL TRAFFIC ONLY sign (see Figure TTC-48).**

Option:

04 In urban areas, the legend ROAD (STREET) CLOSED TO THRU TRAFFIC (R11-4) or ROAD CLOSED, LOCAL TRAFFIC ONLY or CLOSED LOCAL TRAFFIC ONLY as described in Paragraph 3 may be used.

Figure 6F-2, Regulatory Signs and Plaques in Temporary Traffic Control (Sheet 1 of 2)

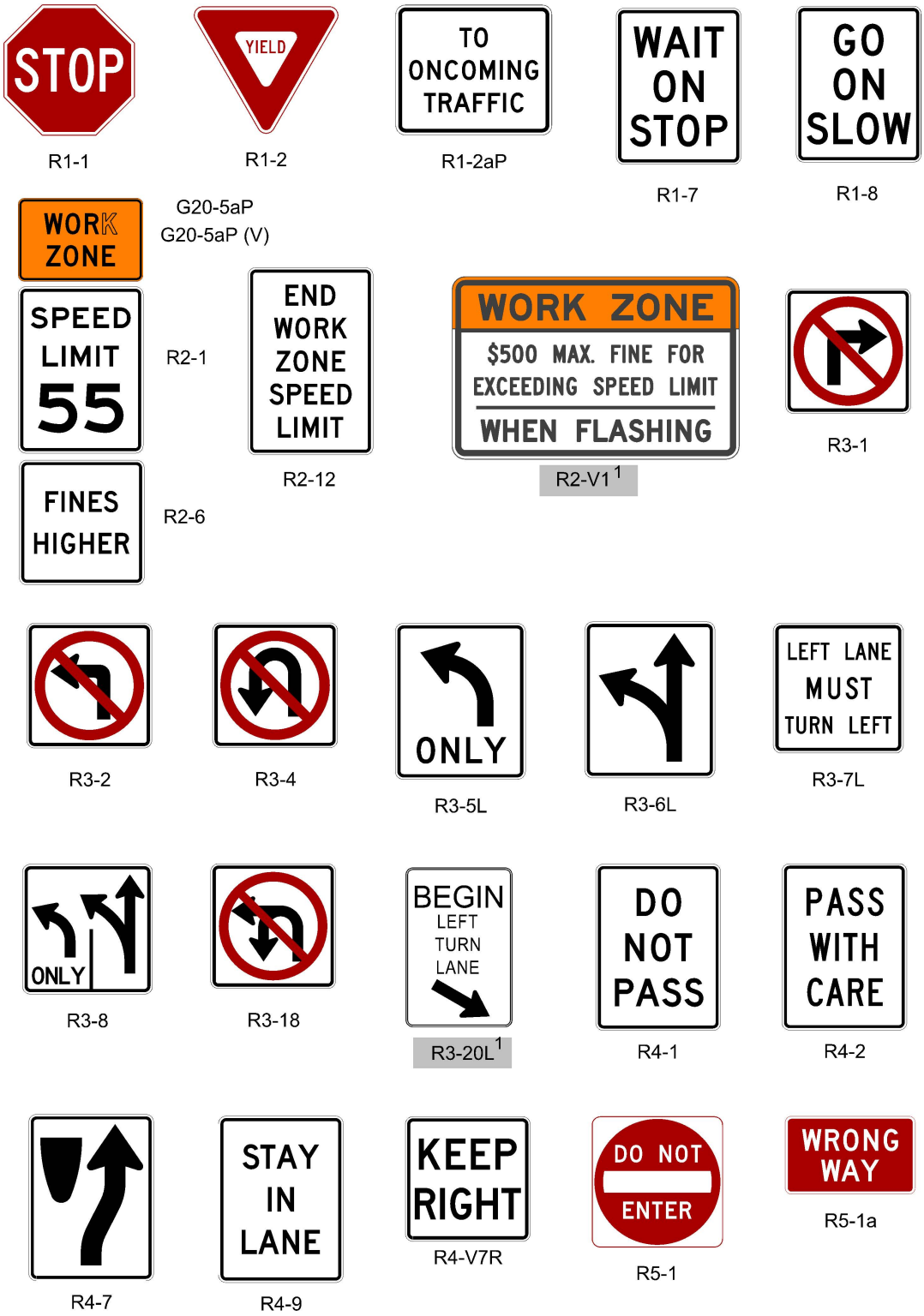

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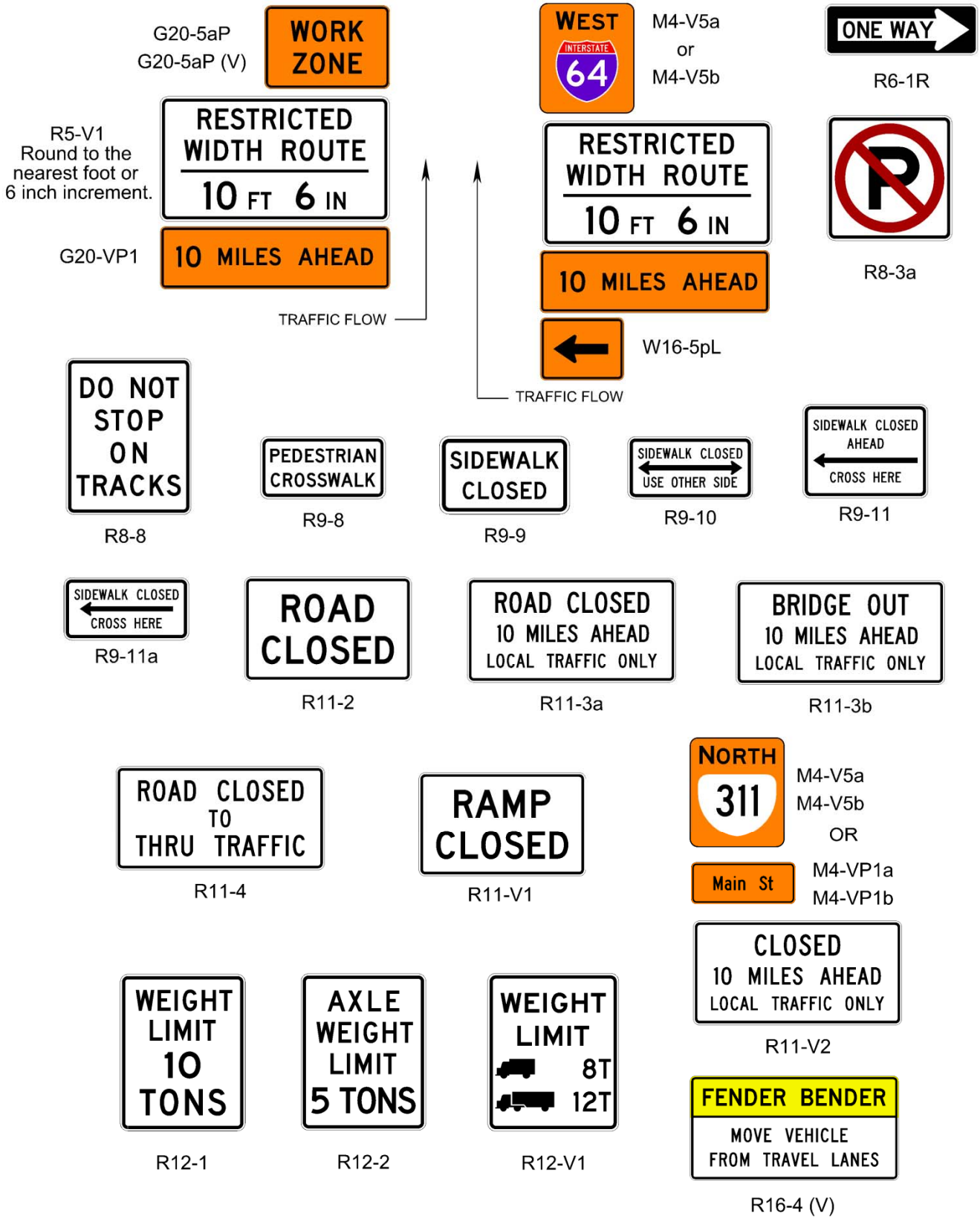
Figure 6F-2, Regulatory Signs and Plaques in Temporary Traffic Control (Sheet 2 of 2)



Option:

05 The ONE WAY sign may be either a horizontal or vertical rectangular sign.

06 In urban areas, a word message that includes the name of an intersecting street name or well-known destination may be substituted for the words XX MILES AHEAD on the R11-3a sign where applicable.

07 The words BRIDGE OUT (or BRIDGE CLOSED) may be substituted for the words ROAD (STREET) CLOSED on the R11-3a or R11-4 sign where applicable.

Section 6F.10 Weight Limit Signs (R12-2, R12-5, R12-V1)

Standard:

01 **A Weight Limit sign (see Figure 6F-2) which shows the gross weight or axle weight that is permitted on the roadway or bridge, shall be consistent with State or local regulations and shall not be installed without the approval of the authority having jurisdiction over the highway.**

02 **Where posting of specific load limits are used, the Weight Limit Symbol (R12-V1) sign shall be used in lieu of the Weight Limit symbol sign (R12-5). The Weight Limit symbol sign (R12-5) from the 2009 MUTCD shall not be used.**

03 **Section 2B.59 and Figure 2B-V1 of the Virginia Supplement to the 2009 MUTCD and its VSHS shall be referenced when the Weight Limit Symbol sign is used.**

04 **When weight restrictions are imposed because of the activity in a TTC zone, a marked detour shall be provided for vehicles weighing more than the posted limit.**

Section 6F.11 Restricted Width Route Sign (R5-V1)

Support:

01 The Virginia Department of Motor Vehicles routinely issues general blanket permits allowing vehicles to exceed the statutory width requirements up to a maximum vehicle and/or load width of 14 feet. These vehicles are allowed to travel on all routes that are not specifically signed limiting the width.

02 Construction/maintenance activities might create roadway width restrictions that are less than 14 feet. Therefore, the Department has a need to post signs on these routes notifying permit holders of a width restriction. To accomplish this, we have developed a regulatory sign alerting operators of those vehicles with blanket width permits that the roadway width might be insufficient for their passage. This has been accomplished in an effort to increase safety and to ensure the continual flow of traffic through our work zones.

Standard:

03 **Signs shall be installed on roadways where a TTC zone exists with physical barriers on both sides of a single lane and the clear distance between edge lines is less than 14 feet.**

04 **A WORK ZONE (G20-5aP, G20-5aP (V)) plaque or CARDINAL DIRECTION/ROUTE SHIELD (M4-V5a or M4-5b) plaque shall be installed above the RESTRICTED WIDTH ROUTE (R5-V1) sign. The CARDINAL DIRECTION/ROUTE SHIELD plaque shall consist of a route shield for guide use (M1-1, M1-4 (Guide), M1-V1b, M1-V1d, M1-V2b and M1-V2d) installed on a fluorescent orange background and the cardinal direction message shall be a black legend (see Figure TTC-25).**

05 **A WORK ZONE plaque shall be installed above the RESTRICTED WIDTH ROUTE sign in advance of the location where the clear width is less than 14 feet. The clear width on the RESTRICTED WIDTH ROUTE sign shall be rounded down to the nearest foot or half foot increment. Table 2C-4 of the Virginia Supplement to the 2009 MUTCD shall be used as a guide in determining the advance placement distance of the signs. At all other locations, a CARDINAL DIRECTION/ROUTE SHIELD plaque shall be installed above the RESTRICTED WIDTH ROUTE sign.**

Guidance:

06 *Additionally, signs should be installed on the approaches of intersecting routes and alternate routes to the restricted route to alert traffic intending to turn onto the restricted route. Engineering judgment should be used in determining the effective placement of this sign.*

07 *When other roadways exist between the last alternate route and the restricted location, which could generate traffic having blanket width permits, consideration should be given to posting additional signs at those intersecting locations.*

Standard:

08 **When used the XX MILES AHEAD (G20-VP1) and ARROW (W16-5pl) plaques shall have a black legend and border on a fluorescent orange rectangular background (see Figure TTC-25).**

09 **When the RESTRICTED WIDTH ROUTE sign is installed on an intersecting route, an ARROW plaque shall be installed below it to indicate the direction of the restriction.**

Guidance:

10 *When an advance RESTRICTED WIDTH ROUTE sign is installed on the restricted route the XX MILES AHEAD plaque should be mounted below the sign.*

Option:

11 In addition to the ARROW plaque, the XX MILES AHEAD plaque may be installed on intersecting routes.

Section 6F.12 Do Not Pass Sign (R4-1) and Stay In Lane Sign (R4-9)

Standard:

01 **A DO NOT PASS (R4-1) sign shall be used when the centerline has been obliterated or until pavement markings have been installed. The DO NOT PASS sign shall be installed after the NO CENTER LINE (W8-12) sign. Thereafter the DO NOT PASS sign shall be installed every mile if the unmarked area is less than 3 miles or every 2 miles if the unmarked area is longer than 4 miles (see Figure TTC-59)**.

02 **A STAY IN LANE (R4-9) sign (see Figures 6F-2, TTC-40 and TTC-57) shall be used when motorists are exposed to a lane differential during pavement milling and paving operations.**

03 **When used on a portable sign support, the STAY IN LANE sign shall be adjusted daily with the work operation and a sand bag weighing approximately 25-pounds shall be place on each leg of the sign stand.**

Guidance:

04 *A STAY IN LANE sign should be used in multi-lane shift.*

Option:

05 A STAY IN LANE sign may be used where a multi-lane shift has been incorporated as part of the TTC on a highway to direct road users around road work that occupies part of the roadway on a multi-lane highway.

Section 6F.13 Work Zone $500 Max. Fine For Exceeding Speed Limit When Flashing [1] Sign (R2-V1)

Support:

01 Section §46.2-878.1 of the Code of Virginia, enacted into law on July 1, 2003, establishes a fine for speeding in a work zone at not more than $500 when workers are present and the work zone is indicated by appropriately placed signs. This Code section was amended by the 2012 General Assembly by adding "for projects covered by contract entered into on or after July 1, 2012, with attached flashing light" or other traffic control device indicating that work is in progress. The intent of this change in the Code is for flashing lights to be activated indicating to motorists when workers are present and work is in progress.[1]

Standard:

02 **The use of the WORK ZONE $500 MAX. FINE FOR EXCEEDING SPEED LIMIT WHEN FLASHING[1] (R2-V1) sign shall be determined by the Regional Traffic Engineer upon the completion of a traffic / engineering study and work zone speed analysis, TE-350. TTC signs for this initiative shall conform to Figure TTC-52.**

03 **The first line "WORK ZONE[1]" shall have a black legend and border on a fluorescent orange rectangular background. The rest of the sign shall have a black legend and border on a white rectangular background (see Figure 6F-2).**

Guidance:

04 *In order for this measure to have an optimum impact on safety and be enforceable, it should be coordinated with the local law enforcement community and/or State Police.*

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05 *Recommended guidelines for selecting work zones for increased fines are as follows:*

- *Projects on Limited Access highways with a work duration of 60 days or more*
- *Projects on Non-Limited Access highways with a posted or statutory (if not posted) speed limit of 35 mph or greater that will have a work duration of 120 days or more*
- *Projects (both Limited and Non-Limited access highways) where safety will be increased based on the engineering judgment of the Regional Traffic Engineer*

Standard:

06 **The Type B flashing warning lights shall be remotely operated and activated only when workers are present in the work zone.**[1]

Section 6F.14 Work Zone Plaque (G20-5aP, G20-5aP (V)), Speed Limit Sign (R2-1), Fines Higher Plaque (R2-6P), and End Work Zone Speed Limit Sign (R2-12)

Standard:

01 **When increased fines are imposed for traffic violations within the designated TTC zone a FINES HIGHER assembly consisting of the WORK ZONE (G20-5aP, G20-5aP (V)) plaque shall be used above the SPEED LIMIT (R2-1) sign and the FINES HIGHER (R2-6P) plaque shall be installed below the SPEED LIMIT sign. The FINES HIGHER assembly signs shall be used throughout the TTC zone if additional SPEED LIMIT signs are needed.**

02 **An END WORK ZONE SPEED LIMIT (R2-12) sign (see Figure 6F-2) shall be installed at the downstream end of the work zone to provide notice to road users of the termination of the increased fines zone.**

03 **The WORK ZONE plaque shall have a black legend and border on a fluorescent orange rectangular background. The SPEED LIMIT and END WORK ZONE SPEED LIMIT signs and FINES HIGHER plaque shall have a black legend and border on a white rectangular background. All supplemental plaques mounted below the Higher Fines signs and plaque shall have a black legend and border on a white rectangular background.**

Option:

04 The WORK ZONE plaque along with the SPEED LIMIT sign may be used to emphasize the roadway's posted speed limit when the increased fines are not imposed.

Guidance:

05 *The use of the FINES HIGHER assembly should be limited to locations where work is actually underway, or to locations where the roadway, shoulder, or other conditions, require a speed reduction or extra caution on the part of the road user.*

06 *Where used, the FINES HIGHER assembly should be located as close to the work area as possible, as shown in Figure TTC-52 as opposed to placement prior to the advance warning signs (ROAD WORK AHEAD, etc.) and just beyond any interchanges, major intersections, or other major traffic generators.*

Support:

07 Experience has shown that compliance to reduced speed limit signs is greater if placed as close to the work as possible, as opposed to placement prior to the advance warning signs.

08 Section 2B.17 of the 2009 MUTCD contains additional information regarding the use of FINES HIGHER signs.

Section 6F.15 Pedestrian Crosswalk Sign (R9-8)

Option:

01 The PEDESTRIAN CROSSWALK (R9-8) sign (see Figure 6F-2) may be used to indicate where a temporary crosswalk has been established.

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Standard:

02 **If a temporary crosswalk is established, it shall be accessible to pedestrians with disabilities in accordance with Section 6D.02.**

Section 6F.16 Sidewalk Closed Signs (R9-9, R9-10, R9-11, R9-11a)

Guidance:

01 *SIDEWALK CLOSED signs (see Figure 6F-2) should be used where pedestrian flow is restricted. Bicycle/Pedestrian Detour (M4-9a) signs or Pedestrian Detour (M4-9b) signs should be used where pedestrian flow is rerouted (see Section 6F.66).*

02 *The SIDEWALK CLOSED (R9-9) sign should be installed at the beginning of the closed sidewalk, at the intersections preceding the closed sidewalk, and elsewhere along the closed sidewalk as needed.*

03 *The SIDEWALK CLOSED, (ARROW) USE OTHER SIDE (R9-10) sign should be installed at the beginning of the restricted sidewalk when a parallel sidewalk exists on the other side of the roadway.*

04 *The SIDEWALK CLOSED AHEAD, (ARROW) CROSS HERE (R9-11) sign should be used to indicate to pedestrians that sidewalks beyond the sign are closed and to direct them to open crosswalks, sidewalks, or other travel paths.*

05 *The SIDEWALK CLOSED, (ARROW) CROSS HERE (R9-11a) sign should be installed just beyond the point to which pedestrians are being redirected.*

Support:

06 These signs are typically mounted on a detectable barricade to encourage compliance and to communicate with pedestrians that the sidewalk is closed. Printed signs are not useful to many pedestrians with visual disabilities. A barrier or barricade detectable by a person with a visual disability is sufficient to indicate that a sidewalk is closed. If the barrier is continuous with detectable channelizing devices for an alternate route, accessible signing might not be necessary. An audible information device is needed when the detectable barricade or barrier for an alternate channelize route is not continuous.

Section 6F.17 Special Regulatory Signs

Option:

01 Special regulatory signs may be used based on engineering judgment consistent with regulatory requirements as per Chapter 2B of the Virginia Supplement to the MUTCD[1] and the 2009 MUTCD.

Guidance:

02 *Special regulatory signs should comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.*

Support:

03 An example of a special regulatory signs are the PROCEED WHEN WAY IS CLEAR (R1-V1) and[1] FENDER BENDER MOVE VEHICLES (R16-4(V)) sign.

Guidance:

04 *An engineering study should determine the use of the PROCEED WHEN WAY IS CLEAR sign when a stop or yield condition is used to control traffic on a two-lane roadway.*[1]

05 *The FENDER BENDER MOVE VEHICLES* [1] *sign should be installed for TMP Category C projects. Care should be taken when locating the sign so that the effectiveness of any work zone signing is not compromised.*

06 *An engineering study should determine the use of the FENDER BENDER MOVE VEHICLES sign in highly congested areas with high existing crash rates.*

Option:

07 The FENDER BENDER MOVE VEHICLES sign may be installed for a TMP Category B project.

08 Additional FENDER BENDER MOVE VEHICLES signs may be installed on intersecting highways that could be affected by work zone delays as deemed appropriate by the Engineer.

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09 In order to remind drivers who are making turns to yield to pedestrians, a TURNING VEHICLES YIELD TO PEDESTRIANS (R10-15) sign may be used.[1]

Section 6F.18 Warning Sign Function, Design, and Application

Support:

01 TTC zone warning signs (see Figure 6F-3) notify road users of specific situations or conditions on or adjacent to a roadway that might not otherwise be apparent.

Option:

02 Advance warning signs may be used singly or in combination.

Standard:

03 **TTC warning signs shall comply with the Standards for warning signs presented in 2009 MUTCD Part 2 and its SHSM (see Section 1A.11 of the 2009 MUTCD or Virginia Supplement to the 2009 MUTCD) and its VSHS. Except as provided in Paragraph 6, TTC warning signs shall be diamond-shaped with a black legend and border on a fluorescent orange background, except for the W10-1 sign which shall have a black legend and border on a yellow background, and except for signs that are in 2009 MUTCD Parts 2 or 7 and the Virginia Supplement to the 2009 MUTCD to have fluorescent yellow-green backgrounds.**

04 **Reflective sheeting used on warning signs shall be in compliance with Section 247 of the Road and Bridge Specifications.**

05 **Because of their importance, the size of diamond shaped TTC advance warning signs shall be a minimum of 48 x 48 inch.**

Option:

06 Where right-of-way constraints prohibit the use of 48 x 48 inch signs, a minimum size of 36 x 36 inch may be used for advance warning signs. Mounting or space considerations may justify a change from the standard diamond shape.

07 Where distances are not shown on warning signs as part of the message, a supplemental plaque with the distance legend may be mounted immediately below the sign on the same support.

08 Warning signs used for TTC incident management situations may have a black legend and border on a fluorescent prismatic pink (high observation angle) lens background.

09 In emergencies, available warning signs having yellow backgrounds may be used if signs with fluorescent orange or fluorescent pink backgrounds are not at hand.

Guidance:

10 *Where roadway or road user conditions require greater emphasis, larger than standard size warning signs should be used, with the symbol or legend enlarged approximately in proportion to the outside dimensions.*

11 *Where any part of the roadway is obstructed or closed by work activities or incidents, advance warning signs should be installed to alert road users well in advance of these obstructions or restrictions.*

12 *Where road users include pedestrians, the provision of supplemental audible information or detectable barriers, longitudinal channelizing devices, or barricades should be considered for people with visual disabilities.*

Support:

13 Detectable barriers, longitudinal channelizing devices, or barricades communicate very clearly to pedestrians who have visual disabilities that they can no longer precede in the direction that they are traveling.

Standard:

14 **Advanced warning signs shall be installed on entrance ramps if the advanced warning signs installed on the roadway are not visible to road users on the ramp.[1]**

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Section 6F.19 Position of Advanced Warning Signs

Guidance:

01 *Where highway conditions permit, warning signs should be placed in advance of the TTC zone at varying distances depending on roadway type, geometric conditions, sight distance and posted speed. Table 6C-1 contains information regarding the spacing of advance warning signs. Where a series of two or more advance warning signs are used, the closest sign to the TTC zone should be placed approximately 100 feet for low-speed urban streets to 1,300 feet or more for Limited Access highways.*

02 *Where multiple advance warning signs are needed on the approach to a TTC zone, the ROAD WORK AHEAD (W20-1) sign should be the first advance warning sign encountered by road users.*

03 *The word AHEAD should be used in place of a specific distance on advance warning signs in most applications.*

Option:

04 As an alternative to the word AHEAD on the advance warning signs, a specific distance may be used.

Support:

05 For 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.

06 Various conditions, such as limited sight distance or obstructions that might require a driver to reduce speed or stop, might require additional advance warning signs.

07 At TTC zones on lightly-traveled roads, all of the advance warning signs prescribed for major construction might not be needed.

Option:

08 Utility work, maintenance, or minor construction can occur within the TTC zone limits of a major construction project, and additional warning signs may be needed.

Guidance:

09 *Utility, maintenance, and minor construction signing and TTC should be coordinated with appropriate authorities so that road users are not confused or misled by the additional TTC devices.*

Section 6F.20 Reduced Speed Limit Ahead Sign (W3-5)

Standard:

01 **Speeds shall only be reduced within the TTC zone by the Regional Traffic Engineer upon completion of an engineering and traffic investigation warranting the reduction.**

Guidance:

02 *The Reduced Speed Limit Ahead (W3-5) sign (see Figure 6F-3) which serves as a general warning of speed reduction, should be located as close to the work area as possible, as opposed to placement prior to the advance warning signs (ROAD WORK AHEAD, etc.).*

Section 6F.21 Road (Street) Work Ahead Sign (W20-1), Road Work Next 2 Miles Sign (W21-V2), and Emergency Work Ahead Sign (W20-V27)[1]

Standard:

01 **The ROAD WORK AHEAD (W20-1) sign shall be used in place of the Workers (W21-1 and W21-1a) symbol sign. The Worker symbol sign shall not be used.**

02 **The ROAD (STREET) WORK sign shall have the legend ROAD (STREET) WORK AHEAD, XX FEET, or XX MILES.**

Guidance:

03 *The ROAD (STREET) WORK AHEAD sign (see Figure 6F-3) which serves as a general warning of obstructions or restrictions, should be located in advance of the work space or any detour, on the road where the work is taking place.*

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04 *Where traffic can enter a TTC zone from a crossroad or a major (high-volume) driveway, an advance warning sign should be used on the crossroad or major driveway.*

Option:

05 Other warning signs may be used in place of ROAD WORK AHEAD when appropriate such as RAMP WORK AHEAD (W21-V16), SURVEY CREW AHEAD (W21-V8), etc. based on the type of operation.

Support:

06 The maximum length of the work area is two miles unless approved by the Regional Traffic Engineer. Work operations such as paving operations and shoulder grading typically will progress more than two miles during a work shift.

Guidance:

07 *The ROAD WORK NEXT 2 MILES sign (W21-V2) should be used instead of the ROAD WORK AHEAD sign (W20-1) if the work area will extend over a greater distance of more than 2 miles during the work shift.*

08 *The initial work area should be as short as possible and should not exceed 2 miles. The work area should be extended as work progresses and a secondary ROAD WORK NEXT 2 MILES sign should be installed.*

09 *No more than two (2 miles each) ROAD WORK NEXT 2 MILES signs and their supporting advance warning signs should be exposed to motorists at any one time.*

Option:

10 The ROAD WORK AHEAD sign or ROAD WORK NEXT 2 MILES sign may be used until December 31, 2012, at which time only the ROAD WORK NEXT 2 MILES sign will be allowed if the work locations occur over a distance of more than 2 miles.

Standard:

11 **The distance of the ROAD WORK NEXT 2 MILES sign shall not increase.**

12 **The EMERGENCY WORK AHEAD (W20-V27) sign used for Temporary Traffic Incident Management Control (TIMC) zone shall have a black legend and border on a fluorescent pink background.[1]**

Guidance:

13 *The EMERGENCY WORK AHEAD sign should be the first advance warning sign encountered by road users in a TIMC zone.*[1]

Option:

14 The Emergency Work Ahead sign may be used in lieu of the Road Work Ahead sign when unexpected or natural event occurs that requires urgent work activity.[1]

15 Other supporting advance warning signs may have a fluorescent orange background with a black legend and border.[1]

Support:

16 Work caused by an unexpected or natural event that must be dealt with urgently, but is not part of daily operations or planned work, can be classified as a traffic incident. Temporary traffic control for incident management can be found in Chapter 6I.[1]

Section 6F.22 Mowing Ahead Sign (W21-8), Mowing Next 2 Miles Sign (W21-V3), Watch For Slow Moving Vehicle Sign (W21-V1), Line Painting Next 5 Miles Sign (W21-V4), and Spraying Next 5 Miles Sign (W21-V5)

Guidance:

01 *The MOWING NEXT 2 MILES (W21-V3) sign (see Figure 6F-3) should be used instead of the MOWING AHEAD (W21-8) sign if the work locations occur over a distance of more than 2 miles.*

02 *A WATCH FOR SLOW MOVING VEHICLES (W21–V1) sign (see Figure 6F-3) should be use in conjunction with MOWING NEXT 2 MILES sign, see Figures TTC-9 and TTC-10.*

03 *No more than two (2 miles each) MOWING NEXT 2 MILES sign and their supporting advance warning signs should be exposed to motorist at any one time.*

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Option:

04 Other warning signs may be used in place of MOWING NEXT 2 MILES when appropriate such as LINE PAINTING NEXT 5 MILES (W21-V4) and SPRAYING NEXT 5 MILES (W21-V5) based on the type of operation (see Figure 6F-3).

Standard:

05 **The MOWING AHEAD sign shall be used on intersecting roadways entering into a mowing operation.**

06 **The distance of the MOWING WORK NEXT 2 MILES sign shall not increase.**

07 **The LINE PAINTING and SPRAYING signs shall have the legend LINE PAINTING NEXT 5 MILES, or SPRAYING NEXT 5 MILES. Their distance shall not increase.**

Guidance:

08 *No more than two (5 miles each) LINE PAINTING NEXT 5 MILES or SPRAYING NEXT 5 MILES signs and their supporting advance warning signs should be exposed to motorist at any one time.*

Section 6F.23 Detour Ahead Sign (W20-2)

Guidance:

01 *The DETOUR AHEAD (W20-2) sign (see Figure 6F-3) should be used in advance of a road user detour over a different roadway or route.*

Standard:

02 **The DETOUR sign shall have the legend DETOUR AHEAD, XX FEET, or XX MILES. The DETOUR sign in TTC zones shall have a black legend and border on a fluorescent orange background.**

Option:

03 Detour signs in TTC incident management situations may have a black legend and border on a fluorescent pink background.

Section 6F.24 Road (Street) Closed Ahead Sign (W20-3), Ramp Closed Ahead Sign (W20-V12), and Road Closed High Water Sign (W20-V11)

Guidance:

01 *The ROAD (STREET) CLOSED AHEAD (W20-3) sign (see Figure 6F-3) should be used in advance of the point where a highway is closed to all road users, or to all but local road users.*

Standard:

02 **The ROAD CLOSED sign shall have the legend ROAD (STREET) CLOSED AHEAD, XX FEET, or XX MILES.**

Option:

03 Other warning signs may be used in place of ROAD CLOSED AHEAD when appropriate such as, RAMP CLOSED AHEAD (W20-V12).

Guidance:

04 *The ROAD CLOSED HIGH WATER (W20-V11) sign should be used in advance of the point where a roadway is closed to all road users due to high water.*

Standard:

05 **Type 3 Barricades with a ROAD CLOSED (R11-3) and Group 2 channelizing devices shall be used to physically close the roadway at the high water location.**

Section 6F.25 One Lane Road Ahead Sign (W20-4)

Standard:

01 **The ONE LANE ROAD AHEAD (W20-4) sign (see Figure 6F-3) shall be used only in advance of that point where motor vehicle traffic in both directions must use a common single lane (see Section 6C.11).**

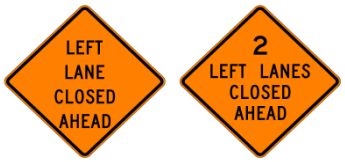
02 **It shall have the legend ONE LANE ROAD AHEAD, XX FEET, or XX MILES.**

Section 6F.26 Lane(s) Closed Signs (W20-5, W20-5a), Turn Lane(s) Closed Signs (W20-V13), Median Crossover Closed Ahead Signs (W20-V15), and Median Crossover Closed Sign (W20-V16)[1]

Standard:

01 **The Lane(s) Closed sign (see Figure 6F-3) shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.**

02 **For a single lane closure, the Lane Closed (W20-5) sign (see Figure 6F-3) shall have the legend RIGHT (LEFT) (CENTER) LANE CLOSED, AHEAD, XX FEET, or XX MILES. Where two adjacent lanes are closed, the W20-5a sign (see Figure 6F-3) shall have the legend 2 RIGHT (LEFT) LANES CLOSED AHEAD, XX FEET, or XX MILES.**



W9-3 or W20-5 W20-5a

Required as of July 1, 2014[1]

Option:

03 Other warning signs may be used in place of RIGHT (LEFT) CENTER LANE CLOSED (W20-5, W20-5a) when appropriate such as, CENTER (LEFT) (RIGHT) TURN LANE CLOSED AHEAD (W20-V13).

04 A base sign, such as the CENTER LANE CLOSED AHEAD sign may be modified with a RIGHT or LEFT overlay panel shown in the 2011 VSHS book.

Standard:

05 **The MEDIAN CROSSOVER CLOSED AHEAD (W20-V15) and MEDIAN CROSSOVER CLOSED (W20-V16) signs shall be used in advance of the point where the median crossover is closed. A NO LEFT TURN (R3-2) sign shall be used in conjunction with the MEDIAN CROSSOVER signs and be installed at the beginning of the turn lane taper or 200 to 300 feet in advance of the of a crossover without turn lane.[1]**

Section 6F.27 Emergency Scene Ahead Sign (W20-V25)

Support:

01 Temporary traffic control for incident management can be found in Chapter 6I.

Guidance:

02 *The EMERGENCY SCENE AHEAD (W20-V25) sign should be the first advance warning sign encountered by road users in a traffic incident management control (TIMC) zone.*

Standard:

03 **The EMERGENCY SCENE AHEAD sign used for TIMC zone shall have a black legend and border on a fluorescent pink background.**

Option:

04 Additional TTC and advance warning signs may be needed in a TIMC zone.

Section 6F.28 Center (Left/Right) Lane Closed Ahead Sign (W9-3)

Standard:

01 **The CENTER (LEFT/RIGHT) LANE CLOSED AHEAD (W9-3) sign (see Figure 6F-3) shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.**

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W9-3

Required as of July 1, 2014[1]

Option:

02 A base sign, such as the CENTER LANE CLOSED AHEAD sign may be modified with a RIGHT or LEFT overlay panel shown in the 2011 VSHS book.

Section 6F.29 Lane Ends Merge Left/ Right (W9-2), Keep Left/Right (R4-V7), and Lane Ends Signs (W4-2)

Standard:

01 **The LANE ENDS MERGE LEFT/RIGHT (W9-2) sign shall be used in advance of the Lane Ends (W4-2) sign(s) to warn motorist to merge from the lane which will occupy the work area. The LANE ENDS MERGE sign shall be placed on the shoulder in which the travel lane is closed. The KEEP LEFT/RIGHT (R4-V7) sign shall be used to indicate the open travel lane and shall be placed on the opposite shoulder across from the LANE ENDS MERGE sign (see Figure TTC-16).**

02 **The KEEP LEFT/RIGHT sign shall only be used as a TTC sign and shall not be used in permanent installations.**

03 **The Lane Ends symbol sign with skip lines displayed (see Figure 6F-3) shall be used to warn drivers of the reduction in the number of lanes for moving motor vehicle traffic in the direction of travel on a multi-lane roadway.**

Option**:**

04 A base sign, such as the LANES ENDS MERGE RIGHT and the KEEP RIGHT sign may be modified with a LEFT overlay panel shown in the 2011 VSHS book.

Section 6F.30 One-Direction Large Arrow Sign (W1-V1)

Support:

01 Due to the familiarly of the location and knowledge of the existing lane drop condition by motorist on Non-Limited Access primary and secondary routes an electronic arrow board can be replaced with a One-Directional Large Arrow (W1-V1) sign on long term projects (greater than two weeks).

Standard:

02 **The size of the One-Direction Large Arrow sign shall be 96" x 48" and it shall have a black arrow and border on a fluorescent orange background.**

03 **The One-Direction Large Arrow sign can only be used on long-term Non-Limited Access Primary and Secondary Routes projects and it shall be approved by the Regional Traffic Engineer before implementation. The One-Directional Large Arrow sign shall not replace an Electronic Arrow Board on a Limited Access highway.**

04 **The Electronic Arrow Board must be in operation for a minimum of two weeks to allow motorist to become accustomed to the new traffic pattern prior to being replaced with the One-Directional Large Arrow sign.**

05 **The mounting height of the One-Direction Large Arrow sign shall be the same as the Electronic Arrow Board, a minimum of seven (7) feet from the bottom of the sign to the roadway elevation.**

Option:

06 During the two week period when the Electronic Arrow Board is in use, the One-Direction Large Arrow sign may be fastened under the flashing arrow board for greater recognition when the devices are switched.

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Section 6F.31 On Ramp Plaque (W13-4P) and Ramp Work Ahead Sign (W21-V16)

Guidance:

01 *When long-term stationary work is being done on a ramp, but the ramp remains open, the ON RAMP (W13-4P) plaque (see Figure 6F-3) should be used to supplement the advance ROAD WORK AHEAD sign.*

Option:

02 A RAMP WORK AHEAD (W21-V16) sign may be used in place of the ROAD WORK AHEAD sign and the ON RAMP plaque.

Section 6F.32 Signal Work Ahead Sign (W21-V17)

Guidance:

01 *The SIGNAL WORK AHEAD (W21-V17) sign should be used while performing work on a signal.*

Option:

02 The ROAD WORK AHEAD sign may be used in place of the SIGNAL WORK AHEAD sign when signal work is on the shoulder of the roadway.

Section 6F.33 Ramp Narrows Sign (W5-4) and Lane Width Plaque (W5-VP1)

Guidance:

01 *The RAMP NARROWS (W5-4) sign (see Figure 6F-3) should be used in advance of the point where work on a ramp reduces the normal width of the ramp along a part or the entire ramp.*

Standard:

02 **For long-term stationary work, when the distance between the edge line and the channelizing devices is less than 14 feet, a LANE WIDTH plaque (W5-VP1) displaying the width from the edge line to the channelizing devices in feet and inches shall be mounted below the RAMP NARROWS sign. The clear width on the LANE WIDTH plaque shall be rounded down to the nearest foot or half foot increment (see Figure TTC-38).**

Guidance:

03 *A traffic engineering study should determine if there is a need for a wide load detour and additional TTC.*

Section 6F.34 Shadow Vehicle and Work Vehicle-Mounted Signs

Guidance:

01 *On two-lane mobile operations, a LANE CLOSED DO NOT PASS (R4-V6) sign should be used on the back of the shadow vehicle.*

Standard:

02 **The LANE CLOSED DO NOT PASS sign shall be rectangular-shaped with a black legend and border. The LANE CLOSED portion of the sign shall have a fluorescent orange background and the DO NOT PASS section shall have a white background. See the 2011 VSHS book for fabrication requirements.**

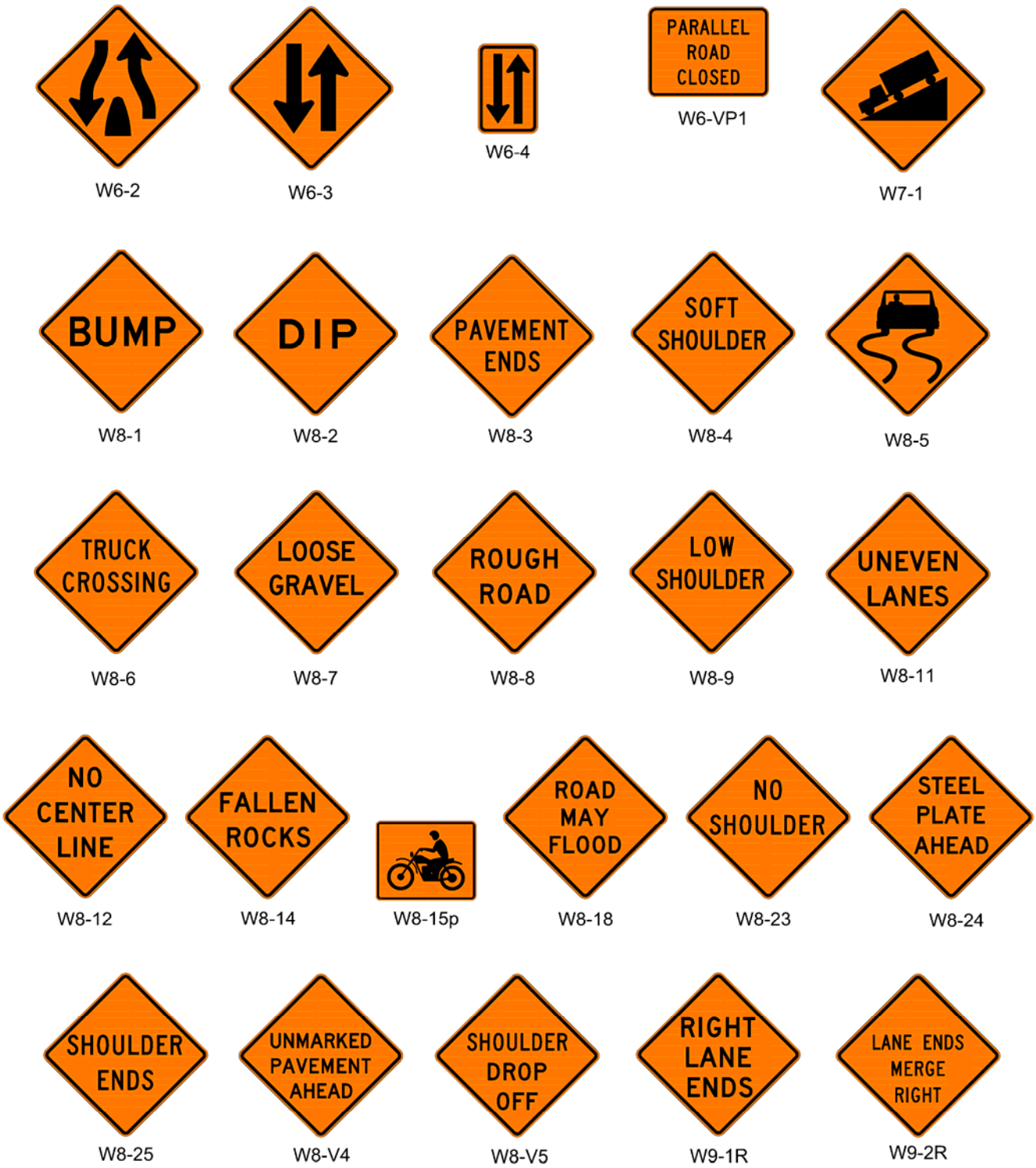
03 **The ROAD WORK AHEAD – X LANE CLOSED (W20-V1 and W20-V2 series) sign shall be used on back of the shadow vehicles performing mobile operations on all roadways.**

04 **Alternate vehicle-mounted sign messages are ROAD WORK AHEAD – LEFT SHOUDLER CLOSED (W20-V1L), ROAD WORK AHEAD – RIGHT SHOULDER CLOSED (W20-V1R), ROAD WORK AHEAD – CENTER LANE CLOSED (W20-V2C), ROAD WORK AHEAD – LEFT LANE CLOSED (W20-V2L), ROAD WORK AHEAD – X LEFT LANE(S) CLOSED (W20-V2aL), ROAD WORK AHEAD – RIGHT LANE CLOSED (W20-V2R) and ROAD WORK AHEAD – X RIGHT LANE(S) CLOSED (W20-V2aR).**

Figure 6F-3, Warning Signs and Plaques in Temporary Traffic Control (Sheet 1 of 5)[1]

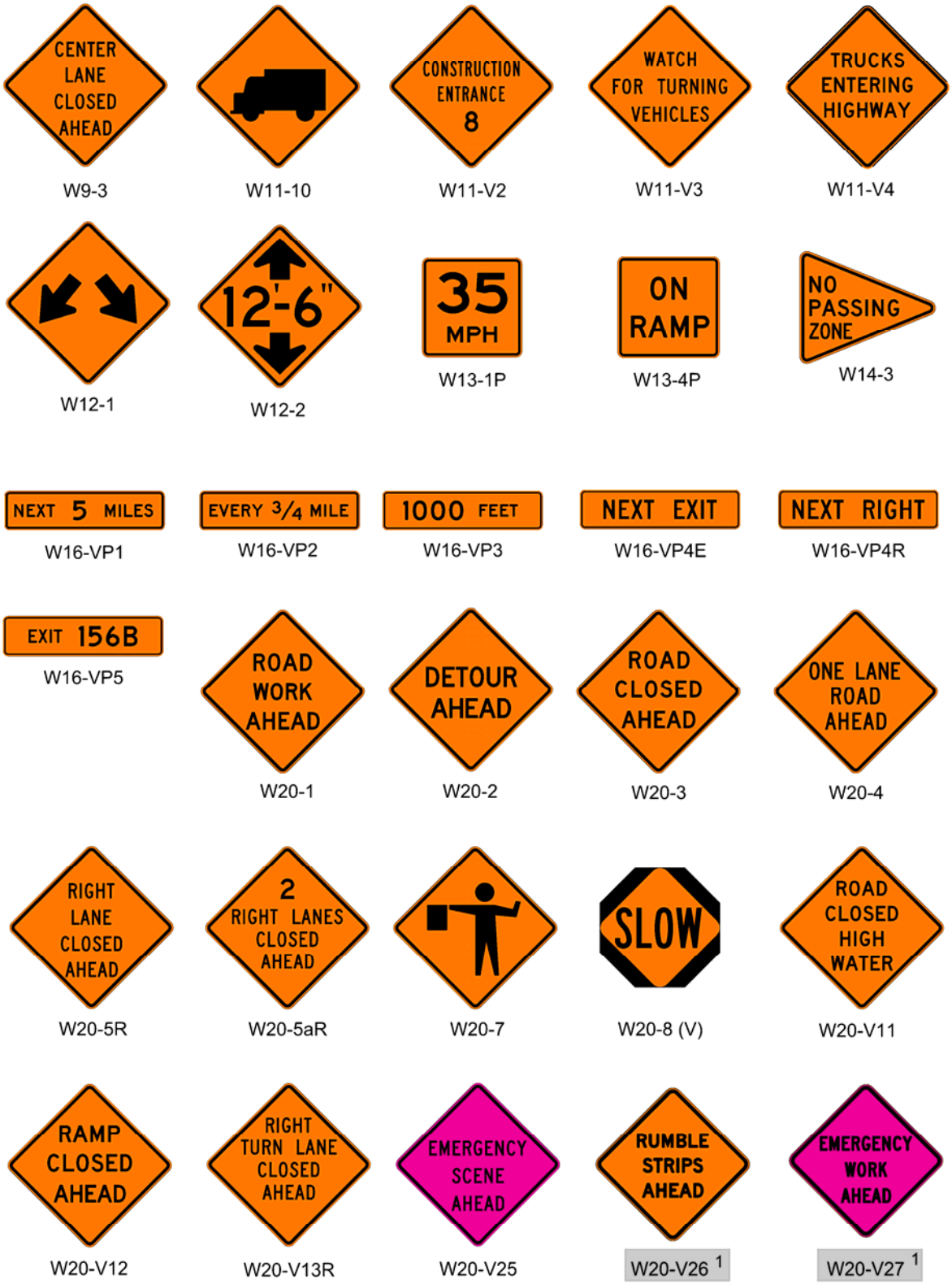
1: Revision 1 – 4/1/2015

Figure 6F-3, Warning Signs and Plaques in Temporary Traffic Control (Sheet 2 of 5)[1]



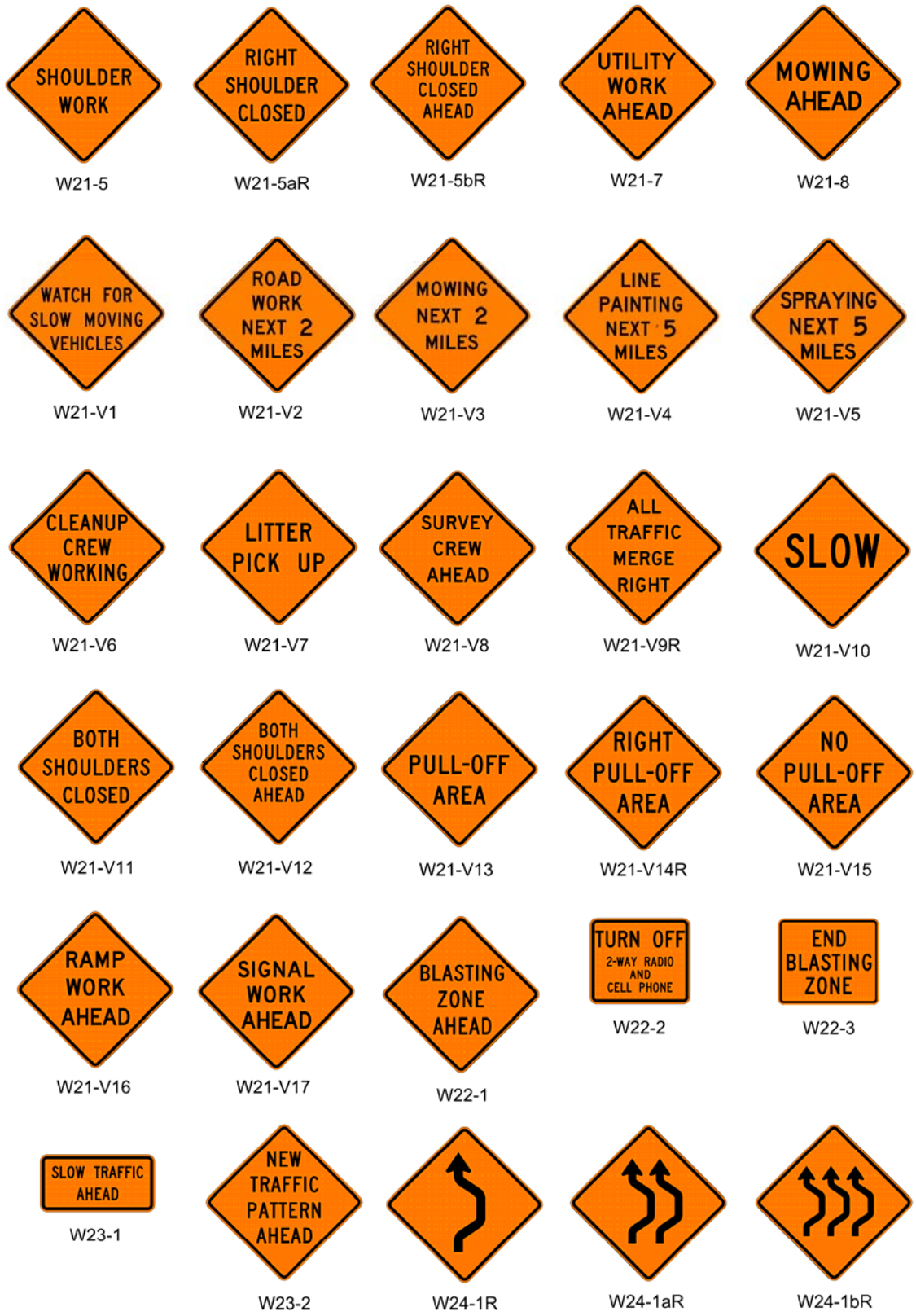
1: Revision 1 – 4/1/2015

Figure 6F-3, Warning Signs and Plaques in Temporary Traffic Control (Sheet 3 of 5)[1]



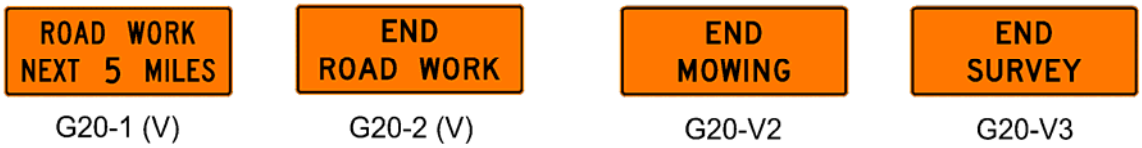
1: Revision 1 – 4/1/2015

Figure 6F-3, Warning Signs and Plaques in Temporary Traffic Control (Sheet 4 of 5)[1]



1: Revision 1 – 4/1/2015

Figure 6F-3, Warning Signs and Plaques in Temporary Traffic Control (Sheet 5 of 5)[1]



05 **Where two adjacent lanes are closed, the ROAD WORK AHEAD – 2 LEFT LANES CLOSED (W20-V2aL) or ROAD WORK AHEAD – 2 RIGHT LANES CLOSED (W20-V2aR) shall be used.**

Option:

06 Other warning sign legends may be used in place of the ROAD WORK AHEAD sign when appropriate such as MOWING AHEAD (W20-V3 and W20-V4 series), LINE PAINTING AHEAD (W20-V5 series), and SPRAYING AHEAD (W20-V6 and W20-V7 series) based on the type of operation.

07 A base sign, such as ROAD WORK AHEAD LEFT SHOULDER CLOSED sign may be modified with such as MOWING AHEAD or RIGHT overlay panel shown in the 2011 VSHS book.

Standard:

08 **When applying sprayed-on pre-storm treatment material, a PRE-STORM TREATMENT (W20-V8 series) sign shall be used on the back of the shadow vehicle with a TMA. A PRE-STORM TREATMENT (W20-V9) sign shall be used on the back of the application (work) vehicle and on a shadow vehicle without a TMA.**

09 **The KEEP BACK 100 FT (W20-V10) sign shall be used on the application (work) vehicle such as a pre-storm treatment vehicle or a salt spreader.**

Option:

10 The PRE-STORM TREATMENT sign may be eliminated on the application (work) vehicle when there is no physical way to attach the sign to the back of the application (work) vehicle.

11 The SLOW TRAFFIC AHEAD (W23-1) sign (see Figure 6F-4) may be used on a shadow vehicle, usually mounted on the rear of the most upstream shadow vehicle, along with other appropriate signs for mobile operations to warn of slow moving work vehicle. A ROAD WORK AHEAD (W20-1) sign may all so be used with the SLOW TRAFFIC AHEAD sign.

12 A truck-mounted Changeable Message Sign capable of display three separate lines of text, simulation of flashing arrow and four corner caution mode may be used in place of the ROAD WORK AHEAD – X LANE CLOSED (W20-V1 to W20-V8 series) sign (see Section 6F.68).

Section 6F.35 Exit Open and Exit Closed Signs (E5-2, E5-2a)

Guidance:

01 *An EXIT OPEN (E5-2) or EXIT CLOSED (E5-2a) sign (see Figure 6F-5) should be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition.*

02 *When an exit ramp is closed, an EXIT CLOSED sign panel should be placed diagonally across the interchange/intersection guide signs.*

Standard:

03 **The EXIT OPEN and EXIT CLOSED sign shall have a black legend and border on a fluorescent orange background.**

04 **For better visibility the EXIT OPEN and EXIT CLOSED shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign (see Figure TTC-37).[1]**

1: Revision 1 – 4/1/2015

Section 6F.36 Exit Only Sign (E5-3) and Exit Sign (E5-V1)

Standard:

01 **A temporary EXIT (E5-V1) sign (see Figure 6F-5) shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign (see Figure TTC-37).**

Option:

02 The temporary EXIT sign placed in the temporary gore may be either black on fluorescent orange or white on green.

03 An EXIT ONLY (E5-3) sign (see Figure 6F-5) may be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition.

Section 6F.37 New Traffic Pattern Ahead Sign (W23-2)

Guidance:

01 *A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 6F-3) should be used on the approach to an intersection or along a section of roadway to provide advance warning of a change in traffic patterns, such as revised lane usage, roadway geometry, or signal phasing.*

02 *To retain its effectiveness, the NEW TRAFFIC PATTERN AHEAD sign should be displayed for up to 2 weeks, and then it should be covered or removed until it is needed again.*

Section 6F.38 Flagger Signs (W20-7a, W20-7), XX Feet Plaque (W16-VP3), and Slow Sign (W21-V10)

Standard:

01 **The FLAGGER (W20-7a) sign word message shall not be used.**

02 **The Flagger[1] symbol sign shall be removed or covered whenever[1] the flagging operation is suspended[1].**

03 **On non-stationary flagger operations a Flagger symbol sign shall stay within ½ mile of each flagger.**

Guidance:

04 *The Flagger symbol sign (see Figure 6F-3) should be used in advance of any point where a flagger is stationed to control road users.*

05 *Additional Flagger symbol signs should be placed at ½ mile intervals and either erected by the approaching flagger, or taken down as the operation proceeds past this point.*

Option:

06 On long-term projects, a Distance (W16-VP3) plaque may be displayed on a supplemental plaque below the Flagger sign. The sign may be used with appropriate legends or in conjunction with other warning signs, such as the BE PREPARED TO STOP (W3-4) sign (see Figure 6F-3).

W16-VP3 for 36" sign - 48 x 12
W16-VP3 for 48" sign - 60 x 18
Required as of July 1, 2014[1]

07 A SLOW (W21-V10) sign may be added to the TTC zone for flagger operation when geometrics conditions prohibit the use of a supplemental flagger. The project's Engineer may allow the SLOW sign to be used in other TTC zones.

1: Revision 1 – 4/1/2015

Guidance:

08 *Where conditions warrant the use of a supplemental flagger but roadway geometrics prohibit the use of a supplemental flagger, a SLOW sign should be placed in the advance warning area.*

Section 6F.39 Two-Way Traffic Signs (W6-3, W6-4) and Parallel Road Closed Plaque (W6-VP1)

Guidance:

01 *When one roadway of a normally divided highway is closed, with two-way vehicular traffic maintained on the other roadway, the Two-Way Traffic (W6-3) sign (see Figure 6F-3) should be used at the beginning of the two-way vehicular traffic section and at intervals to remind road users of opposing vehicular traffic.*

02 *The PARALLEL ROAD CLOSED (W6-VP1) plaque should be installed with and below the Two-Way Traffic sign.*

Option:

03 When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic and the PARALLEL ROAD CLOSED signs may be eliminated.

04 A crashworthy TWO-WAY TRAFFIC (W6-4) sign may be used on channelizing devices to separate two-way traffic in an urban area.

Section 6F.40 Motorized Traffic Signs - Truck Crossing Symbol (W11-10), Truck Crossing Sign (W8-6), Watch for Turning Vehicles Sign (W11-V3), Trucks Entering Highway Sign (W11-V4), and Construction Entrance Sign (W11-V2)

Option:

01 Motorized Traffic (W8-6, W11-10, W11-V2, and W11-V4) signs may be used to alert road users to locations where unexpected travel on the roadway or entries into or departures from the roadway by construction vehicles might occur.

Guidance:

02 *Truck Crossing (W11-10) symbol sign (see Figure 6F-3) should be used where a construction vehicle crossing of the roadway has been established.*

Option:

03 The TRUCK CROSSING (W8-6) word message sign may be used as an alternate to the Truck Crossing (W11-10) symbol sign.

04 The TRUCKS ENTERING HIGHWAY (W11-V4) sign may be used on projects where multiple construction vehicles enter the roadway from different locations throughout the project.

Standard:

05 **TRUCKS ENTERING HIGHWAY sign shall be used to warn of logging trucks entering roadways (see Figure TTC-63). LOG TRUCKS ENTERING HIGHWAY sign shall not be use.**[1]

Guidance:

06 *CONSTRUCTION ENTRANCE (W11-V2) sign should be used to help delivery drivers to identify established construction and delivery entrances on large scale projects.*

Option:

07 A CONSTRUCTION ENTRANCE sign number may be modified with another number overlay panel found in the 2011 VSHS book.

Guidance:

08 *The WATCH FOR TURNING VEHICLES (W11-V3) sign should be used in advance of intersections or driveways with a high daily turning movement.*

Standard:

09 **The WATCH FOR TURNING VEHICLES sign shall not be used on a controlled approach.**

1: Revision 1 – 4/1/2015

Support:

10 These locations might be relatively confined or might occur randomly over a segment of roadway.

Section 6F.41 Rough Road Sign (W8-8), Motorcycle Plaque (W8-15P), and Grooved Pavement Sign (W20-V14)[1]

Guidance:

01 *The ROUGH ROAD (W8-8) sign (see Figure 6F-3) should be used to warn of a rough roadway surface and pavement milled surfaces.*

Option:

02 The GROOVED PAVEMENT (W20-V14) sign may be used as an alternative to the ROUGH ROAD sign.[1]

03 A MOTORCYCLE (W8-15P) plaque (see Figure 6F-3) may be mounted below a ROUGH ROAD sign or a GROOVED PAVEMENT[1] sign when the sign is mounted on a post.

Section 6F.42 Shoulder Work Signs (W21-5, W21-5a, W21-5b, W21-V11, W21-V12)

Support:

01 Shoulder Work signs (see Figure 6F-3) warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.

Standard:

02 **The Shoulder Work signs shall have the legend SHOULDER WORK (W21-5), RIGHT (LEFT) SHOULDER CLOSED (W21-5a), RIGHT (LEFT) SHOULDER CLOSED AHEAD, XX FT or XX MILES (W21-5b), BOTH SHOULDERS CLOSED (W21-V11), or BOTH SHOULDERS CLOSED AHEAD (W21-V12).**

Option:

03 The Shoulder Work sign may be used in advance of the point on a Non-Limited Access highway where there is shoulder work. It may be used singly or in combination with a ROAD WORK NEXT 2 MILES (W21-V2) or ROAD WORK AHEAD sign.

Guidance:

04 *On Limited Access highways, the RIGHT (LEFT) SHOULDER CLOSED AHEAD or BOTH SHOULDERS CLOSED AHEAD (W21-V12) sign followed by RIGHT (LEFT) SHOULDER CLOSED (W21-5a) or BOTH SHOULDERS CLOSED (W21-V11) sign should be used in advance of the point where the shoulder work occurs and should be preceded by a ROAD WORK AHEAD sign. When the shoulder is closed with barrier, a NEXT XX MILE(S) (W16-VP1) or XX FT (W16-VP3) plaque should be used under the RIGHT (LEFT) SHOULDER CLOSED or BOTH SHOULDERS CLOSED signs.*

Option:

05 NEXT XX MILE(S) (W16-VP1) or XX FT (W16-VP3) plaque may be added under the RIGHT (LEFT) SHOULDER CLOSED (W21-5a) or BOTH SHOULDERS CLOSED (W21-V11) sign when signs are post-mounted.

06 A base sign, such as RIGHT SHOULDER CLOSED AHEAD sign may be modified with a LEFT overlay panel as shown in the 2011 VSHS book.

Section 6F.43 Pull-Off Area Signs (W21-V13, W21-V14, W21-V15, E5-V2) and Supplemental Plaques (W16-VP1, W16-VP2, W16-VP3, W16-VP4, W16-VP5)

Support:

01 Pull-off signage is necessary when one or both shoulders are closed with temporary traffic barrier to warn motorist if there are opportunities for disabled vehicles to pull off the roadway (see Figures 6F-3 and 6F-5).

Guidance:

02 *A NO PULL-OFF AREA (W21-V15) sign with NEXT XX MILES (W16-VP1) plaque (see Figure 6F-3) should be installed after the shoulder closure sign to warn motorist there are no opportunities for disabled vehicles to pull off the roadway throughout the work area.*

1: Revision 1 – 4/1/2015

03 *Where multiple pull-off areas are provided for disable vehicles, a LEFT (RIGHT) PULL-OFF AREA (W21-V14L/R) sign with EVERY X MILE (W16-VP2) plaque should be installed after the shoulder closure sign(s). The legend of the plaque should be EVERY ½ MILE, EVERY ¾ MILE, or EVERY 1 MILE (see Figure 6F-3 and Figure TTC-8).*

04 *A LEFT/RIGHT PULL-OFF AREA sign along with a XX FEET (W16-VP3) plaque should be installed in advance of every disabled vehicle pull off area. A Pull-Off Area Entrance (E5-V2) sign (see Figure 6F-5) should identify the beginning of every disabled vehicle pull-off area.*

05 *Where an interchange will provide a pull-off for disabled vehicles, a PULL-OFF AREA (W21-V13) sign with an Exit Number (W16-VP5) plaque should be installed adjacent to the Interchange Advance Guide sign. If multiple Interchange Advance Guide signs are used then the PULL-OFF AREA sign and the Exit Number plaque should be install between the two Interchange Advance Guide signs. A Pull-Off Area Entrance sign should be installed on the shoulder adjacent to the Interchange Exit Directional sign.*

06 *Where interchange numbers are not provided the PULL-OFF AREA sign with a NEXT EXIT (W16-VP4E) plaque should be installed on the shoulder adjacent to the Interchange Advance Guide sign.*

Option:

07 A base sign, such as RIGHT PULL-OFF AREA sign may be modified with a LEFT overlay panel shown in the 2011 VSHS book.

08 The legends NEXT LEFT (W16-VP4L) or NEXT RIGHT (W16-VP4R) may be substituted for NEXT EXIT plaque.

Section 6F.44 Survey Crew Ahead Sign (W21-V8)

Guidance:

01 *The SURVEY CREW AHEAD (W21-V8) sign should be used in place of the SURVEY CREW (W21-6) sign.*

02 *The SURVEY CREW AHEAD sign (see Figure 6F-3) should be used to warn of surveying crews working in or adjacent to the roadway.*

W21-V8

Required as of July 1, 2014[1]

Section 6F.45 Utility Work Ahead Sign (W21-7)

Option:

01 The UTILITY WORK AHEAD (W21-7) sign (see Figure 6F-3) may be used as an alternate to the ROAD (STREET) WORK (W20-1) sign for utility operations on or adjacent to a highway.

02 The words XX FEET or XX MILES may be substituted word ahead on the UTILITY WORK AHEAD sign.

Support:

03 Typical examples of where the UTILITY WORK sign is used appear in Temporary Traffic Control (TTC) Figures TTC-1, TTC-3, TTC-4, TTC-5, TTC-15, TTC-16, TTC-17, TTC-18, TTC-19, TTC-35 and TTC-36.

Section 6F.46 Signs for Blasting Areas

Support:

01 Radio-Frequency (RF) energy can cause the premature firing of electric detonators (blasting caps) used in TTC zones.

1: Revision 1 – 4/1/2015

Standard:

02 **Road users shall be warned to turn off mobile radio transmitters and cellular telephones where blasting operations occur. A sequence of signs shall be prominently displayed to direct operators of mobile radio equipment, including cellular telephones, to turn off transmitters in a blasting area. These signs shall be covered or removed when there are no explosives in the area or the area is otherwise secured.**

Section 6F.47 Blasting Zone Ahead Sign (W22-1)

Standard:

01 **The BLASTING ZONE AHEAD (W22-1) sign (see Figure 6F-3) shall be used in advance of any TTC zone where explosives are being used. The TURN OFF 2-WAY RADIO AND CELL PHONE and END BLASTING ZONE signs shall be used in sequence with this sign (see Figure TTC-2).**

Section 6F.48 Turn Off 2-Way Radio And Cell Phone Sign (W22-2)

Standard:

01 **The TURN OFF 2-WAY RADIO AND CELL PHONE (W22-2) sign (see Figure 6F-3) shall follow the BLASTING ZONE AHEAD sign and shall be placed at least 1,000 feet before the beginning of the blasting zone (see Figure TTC-2).**

Section 6F.49 End Blasting Zone Sign (W22-3)

Standard:

01 **The END BLASTING ZONE (W22-3) sign (see Figure 6F-3) shall be placed a minimum of 1,000 feet past the blasting zone (see Figure TTC-2).**

Option:

02 The END BLASTING ZONE sign may be placed either with or preceding the END ROAD WORK sign.

Section 6F.50 Soft Shoulder Sign (W8-4), Low Shoulder Sign (W8-9), and Shoulder Drop Off Sign (W8-V5)

Option:

01 The SOFT SHOULDER (W8-4) sign (see Figure 6F-3) may be used to warn of a soft shoulder condition.

02 The LOW SHOULDER (W8-9) sign (see Figure 6F-3) may be used to warn of a shoulder condition where there is an elevation difference of 2 inches or less between the shoulder and the travel lane.

Standard:

03 **If used, the LOW SHOULDER sign shall be repeated at 1 mile intervals if the condition extends over a distance in excess of 1 mile.**

04 **The SHOULDER DROP OFF (W8-V5) sign (see Figure 6F-3) shall be used when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 2 inches in depth for a continuous length along the roadway, based on engineering judgment. Where the condition extends over a distance in excess of 1 mile, the sign shall be repeated at 1 mile intervals.**

W8-V5

Required as of July 1, 2014[1]

Standard:

05 **The SHOULDER DROP OFF (W8-17P) supplemental plaque (see Figure 6F-4 in the 2009 MUTCD) shall be mounted under the Shoulder Drop Off (W8-17) symbol sign when post-mounted.**

1: Revision 1 – 4/1/2015

Standard:

06 **The SHOULDER DROP OFF (W8-17P) supplemental plaque (see Figure 6F-4 in the 2009 MUTCD) shall be mounted under the Shoulder Drop Off (W8-17) symbol sign when post-mounted.**

Section 6F.51 Uneven Lanes Sign (W8-11)

Standard:

01 **The UNEVEN LANES (W8-11) sign (see Figure 6F-3) shall be used during operations that create a difference in elevation between adjacent lanes that are open to travel.**

02 **When used on a portable sign support, the UNEVEN LANES sign shall be adjusted daily with the work operation and a sand bag weighing approximately 25-pounds shall be placed on each leg of the sign stand.**

Section 6F.52 Steel Plate Ahead Sign (W8-24)

Standard:

01 **The STEEL PLATE AHEAD (W8-24) sign (see Figure 6F-3) shall be used to warn road users whenever a steel plate(s) is being used to protect the surface of the roadway open to travel.**

02 **When used on a portable sign support, the STEEL PLATE AHEAD sign shall be adjusted daily with the work operation and a sand bag weighing approximately 25-pounds shall be placed on each leg of the sign stand.**

03 **Conspicuity pavement markings shall be applied to steel plate(s) when used (see Section 6G.15).**

Support:

04 The steel plate could make the road surface uneven and could create slippery conditions during wet weather; therefore, conspicuity pavement markings are required when steel plates are used.

Option:

05 Additional warning signs may be necessary for the conditions present. A ride through of the worksite should be performed to check for bumps and rough road conditions.

Section 6F.53 No Center Line Sign (W8-12) and Unmarked Pavement Ahead Sign (W8-V4)

Standard:

01 **The NO CENTER LINE (W8-12) sign (see Figure 6F-3) shall be used when the work obliterates the double yellow or yellow skip line center line(s) pavement markings. This sign should be placed at the beginning of the TTC zone and repeated at 2-mile intervals in long TTC zones.**

W8-12 (2009 MUTCD)

Required as of July 1, 2014[1]

02 **The UNMARKED PAVEMENT AHEAD (W8-V4) sign shall be erected in advance of resurfaced roadway sections 500 feet or more in length where the skip lines or the skip and edge lines have been removed until pavement marking are applied.**

Support:

03 Section 6F.86 contains information regarding temporary markings.

1: Revision 1 – 4/1/2015

Section 6F.54 Reverse Curve Signs (W1-4 Series)

Guidance:

01 *In order to give road users advance notice of a lane shift, a Reverse Curve (W1-4, W1-4b, or W1-4c) sign (see Figure 6F-3) should be used when a lane (or lanes) is being shifted to the left or right. If the design speed of the curves is 30 mph or less, a Reverse Turn (W1-3) sign should be used.*

Standard:

02 **If a Reverse Curve (or Turn) sign is used, the direction of the reverse curve (or turn) shall be appropriately illustrated. Except as provided in Paragraph 3, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.**

Option:

03 Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque (see Figure 6F-3) may be used instead of a sign that illustrates the number of lanes.

04 Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

Section 6F.55 Double Reverse Curve Signs (W24-1 Series)

Option:

01 The Double Reverse Curve (W24-1, W24-1a, or W24-1b) sign (see Figure 6F-3) may be used where the tangent distance between two reverse curves is less than 600 feet, thus making it difficult for a second Reverse Curve (W1-4 series) sign to be placed between the curves. If the design speed of the curves is 30 mph or less, Double Reverse Turn signs should be used.

Standard:

02 **If a Double Reverse Curve (or Turn) sign is used, the direction of the double reverse curve (or turn) shall be appropriately illustrated. Except as provided in Paragraph 3, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.**

Option:

03 Where two or more lanes are being shifted, a W24-1 (or Double Reverse Turn sign showing one lane) sign with an ALL LANES (W24-1cP) plaque (see Figure 6F-3) may be used instead of a sign that illustrates the number of lanes.

04 Where more than three lanes are being shifted, the Double Reverse Curve (or Turn) sign may be rectangular.

Section 6F.56 Other Warning Signs

Option:

01 Advance warning signs may be used by themselves or with other advance warning signs.

02 Besides the warning signs specifically related to TTC zones, several other warning signs in Part 2 of the 2009 MUTCD may apply in TTC zones.

Standard:

03 **Except as provided in Section 6F.02, other warning signs that are used in TTC zones shall have black legends and borders on a fluorescent orange background.**

Section 6F.57 Special Warning Signs

Option:

01 Special warning signs may be used based on engineering judgment.

Guidance:

02 *Special warning signs should comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.*

Section 6F.58 Advisory Speed Plaque (W13-1P)

Option:

01 In combination with a warning sign, an Advisory Speed (W13-1P) plaque (see Figure 6F-3) may be used to indicate a recommended speed through the TTC zone.

Standard:

02 **An engineering study by the Regional Traffic Engineer or official having jurisdiction shall establish the advisory speed (see Section 2C.08 of the Virginia Supplement to the 2009 MUTCD). Except in emergencies, an Advisory Speed plaque shall not be mounted until the engineering study determines the recommended speed.**

03 **The Advisory Speed plaque shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with fluorescent orange TTC zone signs, this plaque shall have a black legend and border on a fluorescent orange background.**

04 **The Advisory Speed plaque shall be at least 30 x 30 inches in size when used with a sign that is 48 x 48 inches or larger or at least 24 x 24 inches in size when used with a sign that is 36 x 36 inches.**

W13-1 24" x 24" on 36" x 36" signs
W13-1 30" x 30" on 48" x 48" signs
Required as of July 1, 2014[1]

Section 6F.59 Supplementary Distance Plaque (W16-VP1)

Option:

01 In combination with a warning sign, a Supplementary Distance (W16-VP1) plaque (see Figure 6F-3) with the legend NEXT XX MILES may be used to indicate the length of highway over which a work activity is being conducted, or over which a condition exists in the TTC zone.

02 In long TTC zones, Supplementary Distance plaques with the legend NEXT XX MILES may be placed in combination with warning signs at regular intervals within the zone to indicate the remaining length of highway over which the TTC work activity or condition exists.

Standard:

03 **The Supplementary Distance plaque with the legend NEXT XX MILES shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with fluorescent orange TTC zone signs, this plaque shall have a black legend and border on a fluorescent orange background.**

04 **The sign shall be 60 x 18 inches in size when used with a sign that is 48 x 48 inches or least 48 x 12 inches in size when used with a sign that is 36 x 36 inches.**

W16-VP1 for 36" sign - 48 x 12
W16-VP1 for 48" sign - 60 x 18
Required as of July 1, 2014[1]

1: Revision 1 – 4/1/2015

Guidance:

05 *When used in TTC zones, the Supplementary Distance plaque with the legend NEXT XX MILES should be placed below the initial warning sign designating that, within the approaching zone, a temporary work activity or condition exists.*

Section 6F.60 Guide Signs

Support:

01 Guide signs along highways provide road users with information to help them along their way through the TTC zone. The design of guide signs is presented in Part 2 of the 2009 MUTCD.

Guidance:

02 *The following guide signs should be used in TTC zones as needed:*

A. Standard route markings, where temporary route changes are necessary,
B. Directional signs and street name signs, and
C. Special guide signs relating to the condition or work being done.

Standard:

03 **If additional temporary guide signs are used in TTC zones, they shall have a black legend and border on a fluorescent orange background.**

Option:

04 Guide signs used in TTC incident management situations may have a black legend and border on a fluorescent pink background.

05 When directional signs and street name signs are used in conjunction with detour routing, these signs may have a black legend and border on a fluorescent orange background.

06 When permanent directional signs or permanent street name signs are used in conjunction with detour signing, they may have a white legend on a green background.

Section 6F.61 Road Work Next XX Miles Sign (G20-1 (V))

Guidance:

01 *The ROAD WORK NEXT XX MILES (G20-1 (V)) sign (see Figure 6F-3) should be installed in advance of TTC zones that are more than 2 miles in length.*

Standard:

02 **The ROAD WORK NEXT XX MILES sign shall be 60 x 24 inches in size on Non-Restricted Right-of-Way Roadways and 48 x 24 inches in size on Restricted Right-of-Way Roadways and Residential & Urban < 500 ADT and ≤ 30 MPH.**

03 **The distance displayed on the ROAD WORK NEXT XX MILES sign shall be rounded up to the nearest whole mile.**

Option:

04 The ROAD WORK NEXT XX MILES sign may be mounted on a Type 3 Barricade. The sign may also be used for TTC zones of shorter length.

Section 6F.62 End Road Work Sign (G20-2 (V)), End Mowing Sign (G20-V2), and End Survey Sign(G20-V3)

Standard:

01 **The END ROAD WORK (G20-2 (V)) sign shall be used in place of the 2009 MUTCD's END ROAD WORK (G20-2) sign.**

02 **Alternatives to the END ROAD WORK sign shall be END MOWING (G20-V2) and END SURVEY (G20-V3) signs.**

Guidance:

03 *The END ROAD WORK, END MOWING or END SURVEY signs should be placed 500 feet downstream end of the termination area as determined by engineering judgment.*

Option:

04 The END ROAD WORK sign may be installed on the back of a warning sign facing the opposite direction of road users or on the back of a Type 3 Barricade.

Section 6F.63 Pilot Car Follow Me Sign (G20-4) - (Vehicle-Mounted)

Standard:

01 **The PILOT CAR FOLLOW ME (G20-4) vehicle-mounted sign (see Figure 6F-4) shall be mounted in a conspicuous position on the rear of a vehicle used for guiding one-way vehicular traffic through or around a TTC zone (see Section 6C.13). A flagger shall be stationed on the approach to the activity area and on intersecting routes within the work area to stop vehicular traffic until the pilot vehicle is available.**

Section 6F.64 Work Vehicle Frequent Turns Sign (G20-V1a) and[1] Work Vehicle Do Not Follow Sign (G20-V1) - (Vehicle-Mounted)

Standard:

01 **The WORK VEHICLE FREQUENT TURNS (G20-V1a) or[1] WORK VEHICLE DO NOT FOLLOW (G20-V1) vehicle-mounted sign (see Figure 6F-4) shall be mounted in a conspicuous position on the rear of a vehicle hauling/delivering material to the work space.**

Option:

02 The WORK VEHICLE FREQUENT TURNS vehicle-mounted sign may be displayed at all times.[1]

03 The WORK VEHICLE DO NOT FOLLOW sign is not required on one-way, two-lane operations since flaggers normally control the ingress and egress of work vehicles, however it may be used as an option. The sign may be covered or removed from view during normal operations other than those listed above.[1]

Standard:

04 **The WORK VEHICLE DO NOT FOLLOW vehicle-mounted sign shall be replaced with the WORK VEHICLE FREQUENT TURNS vehicle-mounted sign by July 1, 2017.** [1]

Support:

05 When the tailgate has been removed or lowered for work operations (such as with an Athey Loader), the vehicle would be exempt from having to display the sign. The sign is not required to be placed on the back of pickup trucks, SUV's, vans or other vehicles such as safety service patrol, which can enter or exit the work zone at higher speeds.[1]

Section 6F.65 Caution Frequent Stops Sign (G20-V4) - (Vehicle-Mounted)

Guidance:

01 *The CAUTION FREQUENT STOPS (G20-V4) vehicle-mounted sign (see Figure 6F-4) should be mounted in a conspicuous position on the rear of a mobile work vehicle that stops frequently but moves quickly from one location to another along the roadway performing work operations such as debris removal, inventory and spot field reviews.*

Section 6F.66 Detour Signs (M4-8, M4-8a, M4-V1, M4-V2, M4-V3, M4-V4, M4- 9, M4-9 (V), M4-9a, M4-9b, M4-9c, and M4-10)

Standard:

01 **Each detour shall be adequately marked with standard temporary route signs and destination signs.**

02 **Short-term detours on Limited Access highways shall be marked with a DETOUR (M4-V1, M4-V2, M4-V3, M4-V4, M4-9 (V) or M4-9) sign (see Figures 6F-5 and TTC-46).**

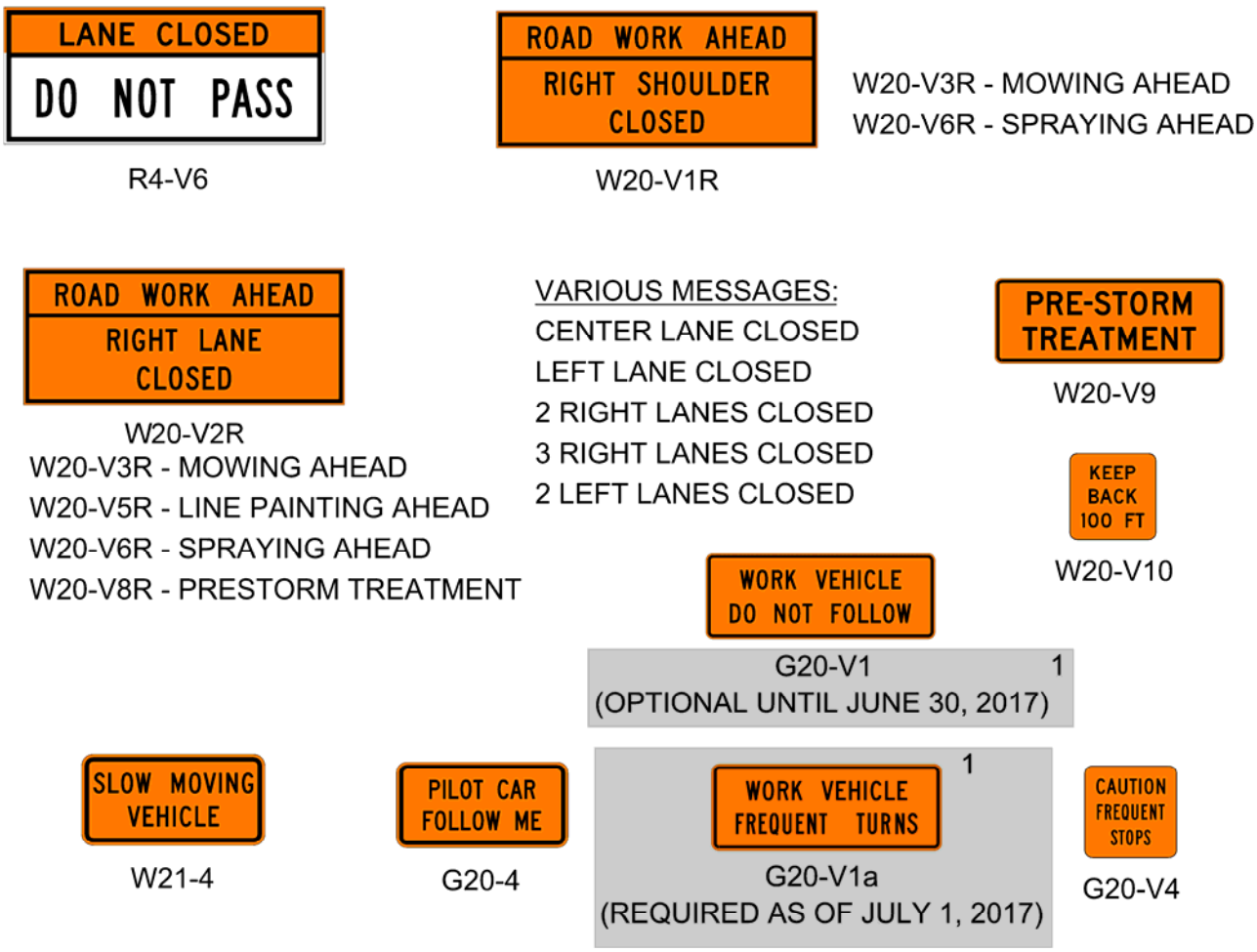
1: Revision 1 – 4/1/2015

03 **Long-term detours on Limited Access highways shall be marked with a DETOUR (M4-8) sign above a Route Shield assembly, Route sign, Cardinal Direction auxiliary signs, and Advance Turn/Direction Arrow auxiliary signs (see Figure TTC-47 and Section 2D of the 2009 MUTCD). Route Sign assemblies shall be mounted in accordance with the general specifications for signs (see Figure 6F-1) with the lowest sign in the assembly at the height prescribed for a single sign. See Figures TTC-34 and TTC-48 for detours on other roadways.**

Guidance:

04 *On roadways with a posted speed limit below 35, an Advance Route Turn assembly or an Advance Turn Detour sign should be installed not less than 200 feet in advance of the turn. On all other roadways, an Advance Route Turn assembly or an Advance Turn Detour sign assembly should be installed not less than 300 feet in advance of the turn.*

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



Option

05 Detour signs in TTC incident management situations may have a black legend and border on a fluorescence pink background.

06 The DETOUR (M4-8) sign (see Figure 6F-5) may be mounted at the top of a route sign assembly to mark a temporary route that detours from a highway, bypasses a section closed by a TTC zone, and rejoins the highway beyond the TTC zone.

07 The STREET NAME (M4-VP1a or M4-VP2a) plaque may be use above the M4-9 and M4-V1 series.

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Guidance:

08 *The Detour Arrow (M4-10) sign should normally be mounted just below the ROAD CLOSED (R11-2) sign. The Detour Arrow sign should include a horizontal arrow pointed to the right or left as required.*

09 *The DETOUR (M4-9 or M4-9 (V), M4-V1, M4-V2, M4-V3, M4-V4) sign (see Figure 6F-5) should be used for unnumbered highways, for emergency situations, for periods of short durations, or where, over relatively short distances, road users are guided along the detour and back to the desired highway without route signs.*

Option

10 The DETOUR (M4-V1, M4-V2, M4-V3, M4-V4, M4-9 or M4-9 (V)) sign may be used in place of the Advance Turn/Direction Arrow auxiliary signs on Route Shield assembly.

Guidance:

11 *Where a Route Shield assembly is not used, a Street Name sign should be placed above, or the street name should be incorporated into, a DETOUR (M4-V1, M4-V2, M4-V3, M4-V4, M4-9 or M4-9 (V)) sign to indicate the name of the street being detoured.*

12 *The END DETOUR (M4-8a) sign (see Figure 6F-5) should be used to indicate that the detour has ended.*

13 *When the END DETOUR sign is used on a numbered highway, the sign should be mounted above a route sign after the downstream end of the detour.*

14 *The Pedestrian/Bicycle Detour (M4-9a) sign (see Figure 6F-5) should be used where a pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic.*

Standard:

15 **If used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate direction.**

Option:

16 The arrow on a Pedestrian/Bicycle Detour sign may be on the sign face or on a supplemental plaque.

17 The Pedestrian Detour (M4-9b) sign or Bicycle Detour (M4-9c) sign (see Figure 6F-5) may be used where a pedestrian or bicycle detour route (not both) has been established because of the closing of the pedestrian or bicycle facility to through traffic.

Section 6F.67 Business Entrance Signs (M4-V6a, M4-V6b)

Option:

01 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.

Standard:

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

03 **If the Business Entrance sign is attached to a Group 2 channelizing device, it shall be crashworthy.**

Section 6F.68 Portable Changeable Message Signs

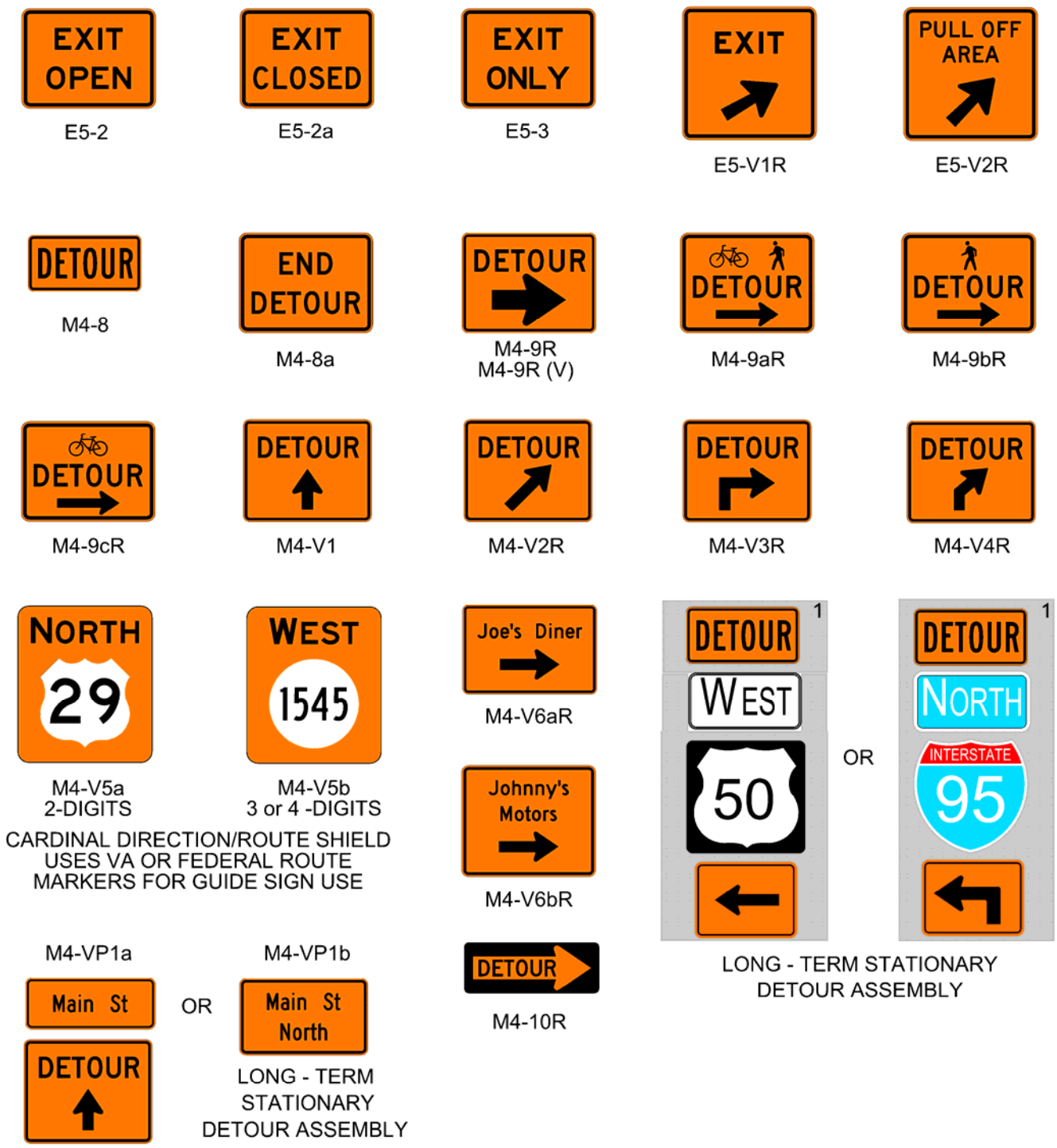
Support:

01 Portable changeable message signs (PCMS) are TTC devices installed for temporary use with the flexibility to display a variety of messages. In most cases, the PCMS follow the same provisions for design and application as those given for changeable message signs (CMS) in Chapter 2L of the 2009 MUTCD. The information in this Section describes situations where the provisions for the PCMS differ from those given in Chapter 2L of the 2009 MUTCD.

02 The PCMS is used most frequently on high-density urban freeways, but have applications on all types of highways where highway alignment, road user routing problems, or other pertinent conditions require advance warning and information.

03 The PCMS has a wide variety of applications in TTC zones including: roadway, lane, or ramp closures; incident management; width restriction information; speed control or reductions; advisories on work scheduling; road user management and diversion; warning of adverse conditions or special events; and other operational control.

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



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04 The primary purpose of the PCMS in TTC zones is to advise the road user of unexpected situations. The PCMS is particularly useful as it is capable of:

A. Conveying complex messages,
B. Displaying real time information about conditions ahead, and
C. Providing information to assist road users in making decisions prior to the point where actions must be taken.

05 Some typical applications include the following:

A. Where the speed of vehicular traffic is expected to drop substantially;
B. Where significant queuing and delays are expected;
C. Where adverse environmental conditions are present;
D. Where there are changes in alignment or surface conditions;
E. Where advance notice of ramp, lane, or roadway closures is needed;
F. Where crash or incident management is needed; and/or
G. Where changes in the road user pattern occur.

Guidance:

06 *The components of a PCMS should include: a message sign, control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material.*

Standard:

07 **The PCMS shall comply with the applicable design and application principles established in Chapter 2A of the 2009 MUTCD. The PCMS shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages (see Appendix D, Portable Changeable Message Sign (PCMS) Displays).**

Support:

08 Section 2L.02 of the 2009 MUTCD contains information regarding overly simplistic or vague messages that is also applicable to the PCMS.

Standard:

09 **The PCMS legend shall be yellow or orange on a black background.**

Support:

10 Section 2L.04 of the 2009 MUTCD contains information regarding the luminance, luminance contrast, and contrast orientation that is also applicable to the PCMS.

Guidance:

11 *The PCMS should be visible from 1/2 mile under both day and night conditions.*

Support:

12 Section 2B.13 of the Virginia Supplement to the 2009 MUTCD contains information regarding the design of the PCMS that is used to display speed limits that change based on operational conditions, or are used to display the speed at which approaching drivers are traveling.

Guidance:

13 *The PCMS should be limited to three lines of eight characters per line or should consist of a full matrix display.*

14 *Except as provided in Paragraph 15, the letter height used for the PCMS messages should be a minimum of 18 inches.*

Option:

15 For the CMS mounted on service patrol trucks or other incident response vehicles, a letter height as short as 10 inches may be used. Shorter letter sizes may also be used on a PCMS used on low speed (30 mph or less) facilities provided that the message is legible from at least 650 feet.

16 The PCMS may vary in size.

Guidance:

17 *Messages on a PCMS should consist of no more than two phases (two screen displays), and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read. Messages should be centered within each line of legend. If more than one PCMS is simultaneously legible to road users, then only one of the signs should display a sequential message at any given time.*

Support:

18 Road users have difficulties in reading messages displayed in more than two phases (two screen displays) on a typical three-line PCMS.

Standard:

19 **Techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, traveling horizontally or vertically across the face of the sign, or other dynamic elements shall not be used.**

20 **PCMS messages shall comply with Appendix D and be approved by the project's Engineer.**

Guidance:

21 *When a message is divided into two phases, the display time for each phase should be at least 2 seconds, and the sum of the display times for both of the phases should be a maximum of 8 seconds.*

22 *All messages should be designed with consideration given to the principles provided in this Section and also taking into account the following:*

A. The message should be as brief as possible and should contain three thoughts (with each thought preferably shown on its own line) that convey:

1. The problem or situation that the road user will encounter ahead,
2. The location of or distance to the problem or situation, and
3. The recommended driver action.

B. If more than two phases are needed to display a message, additional portable changeable message signs should be used. When multiple PCMS's are needed, they should be placed on the same side of the roadway and they should be separated from each other by a distance of at least 1,000 feet on roadways with posted speed of 45 mph or greater and by a distance of at least 500 feet on roadways with posted speed less than 45 mph.

Standard:

23 **When the word messages shown in Tables 1A-1 or 1A-2 of the 2009 MUTCD need to be abbreviated on a PCMS, the provisions described in Section 1A.15 shall be followed.**

24 **In order to maintain legibility, PCMS shall automatically adjust their brightness under varying light conditions.**

25 **The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.**

26 **The PCMS shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.**

27 **The mounting of the PCMS on a trailer, a large truck, or a service patrol truck shall be such that the bottom of the message sign shall be a minimum of 7 feet above the roadway in urban areas and 5 feet above the roadway in rural areas when it is in the operating mode.**

28 **A PCMS shall be used as a supplement to and not as a substitute for conventional signs and pavement markings.**

29 **When two portable changeable message signs dual indicate a message (one on the right side and left side of the roadway) they shall be spaced a minimum of 1000 feet apart.**

Guidance:

30 *When a PCMS is used for route diversion, it should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.*

31 *The PCMS should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the PCMS message.*

32 *The PCMS should be placed off the shoulder of the roadway and behind a traffic barrier, if practical. Where a traffic barrier is not available to shield the PCMS, it should be placed off the shoulder and outside of the clear zone.*

Standard:

33 **If a PCMS or other non-crashworthy trailer mounted devices such as but not limited to intelligent transportation systems (ITS), Highway Advisory Radio, Speed Trailers, CB Wizards, ITS cameras, Portable Traffic Control Signals, AFAD units, light towers, etc.[1], has to be placed on the shoulder of the roadway or within the clear zone, it shall be delineated (see Figure 6F-6) with a minimum of four (4) drums placed on the shoulder in advance of the PCMS in a taper with spacing as shown in Table 6F-2. If the PCMS is placed in the median within the clear zone of both travel directions, a minimum of four (4) drums shall be placed in a taper in advance of both travel directions with spacing as shown in Table 6F-2.**

Guidance:

34 *When portable changeable message signs are used in TTC zones, they should display only TTC messages.*

35 *When a PCMS is not being used to display TTC messages, it should be relocated such that it is outside of the clear zone or shielded behind a traffic barrier and turned away from traffic.*

Standard:

36 **A PCMS trailer shall be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the towed trailer as seen by oncoming road users, where the trailer's signal and brake lights are located.**

Section 6F.69 Arrow Boards

Standard:

01 **An arrow board shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a TTC zone.**

02 **An arrow board in the arrow or chevron mode shall be used to advise approaching traffic of a lane closure along major multi-lane roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures.**

03 **An arrow board shall be used in combination with appropriate signs, channelizing devices, or other TTC devices. If placed on roadways with paved shoulders having a width of 8 feet or more, a shoulder taper shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.[1] A trailer mounted arrow board shall be disconnected from the tow-vehicle when used in stationary operations and the vehicle removed from the transition area.**

Guidance:

04 *An arrow board should be placed on the shoulder of the roadway or, if practical, farther from the traveled lane. It should be delineated (see Figure 6-F6) with a minimum of four (4) channelizing devices (matching those used on the roadway taper) in advance of the arrow board forming a taper with spacing as shown in Table 6F-2. When an arrow board is not being used, it should be removed; if not removed, it should be shielded; or if the previous two options are not feasible, it should be delineated with a minimum of four (4) retroreflective Group 2 channelizing devices.*

Standard:

05 **Arrow boards shall meet the minimum size, legibility distance, number of elements, and other specifications shown in Figure 6F-7.**

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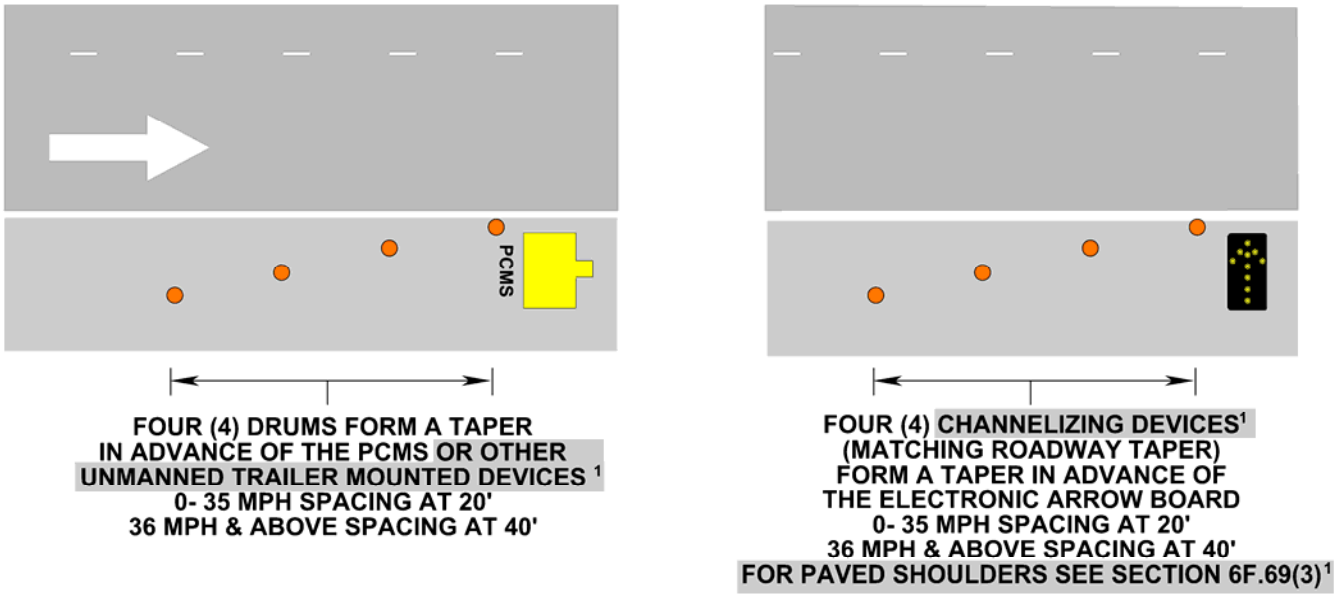
Figure 6F-6, Channelizing Devices for PCMS, Arrow Board and other Trailer Mounted Devices[1]



Support:

06 Type A arrow boards are appropriate for use on low-speed (30 mph or less) urban streets. Type B arrow boards are appropriate for intermediate-speed (31 to 44 mph) facilities. Type C arrow boards are intended to be used on high-speed (45 mph or greater), high-volume motor vehicle traffic control projects. Type D arrow boards are intended for use on low-speed (30 mph or less) urban streets on authorized vehicles.

Standard:

07 **Type A, B, and C arrow boards shall have solid rectangular appearances. A Type D arrow board shall conform to the shape of the arrow.**

08 **All arrow boards shall be finished in non-reflective black. The arrow board shall be mounted on a vehicle, a trailer, or other suitable support.**

09 **An arrow board trailer shall be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the towed trailer as seen by oncoming road users, where the trailer's signal and brake lights are located.**

Guidance:

10 *The minimum mounting height, measured vertically from the bottom of the board to the roadway below it or to the elevation of the near edge of the roadway, of an arrow board should be 7 feet, except on vehicle-mounted arrow boards, which should be as high as practical.*

11 *A vehicle-mounted arrow board should be provided with remote controls.*

Standard:

12 **Arrow board elements shall be capable of at least a 50 percent dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow boards.**

Guidance:

13 *Full brilliance should be used for daytime operation of arrow boards.*

Standard:

14 **The arrow board shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.**

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Guidance:

15 *If an arrow board consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.*

Standard:

16 **The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.**

17 **An arrow board shall have the following three mode selections:**

A. A Flashing Arrow or Sequential Chevron mode;
B. A flashing Double Arrow mode; and
C. A flashing Caution mode.

18 **An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.**

19 **For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, and an arrow board shall be used only in the four-corner caution mode.**

Guidance:

20 *For a stationary lane closure, the arrow board should be located on the shoulder at the beginning of the merging taper.*

21 *Where the shoulder is narrow, the arrow board should be located in the closed lane as close to the beginning of the merging taper as possible, but completely within the channelizing devices.*

Standard:

22 **For consistency and to reduce confusion, only one arrow board shall be used for each travel lanes closed. When arrow boards are used to close multiple lanes, a separate arrow board shall be used for each closed lane.**

Guidance:

23 *When arrow boards are used to close multiple lanes, if the first arrow board is placed on the shoulder, the second arrow board should be placed in the first closed lane at the beginning of the second merging taper (see Figure TTC-18). When the first arrow board is placed in the first closed lane, the second arrow board should be placed in the second closed lane at the downstream end of the second merging taper.*

24 *For mobile operations where a lane is closed, the arrow board should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.*

Standard:

25 **A vehicle displaying an arrow board shall be equipped with amber high-intensity rotating, oscillating, or strobe lights, however, the lights shall not interfere with the visibility and recognition of the arrow board.**

26 **Arrow boards shall only be used to indicate a lane closure. Arrow boards shall not be used to indicate a lane shift.**

27 **An arrow display shall not be used on a two-lane, two-way roadway for temporary one-lane operation.**

Option:

28 A changeable message sign may be used to simulate an arrow board display on vehicle-mounted signs in moving/mobile operations, followed by a word message describing the operation.

Standard:

29 **Arrow boards shall be maintained in a manner in which all of the appropriate numbers of lamps for selected mode are operating properly. Corrective action shall be taken when there is more than one lamp out in the stem (prior to returning to the next work shift). Immediate (within 30 minutes of notification) corrective action shall be taken when there are any lamps out in the arrow head(s).**

Figure 6F-7, Advance Warning Arrow Board Display Specifications

Operating Mode	Display (Type C Board Illustrated)
The following modes shall be provided:	(Right arrow shown; left is similar)

1. At least one of the two following modes shall be provided:

Flashing Arrow

Move/Merge Right[1]

Sequential Chevron

Move/Merge Right

2. Flashing Double Arrow

Move/Merge Right or Left

3. Flashing Caution

Flashing Caution

Board Type	Minimum Size (Inches)	Minimum Legibility Distance (miles)	Minimum Number of Elements
A	48 x 24	1/2	12
B	60 x 30	3/4	13
C	96 x 48	1	15
D	(DOUBLE ARROW SHAPE)	1/2	12

Standard:
Arrow board shall be maintained in a manner in which all of the appropriate number of lamps for the selected mode are operating properly.
***Immediate corrective action shall be take when there is more than one lamp out in the stem.
***Immediate corrective action shall be take when there are any lamps out in the arrow head(s).

Section 6F.70 High-Level Warning Devices (Flag Trees)

Option:

01 A high-level warning device (flag tree) may supplement other TTC devices in TTC zones.

Support:

02 A high-level warning device, most commonly used in high-density road user situations to warn road users of short-term operations, is designed to be seen over the top of typical passenger cars and/or parked vehicles. A typical high-level warning device is shown in Figure 6H-1.

Standard:

03 **A high-level warning device shall consist of a minimum of two flags with or without a Type B high-intensity flashing warning light. The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be not less than 8 feet. The flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color.**

Option:

04 An appropriate warning sign may be mounted below the flags.

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Section 6F.71 Channelizing Devices

Standard:

01 **Designs of various channelizing devices shall be as shown in Figure 6F-9. All channelizing devices shall be crashworthy.**

Support:

02 The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices.

03 Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to channelize vehicular traffic away from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.

Standard:

04 **Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision.**

05 **Where channelizing devices are used to channelize pedestrians, there shall be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the bottom surface shall be no higher than 2 inches above the ground. The top of the top surface shall be no lower than 32 inches above the ground.**

Option:

06 A gap not exceeding 2 inches between the bottom rail and the ground surface may be used to facilitate drainage.

Guidance:

07 *Where multiple channelizing devices are aligned to form a continuous pedestrian channelizer, connection points should be smooth to optimize long-cane and hand trailing.*

08 *The spacing between cones, tubular markers, vertical panels, and drums, should be as shown in Table 6F-2. The spacing of channelizing devices in tangent sections of the TTC zone is normally twice the distance for devices used in the taper and around curves of 6 degrees and greater (or radius of 950 feet or less).*

09 *When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Figure TTC-42, the channelizing devices should be extended a distance in feet of four times the speed limit in mph beyond the downstream end of the transition area.*

Option:

10 Warning lights (see Section 6F.91) may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

Standard:

11 **Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Except for the sequential flashing warning lights discussed in Paragraphs 12 and 13, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.**

Option:

12 A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

Standard:

13 **When used, the successive flashing of the sequential warning lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55 nor more than 75 times per minute.**

14 **Warning lights or other devices placed on channelizing devices shall meet crashworthiness requirements and have approval for use on that type of channelizing device. Retroreflective barrier[1] panels shall not be installed on Group 1 or 2 channelizing devices.**

15 **The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night. In addition to conforming to the requirements stated herein, channelizing devices, including retroreflective material, shall be in compliance with Section 247 of the Road and Bridge Specifications.**

Option:

16 The name and telephone number of the highway agency, contractor, or supplier may be displayed on the non-retroreflective surface of all types of channelizing devices.

Standard:

17 **The letters and numbers of the name and telephone number shall be non-retroreflective and not over 2 inches in height.**

Guidance:

18 *Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.*

Standard:

19 **Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced. Replacement and correction of ineffective channelizing devices shall be accomplished in accordance with the latest edition of the American Traffic Safety Service Association's (ATSSA) "Quality Standards for Work Zone Traffic Control Devices" publication.**

Section 6F.72 Cones

Standard:

01 **Cones (see Figure 6F-9) shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. The minimum height of cones for use on all roadways shall be 36 inch.**

02 **For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 36 inches in height shall be provided by a 6-inch wide white and located 3 to 4 inches from the top of the cone and an additional 4-inch wide white band located approximately 2 inches below the 6-inch band.**

03 **Retroreflectorization of cones that are more than 36 inches in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 4 to 6 inches wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflective spaces between the orange and white stripes shall not exceed 3 inches in width.**

Option:

04 When workers are present to maintain them, traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration maintenance and utility work.

Guidance:

05 *Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.*

Standard:

06 **When workers are not present on the jobsite to maintain the cones, Group 2 channelizing devices shall be used for channelization.**

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Option:

07 Cones may be doubled up to increase their weight.

Support:

08 Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings that can be dropped over the cones and onto the base to provide added stability.

Guidance:

09 *Ballast should be kept to the minimum amount needed.*

Section 6F.73 Tubular Markers

Standard:

01 **Tubular markers (see Figure 6F-9) shall be predominantly orange and shall not be less than 36 inches high and 2 inches wide facing road users. They shall be constructed of lightweight, deformable[1] material that can be struck without causing damage to the impacting vehicle.**

02 **Tubular markers shall be retroreflectorized and shall be in compliance with Section 247 of the Road and Bridge Specifications. Retroreflectorization of tubular markers that have a height of less than 42 inches shall be provided by two 3-inch wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of tubular markers that have a height of 42 inches or more shall be provided by four 4- to 6-inch wide alternating orange and white retroreflective, ASTM Type III Reboundable,[1]** stripes with the top stripe being orange.

Guidance:

03 *Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices.*

04 *Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability unless the condition stated in Paragraph 7 exists. Ballast should be kept to the minimum amount needed.*

Option:

05 Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving vehicular traffic are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of larger devices.

Standard:

06 **A tubular marker shall be attached to the pavement to display the minimum 2-inch width to the approaching road users.**

07 **When workers are not present on the jobsite to maintain the tubular markers, the tubular markers shall be affixed to the pavement.**

Section 6F.74 Vertical Panels

Standard:

01 **Vertical panels (see Figure 6F-9) shall have retroreflective striped material 12 inches in width and at least 24 inches in height. They shall have alternating diagonal fluorescent orange and fluorescent white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass.**

02 **Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.**

Option:

03 Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

04 Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades when approved by the Regional Traffic Engineer.

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Table 6F-2, Spacing of Channelizing Devices

Work Zone Location	Posted Speed Limit (mph)	Spacing of Devices (Feet)
In Tapers and Curves	35 mph or less	20
Parallel to the Travel way	35 mph or less	40
Spot Construction Access *	35 mph or less	80
In Tapers and Curves	Greater than 35 mph	40
Parallel to the Travel way	Greater than 35 mph	80
Spot Construction Access *	Greater than 35 mph	120
*For easier access by construction vehicles into the work area, spacing of devices may be increased to this distance, but shall not exceed one access per 0.25 mile unless approved by the engineer and documented.		

Section 6F.75 Drums

Standard:

01 **Drums (see Figure 6F-9) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 36 inches in height and have at least an 18-inch minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective, ASTM Type III Reboundable,[1] stripes 6 inches wide. Drums with retroreflective sheeting conforming to Section 247 purchased prior to July 1, 2012 can continue to be used on projects until July 1, 2016. On and after July 1, 2016, all drums shall meet the retroreflective sheeting requirements of Section 247 dated July 1, 2012.** [1]

Guidance: [1]

02 *Until July 1, 2016, drums with like retroreflective sheeting should be grouped together and not scattered randomly throughout the work zone or project.*[1]

Standard:

03 **Any non-retroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3 inches wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.**

Support:

04 Drums are highly visible, have good target value, give the appearance of being formidable obstacles and, therefore, command the respect of road users. They are portable enough to be shifted from place to place within a TTC zone in order to accommodate changing conditions, but are generally used in situations where they will remain in place for a prolonged period of time.

Option:

05 Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

Guidance:

06 *Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user.*

Standard:

07 **Ballast shall not be placed on the top of a drum. Drums shall be adequately ballasted to prevent movement by passing vehicles. Weighted collars shall lay flat on the ground or roadway around the bottom of drums, and shall be the approved type and size for that particular device.**

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Guidance:

08 *Drums that use weighted collars for ballast should use a minimum of 2 drum collars when placed within 12 feet of active travel lanes on Limited Access highways to ensure stability.*

Standard:

09 **Drums shall be used in all unmanned work zone locations, in all merging and shifting tapers on Limited Access highways during nighttime operations, and in tapers providing delineation for non-crashworthy trailer mounted devices such as but not limited to intelligent transportation systems (ITS), PCMS, Highway Advisory Radio, Speed Trailers, CB Wizards, ITS cameras, Portable Traffic Control Signals, AFAD units, light towers, etc.[1] On long-term stationary TTC zones, drums shall be used in tapers providing delineation of the Arrow Board.**

Option:

10 Drums may be left on the shoulder between work operations but must not interfere with the road user's use of the shoulder or travel way.[1]

Section 6F.76 Type 3 Barricades

Support:

01 A barricade is a portable or fixed device having three rails with appropriate markings and is used to control road users by closing or restricting all or a portion of the right-of-way.

02 Type 3 Barricades are shown in Figures 6F-8 and 6F-9.

Standard:

03 **Stripes on Type 3 Barricade rails shall be alternating fluorescent orange and fluorescent white sloping downward at an angle of 45 degrees in the direction road users are to pass. Barricade stripes shall be 6 inches wide.**

04 **The minimum length for Type 3 Barricades shall be 48 inches. Each barricade rail shall be approximately 8 to[1] 12 inches wide. Barricades used on Limited Access highways shall have a minimum of 2 exposed rails[1] of retroreflective area facing road users.**

Guidance:

05 *Where Type 3 Barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn (see Figures 6F-8 and 6F- 9).*

06 *Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades (see Figures 6F-8 and 6F- 9).*

07 *Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades (see Figures 6F-8 and 6F- 9).*

08 *Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.*

09 *The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.*

10 *Type 3 Barricade rail supports should not project into pedestrian circulation routes more than 4 inches from the support between 27 and 80 inches from the surface as described in Section 4.4.1 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD).*

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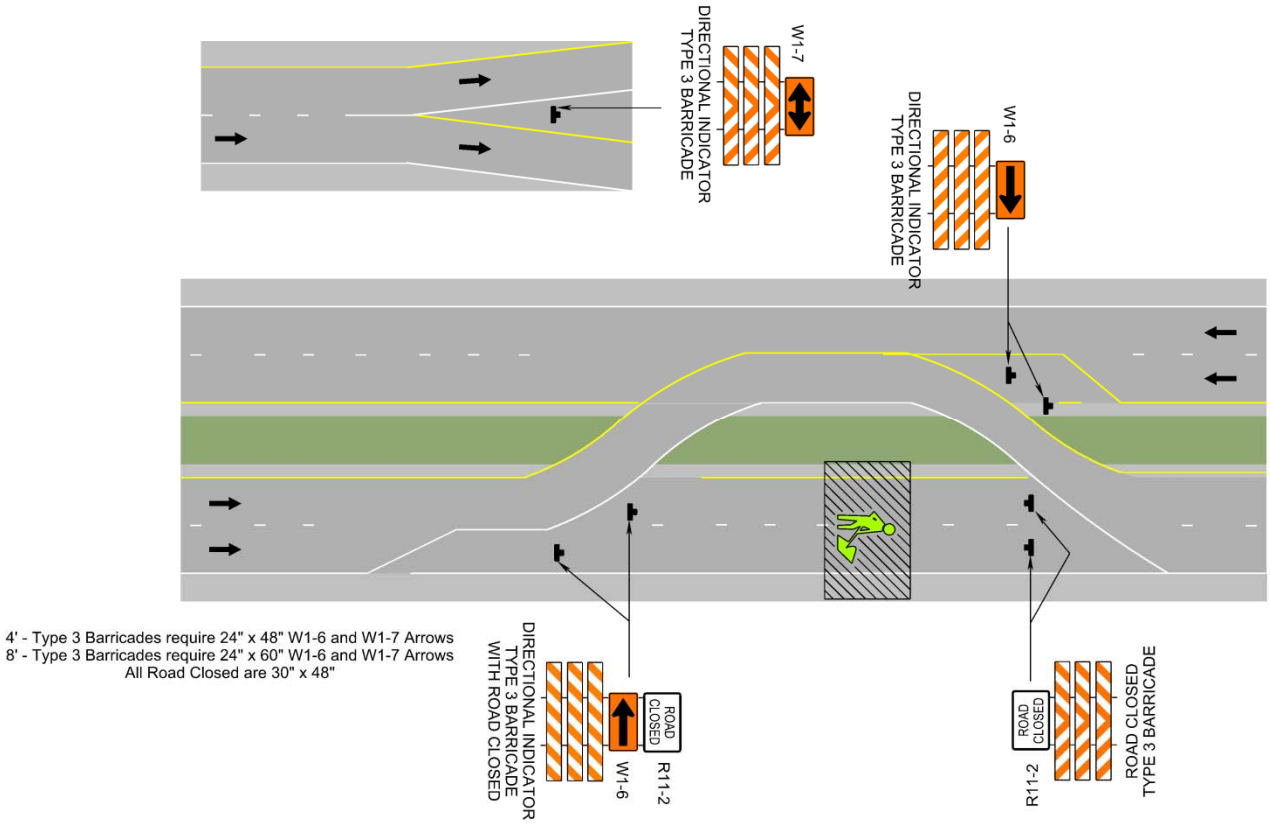
Figure 6F-8, Type 3 Barricade Placement Guidelines

See Figures TTC-43 and TTC-44 for installation details



Standard:

11 **Type 3 Barricades shall be crashworthy as they are located adjacent to vehicular traffic flow and are subject to impact by errant vehicles.**

Guidance:

12 *On Limited Access highways or in other situations where Type 3 Barricades may be susceptible to overturning in the wind, ballasting should be used.*

Option:

13 Sandbags (one 50-pound bag) may be placed on each leg of the frame of Type 3 Barricades as flat to the ground as possible to provide the required ballast.

Standard:

14 **Ballast shall not be placed on top of any striped rail. Type 3 Barricades shall not be ballasted by objects such as rocks or chunks of concrete. Ballast shall not extend into the accessible passage width of 60 inches.**

Guidance:

15 *Type 3 Barricades should be used to close or partially close a road.*

Option:

16 Type 3 Barricades used at a road closure may be placed completely across a roadway or from curb to curb. Type 3 Barricades may be used alone or in groups to close or partially close a road.

Standard:

17 **Where provision is made for access of authorized equipment and vehicles, a Type 3 Barricade shall be used to close a work access opening or construction entrance.[1]**

18 **The responsibility for ensuring the placement of Type 3 Barricades shall be assigned to a person who will ensure proper closure at the end of each work day.[1]**

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Support:

19 When a highway is legally closed but access must still be allowed for local road users, barricades usually are not extended completely across the roadway.

Standard:

20 **A sign shall be installed with the appropriate legend concerning permissible use by local road users (see Section 6F.09). Adequate visibility of the barricades from both directions shall be provided.**

Guidance:

21 *Signs mounted on Type 3 Barricades should not cover more than the top rail*[1].

Option:

22 Crashworthy signs may be mounted on or above a Type 3 Barricade.

Section 6F.77 Direction Indicator Barricades

Standard:

01 **The Direction Indicator Barricade (see Figure 6F-9) shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally aligned, retroreflective rail. Their stripes shall direct traffic the same as Type 3 Barricades (see Figures 6F-8 and 6F-9).**

02 **The One-Direction Large Arrow (W1-6) sign shall be black on a fluorescent orange background. The stripes on the bottom rail shall be alternating fluorescent orange and fluorescent white sheeting sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 4 inches wide. The One-Direction Large Arrow (W1-6) sign shall be 24 x 12 inches. The bottom rail shall have a length of 24 inches and a height of 12 inches.**

03 **The Direction Indicator Barricade, including any associated ballast or lights, shall be crashworthy.**

Option:

04 The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary and may be used in place of drums in tapers on Limited Access highways.

Guidance:

05 *If used, Direction Indicator Barricades should be used in series to direct the driver through the transition and into the intended travel lane.*

06 *The bottom of a sign mounted on a barricade, or other portable support, shall be at least 1 foot above the traveled way.*

Section 6F.78 Temporary Traffic Barriers as Channelizing Devices

Support:

01 Temporary traffic barriers are not TTC devices in themselves; however, when placed in a position identical to a line of channelizing devices and marked and/or equipped with appropriate channelization features to provide guidance and warning both day and night, they serve as TTC devices.

Standard:

02 **Temporary traffic barriers serving as TTC devices shall comply with requirements for such devices as set forth throughout this Manual and Part 6 of the 2009 MUTCD.**

03 **Temporary traffic barriers (see Section 6F.94) shall not be used solely to channelize road users, but also to protect the work space. If used to channelize vehicular traffic, the temporary traffic barrier shall be supplemented with delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility.**

04 **Temporary traffic barriers by themselves shall not be used for a merging taper.**

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Guidance:

05 *Group 2 channelizing devices, pavement markers and pavement markings should be used for a merging taper in advance of the traffic barrier (see Figure TTC-20). Temporary traffic barriers should not be used for a constricted/restricted TTC zone.*

06 *When used for channelization, temporary traffic barriers should be of a light color for increased visibility.*

Section 6F.79 Longitudinal Channelizing Devices

Support:

01 Longitudinal channelizing devices (see Figure 6F-9) are lightweight, deformable devices that are highly visible, have good target value, and can be connected together or used singly as Type 3 Barricades.

Standard:

02 **If used singly as Type 3 Barricades, longitudinal channelizing devices shall comply with the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for the devices described in this Chapter.**

03 **If used to channelize vehicular traffic at night, longitudinal channelizing devices shall be interlocked and supplemented with retroreflective material or delineation for improved nighttime visibility.**

Option:

04 Longitudinal channelizing devices may be used instead of a line of cones, drums, or barricades.

05 Longitudinal channelizing devices may be hollow and filled with water as ballast.

06 Longitudinal channelizing devices may be used for pedestrian traffic control.

Standard:

07 **If used for pedestrian traffic control, longitudinal channelizing devices shall be interlocked to delineate or channelize flow. The interlocking devices shall not have gaps that allow pedestrians to stray from the channelizing path.**

Guidance:

08 *Longitudinal channelizing devices have not met the crashworthy requirements for temporary traffic barriers and should not be used to shield obstacles or provide positive protection for pedestrians or workers.*

Section 6F.80 Temporary Lane Separators

Option:

01 Temporary lane separators may be used to channelize road users, to divide opposing vehicular traffic lanes, to divide lanes when two or more lanes are open in the same direction, and to provide continuous pedestrian channelization.

Standard:

02 **Temporary lane separators shall be crashworthy. Temporary lane separators shall have a maximum height of 4 inches and a maximum width of 1 foot, and shall have sloping sides in order to facilitate crossover by emergency vehicles.**

Option:

03 Temporary lane separators may be supplemented with any of the approved channelizing devices contained in this Chapter, such as tubular markers, vertical panels, and opposing traffic lane dividers.

Standard:

04 **If appropriate channelizing devices are used to supplement a temporary lane separator, the channelizing devices shall be retroreflectorized to provide nighttime visibility. If channelizing devices are not used, the temporary lane separator shall contain retroreflectorization to enhance its visibility.**

Guidance:

05 *A temporary lane separator should be stabilized by affixing it to the pavement in a manner suitable to its design, while allowing the unit to be shifted from place to place within the TTC zone in order to accommodate changing conditions.*

Standard:

06 **At pedestrian crossing locations, temporary lane separators shall have an opening or be shortened to provide a pathway that is at least 60 inches wide for crossing pedestrians.**

Guidance:

07 *A temporary lane separator should be stabilized by affixing it to the pavement in a manner suitable to its design, while allowing the unit to be shifted from place to place within the TTC zone in order to accommodate changing conditions.*

Standard:

08 **At pedestrian crossing locations, temporary lane separators shall have an opening or be shortened to provide a pathway that is at least 60 inches wide for crossing pedestrians.**

Section 6F.81 Other Channelizing Devices

Standard:

01 **Channelizing devices other than those described in this Chapter shall require approval from the State Traffic Engineer of the Virginia Department of Transportation based on an engineering study prior to their use.**

Guidance:

02 *Other channelizing devices should comply with the general size, color, stripe pattern, retroreflection, and placement characteristics established for the devices described in this Chapter.*

Section 6F.82 Detectable Edging for Pedestrians

Support:

01 Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings are not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

Guidance:

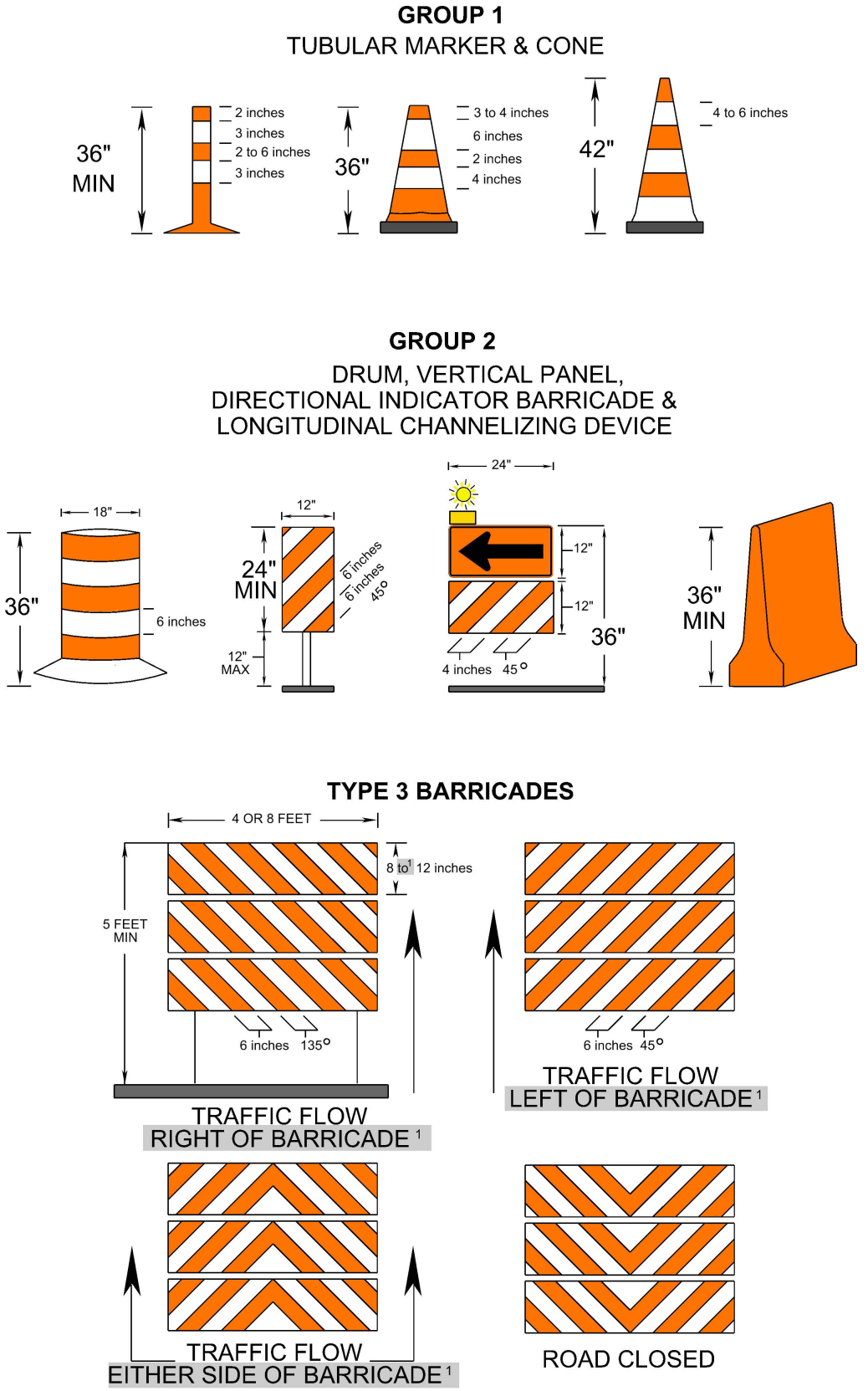
02 *When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least 6 inches above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of 2.5 inches above the surface. This edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed-in-place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly attached to the ground or to other devices. Adjacent sections of this edging should be interconnected such that the edging is not displaced by pedestrian or vehicular traffic or work operations, and such that it does not constitute a hazard to pedestrians, workers, or other road users.*

Support:

03 Examples of detectable edging for pedestrians include:

A. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
B. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.
C. Sections of lumber interconnected and fixed in place to form a continuous edge.
D. Formed-in-place asphalt or concrete curb.
E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.
F. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway that provides a pedestrian edging at ground level.
G. Chain link or other fencing equipped with a continuous bottom rail.

Figure 6F-9, Channelizing Devices



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Guidance:

04 *Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.*

Section 6F.83 Temporary Raised Islands

Standard:

01 **Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices. Type A pavement markings, matching the temporary pavement marking, shall be applied to the temporary raised island.**

02 **Temporary raised islands shall not be used on Limited Access highways.**

Option:

03 A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of up to 15,000 average daily traffic (ADT).

04 Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the TTC zone is not required.

Guidance:

05 *Temporary raised islands should have the basic dimensions of 4 inches high by at least 15 inches wide and have rounded or chamfered corners.*

06 *The temporary raised islands should not be designed in such a manner that they would cause a motorist to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.*

Standard:

07 **Flex post delineators and temporary pavement markers shall be affixed on top of the temporary raised island. The temporary pavement marker shall match the color of the Type A pavement marking of the temporary raised island. The flex post delineator shall be spaced every 80 feet, with a temporary pavement marker spaced in-between each flex post delineator. See Figure 6 in Appendix A of this manual or IIM-LD-93 for specific details on[1] Temporary Asphalt Medians.**

08 **Flex post delineators (see Figure 6F-9) Tubular Markers, shall be predominantly orange and shall not be less than 36 inches high and 2 inches wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.**

09 **Flex post delineators shall be retroreflectorized and shall be in compliance with Section 247 of the Road and Bridge Specifications. Retroreflectorization of flex post delineators that have a height of less than 42 inches shall be provided by two 3-inch wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of tubular markers that have a height of 42 inches or more shall be provided by four 4- to 6-inch wide alternating orange and white stripes with the top stripe being orange.**

10 **At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 60-inch wide pathway for the crossing pedestrian.**

Section 6F.84 Opposing Traffic Lane Divider and Sign (W6-4)

Support:

01 Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.

Standard:

02 **Opposing traffic lane dividers shall not be placed across pedestrian crossings.**

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03 **The Opposing Traffic Lane Divider (W6-4) sign (see Figure 6F-4 of the 2009 MUTCD) shall be an upright, retroreflective fluorescent orange-colored sign placed on a flexible support and sized at least 12 inches wide by 24 inches high.**

Section 6F.85 Pavement Markings

Standard:

01 **The provisions of this Section shall be considered applicable to long-term stationary TTC zones.**

Support:

02 Pavement markings are installed or existing markings are maintained or enhanced in TTC zones to provide road users with a clearly defined path for travel through the TTC zone in day, night, and twilight periods under both wet and dry pavement conditions.

Guidance:

03 *The work should be planned and staged to provide for the placement and removal of the pavement markings in a way that minimizes the disruption to traffic flow approaching and through the TTC zone during the placement and removal process.*

Standard:

04 **Existing pavement markings shall be maintained in all long -term and intermediate-term stationary (see Section 6G.02, TTC zones in accordance with Chapters 3A and 3B of the 2009 MUTCD) except as otherwise provided for temporary pavement markings in Section 6F.78. Pavement markings shall match the alignment of the markings in place at both ends of the TTC zone. Pavement markings shall be placed along the entire length of any paved surface detour or temporary roadway prior to the detour or roadway being opened to road users.**

05 **For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be 100 percent removed or obliterated as soon as practical. Pavement marking obliteration shall remove the non-applicable pavement marking material, and the obliteration method shall minimize pavement scarring. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.**

06 **Pavement scarring of the roadway in excess of 1/8 inch depth shall be repaired to prevent deterioration of the pavement surface and to provide a smooth surface for motorcyclists**.

Option:

07 Removable, non-reflective, preformed tape that is approximately the same color as the pavement surface may be used where markings need to be covered temporarily.

Section 6F.86 Temporary Markings

Support:

01 Temporary markings are those pavement markings or devices that are placed within TTC zones to provide road users with a clearly defined path of travel through the TTC zone when the permanent markings are either removed or obliterated during the work activities. Temporary markings are typically needed during the reconstruction of a road while it is open to traffic, such as overlays or surface treatments or where lanes are temporarily shifted on pavement that is to remain in place.

Guidance:

02 *Unless justified based on engineering judgment, temporary pavement markings should not remain in place for more than 14 days after the application of the pavement surface treatment or the construction of the final pavement surface on new roadways or over existing pavements.*

03 *The temporary use of edge lines, channelizing lines, lane-reduction transitions, gore markings, and other longitudinal markings, and the various non-longitudinal markings (such as stop lines, railroad crossings, crosswalks, words, symbols, or arrows) should be in accordance with the Virginia Department of Transportation's policy.*

Standard:

04 **Warning signs, channelizing devices and delineation shall be used to indicate required road user paths in TTC zones where it is not possible to provide a clear path by pavement markings.**

Option:

05 Temporary delineation may be provided by the use of flexible temporary pavement markers (FTPMs)[1] for up to ten consecutive days as directed by the Enginer[1], see VDOT special provision for application details.

Standard:

06 **Except as otherwise provided in this Section, all temporary pavement markings for no-passing zones shall comply with the requirements of Chapters 3A and 3B of the 2009 MUTCD. All temporary broken-line pavement markings shall use the same cycle length as permanent markings and shall have line segments that are at least 2 feet long.**

07 **All pavement markings and devices used to delineate road user paths shall be reviewed during daytime and nighttime periods.**

Option:

08 Half-cycle lengths with a minimum of 2-foot stripes may be used on roadways with severe curvature (see Section 3A.06 of the 2009 MUTCD) for broken line center lines in passing zones and for lane lines.

09 For temporary situations of 3 days or less, for a two- or three-lane road, no-passing zones may be identified by using DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (W14-3) signs (see Sections 2B.28, 2B.29, and 2C.45 of the 2009 MUTCD) rather than pavement markings. Also, DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs may be used instead of pavement markings on roads with low volumes for longer periods in accordance with the Virginia Department of Transportation's policy.

Guidance:

10 *If used, the DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs should be placed in accordance with Sections 2B.28, 2B.29, and 2C.45 of the 2009 MUTCD.*

11 *If used, the NO CENTER LINE (W8-12) sign should be placed in accordance with Section 6F.53.*

Standard:

12 **Pavement dotting used for laying out temporary or permanent pavement marking alignment shall not be used as a substitute for temporary pavement markings or temporary pavement markers.**

Section 6F.87 Temporary Raised Pavement Markers

Option:

01 Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may be substituted for markings of other types in TTC zones.

Standard:

02 **If used, the color and pattern of the raised pavement markers shall simulate the color and pattern of the markings for which they substitute.**

03 **Temporary pavement markers shall be installed with construction pavement markings (except non-retroreflective removable markings) in transition (lane drop) or lane shift areas of work zones which will encroach upon the traveled way for a period of more than three days and in other areas as required by the Engineer. Temporary pavement markers shall be installed on twenty-foot centers in lane shift and transition areas. When temporary pavement markers are used in other areas, they shall be installed on forty-foot centers unless otherwise required by the Engineer.**

04 **If temporary raised pavement markers are used to substitute for broken line segments, a group of at least three retroreflective markers shall be equally spaced at no greater than N/8 (see Section 3B.14 of the Virginia Supplement to the 2009 MUTCD). The value of N for a broken or dotted line shall equal the length of one line segment plus one gap.**

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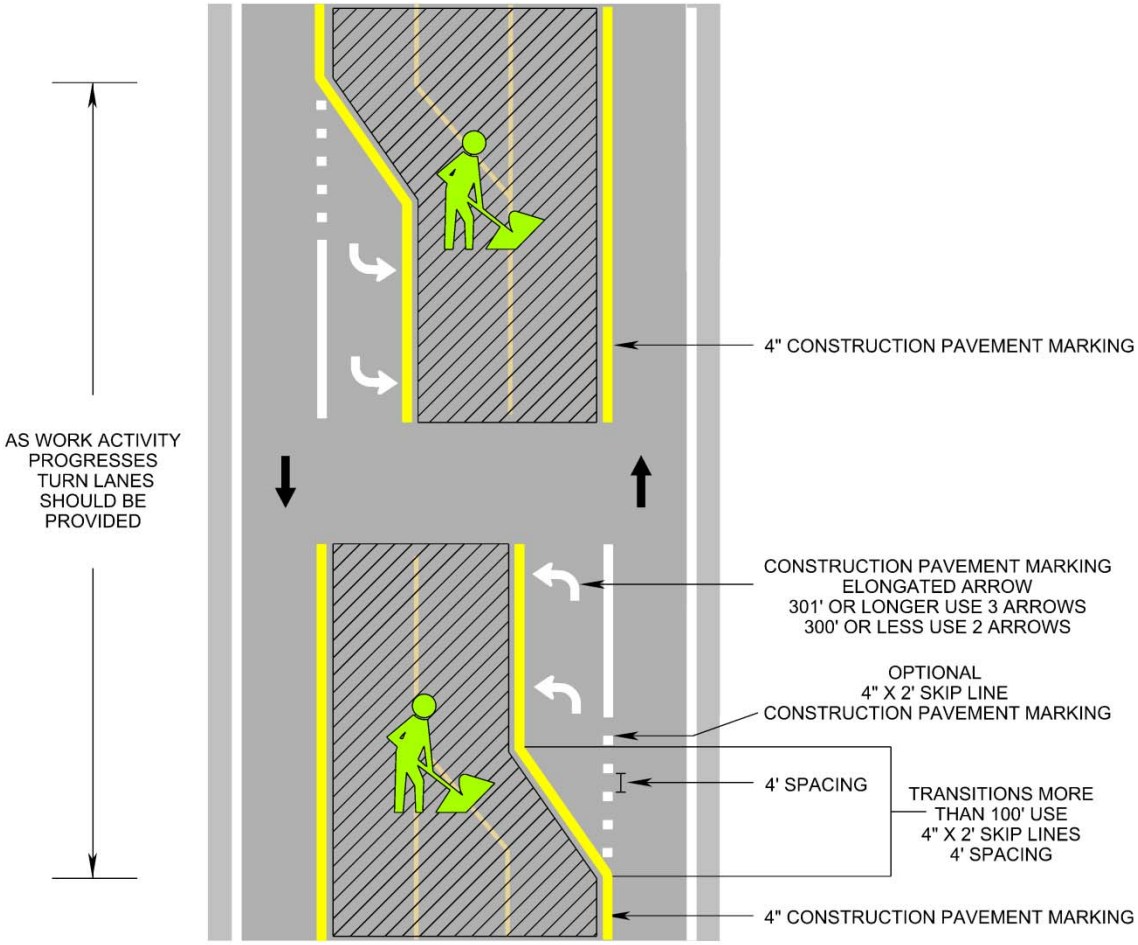
Figure 6F-10, Construction Pavement Marking for Tapers and Turn Lanes



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

05 **If temporary raised pavement markers are used to substitute for solid lines, the markers shall be equally spaced at no greater than N/4, with retroreflective or internally illuminated units at a spacing no greater than N/2. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Section 3B.11 of the Virginia Supplement to the 2009 MUTCD).**

Option:

06 Temporary raised pavement markers may be used to substitute for broken line segments by using at least two retroreflective markers placed at each end of a segment of 2 to 5 feet in length, using the same cycle length as permanent markings.

Guidance:

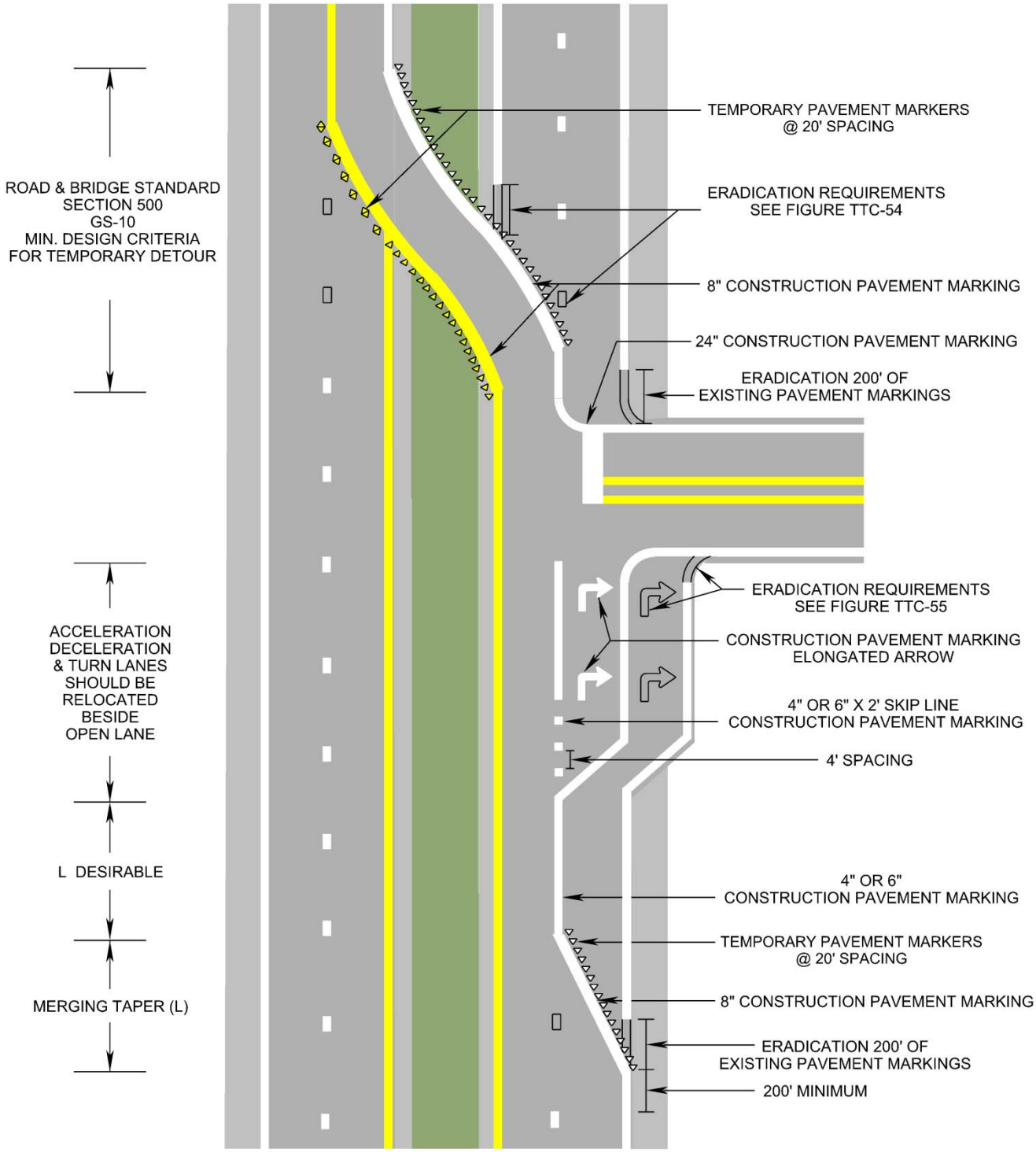
07 *Temporary raised pavement markers used on 2- to 5-foot segments to substitute for broken line segments should not be in place for more than 14 days unless justified by engineering judgment.*

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

Option:

09 Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may also be used in TTC zones to supplement markings as prescribed in Chapters 3A and 3B of the 2009 MUTCD.

Figure 6F-11, Temporary Pavement Marking and Temporary Pavement Markers for Tapers and Acceleration, Deceleration, and Turn Lanes



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

Support:

10 See typical traffic control layout Figure TTC-60 for additional guidelines for installation of temporary raised markers.

Section 6F.88 Delineators

Standard:

01 **When used, delineators shall combine with or supplement other TTC devices. They shall be mounted on crashworthy supports so that the reflecting unit is approximately 4 feet above the near roadway edge. The standard color for delineators used along both sides of two-way streets and highways and the right hand side of one-way roadways shall be white. Delineators used along the left-hand side of one-way roadways shall be yellow.**

Guidance:

02 *Spacing along roadway curves should be as set forth in Section 3F.04 of the 2009 MUTCD and should be such that several delineators are constantly visible to the driver.*

Option:

03 Delineators may be used in TTC zones to indicate the alignment of the roadway and to outline the required vehicle path through the TTC zone.

Section 6F.89 Lighting Devices

Guidance:

01 *Lighting devices should be provided in TTC zones based on engineering judgment.*

02 *When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.*

Option:

03 Lighting devices may be used to supplement retroreflectorized signs, barriers, and channelizing devices. During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by amber colored high-intensity rotating, flashing, oscillating, or strobe lights on a construction/maintenance vehicle.

Standard:

04 **Although vehicle hazard warning lights are permitted to be used to supplement high-intensity amber rotating, flashing, oscillating, or strobe lights, they shall not be used instead of high-intensity rotating, flashing, oscillating, or strobe lights.**

Section 6F.90 Floodlights

Support:

01 Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when vehicular traffic volumes are lower. Large construction projects are sometimes operated on a double-shift basis requiring night work (see Section 6G.26).

Guidance:

02 *When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.*

Standard:

03 **Except in emergency situations, flagger stations shall be illuminated at night with a light source producing at least a minimum of 5 foot candles (50 lux).**

04 **Floodlighting shall not produce a disabling glare condition for approaching road users, flaggers, or workers.**

05 **The adequacy of the floodlight placement and elimination of potential glare shall be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically during each shift.**

Guidance:

06 *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 or anti-glare shields*[1].

Support:

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

Section 6F.91 Warning Lights

Support:

01 Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

Standard:

02 **Warning lights shall be in accordance with the current ITE "Purchase Specification for Flashing and Steady-Burn Warning Lights" (see section 1A.11 of the Virginia Supplement to the 2009 MUTCD).**

03 **When warning lights are used, they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.**

Guidance:

04 *The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.*

Support:

05 The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention.

Option:

06 Warning lights may be used in either a steady-burn or flashing mode.

Standard:

07 **Except for the sequential flashing warning lights that are described in Paragraphs 8 and 9, flashing warning lights shall not be used for delineation, as a series of flashers fails to identify the desired vehicle path.**

Option:

08 A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

Standard:

09 **If a series of sequential flashing warning lights is used, the successive flashing of the lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each flashing warning light in the sequence shall be flashed at a rate of not less than 55 or more than 75 times per minute.**

10 **Type A Low-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.**

11 **Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.**

Support:

12 Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

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Option:

13 Type A warning lights may be mounted on channelizing devices.

Support:

14 Type B High-Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area.

Option:

15 Type B warning lights are designed to operate 24 hours per day and may be mounted on post-mounted advance warning signs, on independent supports, or concrete barrier.

16 Type C Steady-Burn warning lights and Type D 360-degree Steady-Burn warning lights may be used during nighttime hours to delineate the edge of the traveled way.

Guidance:

17 *When used to delineate a curve, Type C and Type D 360-degree warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.*

Section 6F.92 Vehicle Warning Lights

Guidance:

01 *Amber warning lights on vehicles should be mounted as to be viewed 360 degrees on vehicles without arrow boards, and 180 degrees on vehicles with arrow boards.*

Standard:

02 **Vehicle warning lights shall be a high intensity amber rotating, flashing, or oscillating[1] light or combinations of and meet the following conditions:**

1. **Rotating amber lights shall consist of a minimum of two halogen sealed beams enclosed within a dome which displays an amber color when illuminated. Sealed beams shall have a flash rate of 75 to 135[1] flashes per minute. Rotating amber lights shall be visible under either day and night conditions a minimum of ½ mile on Limited Access highways, or a minimum of 1500 feet tangent on all other roadways. Rotating amber lights shall be mounted as to be viewed 360 degrees; double lights may be used to achieve 360 degree viewing.**
2. **Oscillating amber lights shall consist of a minimum 35 watt halogen bulb with an oscillating parabolic reflector or LED Module which produces an up and down and side to side motion. Oscillating lights shall display amber color when illuminated or be contained within an amber colored sealed lens. Oscillating amber lights shall be visible under either day and night conditions a minimum of ½ mile on Limited Access highways, or a minimum of 1500 feet tangent on all other roadways. Oscillating amber lights shall be mounted as to be viewed 360 degrees; or may be used in combinations with amber rotating and/or strobe lights.**
3. **High intensity amber flashing lights shall consist of a double flash unit and display amber color when illuminated or be contained within an amber colored sealed lens. Flash rate shall be 80±10 flashes per minute. High Intensity amber flashing lights shall be visible under either day and night conditions a minimum of ½ mile on Limited Access highways, or a minimum of 1500 feet tangent on all other roadways. High Intensity amber flashing lights shall be mounted as to be viewed 360 degrees; double lights may be used to achieve 360 degree viewing.**

03 **Warning lights shall be used on all vehicles performing moving and mobile operations.**

04 **The use of high-intensity white rotating, flashing, or oscillating[1] lights is reserved for emergency vehicles in the Commonwealth and shall not be used on construction/maintenance vehicles**

Option:

05 If the work operation vehicle in a moving/mobile operation is a motorized piece of equipment, such as a motor grader, grad-all, etc., warning lights may be optional.

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Guidance:

06 *During day and* [1] *night operations, work vehicles entering and exiting the work area should be equipped with and have operating at least one high intensity amber rotating, flashing, or oscillating*[1] *light visible from 360 degrees.*

07 *Unless perceived as a hazard, parked work operation vehicles or equipment in a stationary lane closure should not have their vehicle warning lights in operation which could be a distraction to motorist.*

Section 6F.93 Temporary Traffic Control Signals

Standard:

01 **Temporary traffic control signals (see Section 4D.32 of the 2009 MUTCD) used to control road user movements through TTC zones and in other TTC situations shall comply with the applicable provisions of Part 4 of the 2009 MUTCD.**

Support:

02 Temporary traffic control signals are typically used in TTC zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

Standard:

03 **A temporary traffic control signal that is used to control traffic through a one-lane, two-way section of roadway shall comply with the provisions of Section 4H.02 of the 2009 MUTCD. The signal requires an all-red interval of sufficient duration for road users to clear the portion of the TTC zone controlled by the traffic control signals. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone. All equipment shall be in compliance with Section 238 of the Road and Bridge Specifications and in excellent working condition.**

Guidance:

04 *Where pedestrian traffic is detoured to a temporary traffic control signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals (see Section 4E.09 of the Virginia Supplement to the 2009 MUTCD) are needed for crossing along an alternate route.*

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

Option:

06 Temporary traffic control signals may be portable or temporarily mounted on fixed supports.

Standard:

07 **The Regional Traffic Engineer shall determine which traffic control signal will be used - portable or temporarily mounted on fixed supports.**

08 **The supports for temporary traffic control signals shall not encroach into the minimum required width of a "pedestrian access route" of 48 inch or an "alternate circulation path" of 36 inch.**

Guidance:

09 *Temporary traffic control signals should only be used in situations where temporary traffic control signals are preferable to other means of traffic control, such as changing the work staging or work zone size to eliminate one-way vehicular traffic movements, using flaggers to control one-way or crossing movements, using STOP or YIELD signs, and using warning devices alone.*

Support:

10 Factors related to the design and application of temporary traffic control signals include the following:

A. Safety and road user needs;
B. Work staging and operations;
C. The feasibility of using other TTC strategies (for example, flaggers, providing space for two lanes, or detouring road users, including bicyclists and pedestrians);
D. Sight distance restrictions;

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E. Human factors considerations (for example, lack of driver familiarity with temporary traffic control signals);
F. Road-user volumes including roadway and intersection capacity;
G. Affected side streets and driveways;
H. Vehicle speeds;
I. The placement of other TTC devices;
J. Parking;
K. Turning restrictions;
L. Pedestrians;
M. The nature of adjacent land uses (such as residential or commercial);
N. Legal authority;
O. Signal phasing and timing requirements;
P. Full-time or part-time operation;
Q. Actuated, fixed-time, or manual operation;
R. Power failures or other emergencies;
S. Inspection and maintenance needs;
T. Need for detailed placement, timing, and operation records; and
U. Operation by contractors or by others.

11 Although temporary traffic control signals can be mounted on trailers or lightweight portable supports, fixed supports offer superior resistance to displacement or damage by severe weather, vehicle impact, and vandalism.

Guidance:

12 *Other TTC devices should be used to supplement temporary traffic control signals, including warning and regulatory signs, pavement markings, and channelizing devices.*

13 *The design and placement of temporary traffic control signals should include interconnection to other traffic control signals along the subject roadway.*

14 *Temporary traffic control signals not in use should be covered or removed.*

15 *If a temporary traffic control signal is located within 1/2 mile of an adjacent traffic control signal, consideration should be given to interconnected operation.*

Standard:

16 **Temporary traffic control signals shall not be located within 200 feet of a grade crossing unless the temporary traffic control signal is provided with preemption in accordance with Section 4D.27 of the 2009 MUTCD, or unless a uniformed officer or flagger is provided at the crossing to prevent vehicles from stopping within the crossing.**

17 **Temporary traffic control signals exposed to traffic shall have a minimum of four (4) Group 2 channelizing devices placed in a taper on the shoulder in advance of the signal for delineation.**

Section 6F.94 Temporary Traffic Barriers

Support:

01 Temporary traffic barriers, including shifting portable or movable barriers, are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and to protect workers, bicyclists, and pedestrians.

02 The four primary functions of temporary traffic barriers are:

A. To keep vehicular traffic from entering work areas, such as excavations or material storage sites;
B. To separate workers, bicyclists, and pedestrians from motor vehicle traffic;
C. To separate opposing directions of vehicular traffic; and
D. To separate vehicular traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects.

Option:

03 Temporary traffic barriers, including shifting portable or movable barrier installations to accommodate varying directional traffic demands, may be used to separate two-way vehicular traffic.

Guidance:

04 *Because the protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers, their use should be based on an engineering study. When serving the additional function of channelizing vehicular traffic (see Section 6F.78) temporary traffic barriers should be a light color for increased visibility.*

Standard:

05 **Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if they are used to channelize vehicular traffic. The delineation color shall match the applicable pavement marking color.**

06 **Temporary traffic barriers, including their end treatments, shall be crashworthy and selected from VDOT's Approved Products list[1]. In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with VDOT's Road Design Manual and AASHTO's "Roadside Design Guide" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments.**

07 **Barrier panels 8 inches in width and 12 inches in height shall be installed on top of the barrier. Panels shall be installed on 40 foot centers in transition or taper sections and on 80 foot centers in the tangent sections. A Type B flashing light shall be installed on the run-on end of the barrier and at the breakpoint where the transition or taper ends and the barrier becomes parallel to the roadway. Barrier panels shall have a fluorescent orange retroreflective surface in the direction of oncoming traffic.**

08 **The effect of striking the ends of barriers shall be mitigated by the use of impact attenuators or by flaring the ends of barriers away from the traveled way. Following in the order of preference are the methods to be used in mitigating the effect of striking the ends of barriers:**

1. **Where guardrail exists, the guardrail shall be attached to the barrier with the appropriate fixed object attachment.**
2. **Where cut slope exists, bury the barrier into the cut slope and provide for drainage as needed.**
3. **Extend end of barrier until it is beyond the established Clear Zone (see Appendix A for clear zone values).**
4. **When barrier end is inside the desired Clear Zone, attenuator service Type I or Type II (Sand barrels) shall be used. Refer to Location and Design Division's Special Design Drawings. Contact Location and Design Division's Standards/Special Design Section for type and quantity needed for each location.**

Support:

09 Movable barriers are a linear system of connected barrier segments capable of being rapidly repositioned laterally using a transfer vehicle that travels along the barrier. The transfer is accomplished in a manner that does not interfere with vehicular traffic in adjacent lanes. Movable barriers enable short-term closures to be installed and removed on long-term projects. Providing a barrier-protected work space for short-term closures and providing unbalanced flow to accommodate changes in the direction of peak-period traffic flows are two of the advantages of using movable barriers. Applications of movable include the following:

A. Closing an additional lane during work periods while maintaining the advantage of having the travel way separated from the work space by a barrier;
B. Closing an additional lane during off-peak periods to provide extra space for work activities without adversely impacting vehicular traffic flow; and
C. Creating a temporary reversible lane, thus providing unbalanced capacity favoring the major direction of vehicular traffic flow.

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10 Figure 6H-45 of the 2009 MUTCD shows a temporary reversible lane using movable barriers. The notable feature of the movable barrier is that in both Phase A and Phase B, the lanes used by opposing traffic are separated by a barrier.

11 Figure 6H-34 of the 2009 MUTCD shows an exterior lane closure using a temporary traffic barrier. Notes 7 though 9 address the option of using a movable barrier. By using a movable barrier, the barrier can be positioned to close the lane during the off-peak periods and can be relocated to open the lane during peak periods to accommodate peak traffic flows. With one pass of the transfer vehicle, the barrier can be moved out of the lane and onto the shoulder. Furthermore, if so desired, with a second pass of the transfer vehicle, the barrier could be moved to the roadside beyond the shoulder.

12 More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD).

Section 6F.95 Crash Cushions

Support:

01 Crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two types of crash cushions that are used in TTC zones are stationary crash cushions and truck-mounted attenuators. Crash cushions in TTC zones help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles, and other obstacles. Specific information on the use of crash cushions can be found in AASHTO's "Roadside Design Guide" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD).

Standard:

02 **Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.**

Support:

03 Stationary crash cushions are used in the same manner as permanent highway installations to protect drivers from the exposed ends of barriers, fixed objects, and other obstacles.

Standard:

04 **Stationary crash cushions shall be designed for the specific application intended. When a non-redirective crash cushion (impact attenuator) is used a CRASH AREA KEEP CLEAR (W0-V1) sign shall be installed as directed by the plan assembly (see IIM-LD-222).[1]**

05 **Truck-mounted attenuators (TMA) shall be energy-absorbing devices attached to the rear of shadow trailers or trucks and listed on VDOT's approved device list. If used, the shadow vehicle with the attenuator shall be located in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.**

06 **A TMA shall only be used during an incident management operation to protect a fixed object. The TMA shall remain in place for no more than 24 hours after the initial scene response.[1]**

07 **The rear panel of the TMA cushion shall have alternate 6 to 8-inch wide orange and black or yellow and black[1] chevron (inverted v) stripes. Stripes shall be sloped at a 45 degree angle downward in both directions from the upper center of the rear panel. Fluorescent orange or yellow retroreflective sheeting[1] shall be in compliance with Section 247 of the Road and Bridge Specifications**

08 **The TMA shall be used in accordance with the manufacturer's specifications, including the weight of the support truck, and installed as tested per NCHRP350/Mash Test Level 3 criteria[1]. Documentation of the manufacturer's support truck weight recommendation shall be made available when requested, along with a copy of a weigh ticket for the truck. The weigh ticket shall contain adequate information to associate the ticket with the applicable truck.**

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Option:

09 Additional weight may be added to the support vehicle to achieve the range recommended by the manufacturer of the truck-mounted attenuator provided the total weight is within the Gross Vehicle Weight Recommendation of the support vehicle and is installed such that no movement will occur during impacts.

Support:

10 Trucks or trailers are often used as shadow vehicles to protect workers or work equipment from errant vehicles. These shadow vehicles are normally equipped with flashing arrows, changeable message signs, and/or high-intensity rotating, oscillating, or flashing[1] lights located properly in advance of the workers and/or equipment that they are protecting. However, these shadow vehicles might themselves cause injuries to occupants of the errant vehicles if they are not equipped with truck-mounted attenuators.

Standard:

11 **Shadow trucks with TMA's shall be used:**

A. When closing a lane on a four or more lane roadway with a posted speed of 45 mph or greater;
B. On shoulders, ramps and loops of interstate and Limited Access highways;
C. When a mobile operation occupies all or part of the travel lane on a multi-lane roadway with a posted speed of 45 mph or greater;
D. Other locations where the Regional Traffic Engineer feels such protection is warranted.

12 **When the installation and removal of temporary traffic control devices is performed as a mobile operation meeting the conditions listed in Paragraph 11, a TMA shall be used on the shadow vehicle.**

13 **All TMA units shall conform to the requirements of NCHRP Report 350, Test Level 3 or MASH.**

14 **The shadow vehicle with a TMA shall be positioned a sufficient distance (80-120 feet) in advance of the workers or equipment being protected to allow for appropriate vehicle roll-ahead, but not so far that errant vehicles will travel around the vehicle and strike the protected workers and/or equipment.**

15 **When all work crews, equipment, or hazards have been sufficiently removed from the lane closure, the shadow truck shall be removed.**

Guidance:

16 *Shadow trucks should be used when installing and removing a lane closure in a roadway. In mobile operations, the shadow truck with a truck-mounted attenuator should be 1000 feet ± in advance of the work vehicle.*

Option:

17 Shadow trucks with TMA's may be eliminated when their use would destroy or damage uncured asphalt.

18 For additional operations or hazards located further downstream from the taper, a shadow vehicle without a truck-mounted attenuator, placed a sufficient distance (80-120 feet) in advance of the operation or hazard, may be used for protection when workers are present and work is in progress.[1]

Support:

19 Asphalt pavement resurfacing operations are typically those instances where shadow trucks with TMA's would destroy or damage uncured asphalt. Other operations being accomplished under the same project would still require the use of TMA's if their use would not destroy or damage the uncured asphalt. Examples of those operations include shoulder work where the adjacent lane is required to be closed, pavement marking application closures (except pavement marking tape being inlaid into the new asphalt surface), and other similar type operations.

Standard:

20 **During operation as a shadow vehicle with a TMA, the truck shall not be used as a work operations vehicle. Channelizing devices or signs shall not be stored or installed from the shadow vehicle with a TMA. All other[1] material and/or equipment on the shadow vehicle TMA shall be properly secured to prevent spillage if struck by an errant vehicle.**

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Option:

21 Additional vehicles in an operation may have a TMA device on it as long as it is not in use as a shadow vehicle providing protection as described in Paragraph 16 and as shown in the typical traffic control layouts in Chapter 6H.

Guidance:

22 *The attenuator should be in the full down-and-locked position when in use as a protection vehicle. For stationary operations, the truck-mounted attenuator should be placed in accordance with the manufacturer's recommendations.*

Standard:

23 **The TMA shall be visually inspected daily prior to use and shall be in accordance with and used by the manufacturer's specifications.**

Support:

24 Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD) contains additional information regarding the use of shadow vehicles.

Section 6F.96 Rumble Strips

Support:

01 Transverse rumble strips consist of intermittent, narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration they attract the driver's attention to such features as unexpected changes in alignment and to conditions requiring a stop.

02 Longitudinal rumble strips consist of a series of rough-textured or slightly raised or depressed road surfaces located along the shoulder to alert road users that they are leaving the travel lanes.

03 Portable Temporary Rumble Strips (PTRS) is a transverse rumble strip that consists of intermittent, narrow, transverse areas of rough-textured or slightly raised or depressed surface that extends across the travel lane to alert drivers to unusual vehicular traffic conditions. The PTRS can be quickly installed and removed[1].

Standard:

04 **If it is desirable to use a color other than the color of the pavement for a longitudinal rumble strip, the color of the rumble strip shall be the same color as the longitudinal line the rumble strip supplements.**

05 **If the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the rumble strip shall be white, black, or orange.**

06 **A PTRS shall have a recessed, raised or grooved design to prevent movement and hydroplaning. The PTRS shall consist of interlocking or hinged segments that prevent separation and shall be installed without the use of adhesives or fasteners.**[1]

07 **The PTRS shall be able to withstand being run over by an 80,000 pound vehicle and retain its original placement with minor incidental movement of 6 inches or less during an 8-hour deployment. The PTRS shall be used in arrays of three rumble strips spaced 5 to 8 feet center to center, placed transverse across the travel lane. Incidental movement of the PTRS shall be parallel with other rumble strips in an array but shall not move so that its placement compromises the performance and safety of the other rumble strips, workers or the traveling public.**[1]

Option:

08 Intervals between transverse rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any transverse rumble strip installation.

Guidance:

09 *Transverse rumble strips should be placed transverse to vehicular traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.*

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10 *In urban areas, even though a closer spacing might be warranted, transverse rumble strips should be designed in a manner that does not promote unnecessary braking or erratic steering maneuvers by road users.*

11 *Transverse rumble strips should not be placed on sharp horizontal or vertical curves.*

12 *Rumble strips should not be placed through pedestrian crossings or on bicycle routes.*

13 *Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 4 feet is provided at each edge of the roadway or on each paved shoulder as described in AASHTO's "Guide to the Development of Bicycle Facilities" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD).*

14 *Longitudinal rumble strips should not be placed on the shoulder of a roadway that is used by bicyclists unless a minimum clear path of 4 feet is also provided on the shoulder.*

15 *When approved for use, PTRS should be used in one-lane, two-way flagging operations. The PTRS should extend across the travel lane but not encroach into the opposing lane. Only one array of PTRS should be used in the work zone's advance warning area per travel direction (see TTC-23).*[1]

16 *PTRS should be installed and removed with the advance warning signs for the work operation.*[1]

Section 6F.97 Screens

Support:

01 Screens are used to block the road users' view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.

Guidance:

02 *Screens should not be mounted where they could adversely restrict road user visibility and sight distance and adversely affect the reasonably safe operation of vehicles.*

03 *The use of screens mounted on the top of temporary traffic barriers should be considered in crossover applications whenever multi-lane traffic is reduced to two-way motor vehicle traffic to reduce headlight glare from oncoming traffic and improve mobility through the crossover.*

Option:

04 Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.

Guidance:

05 *Design of screens should be in accordance with Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD).*

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