Traffic Engineering Division Memoranda

Listed are the current Traffic Engineering memoranda. There are also memoranda under review which will be added after revisions are completed. Contact Rajendra.Dhakal@VDOT.Virginia.gov with any questions about these documents.

TE-159 Steel grid deck sign
H & TS-189 Signing for facilities of the Virginia Commission of Game and Inland Fisheries
TE-192 Message alignment for signs VG-14 and VG-15
TE-195 Locations for signs D2-1, D2-2 and D2-3
TE-197 Signing for unattended vehicles
TE-203 Alternate typical protection details for drawbridge on undivided roadways
TE-222 Crossroad identification signs
TE-238 VW-13 bridge end warning sign
TE-242 Signing of construction project termini
TE-251 Pavement marking policy
TE-252 Dry fire hydrants
TE-253 Developer participation in traffic signal cost
TE-254 Authorized vehicles only signs
TE-255 Signing for Adopt-a-Highway litter control revised
TE 261.1 Type B, Class VI pavement markings
TE-266 Traffic signal head color
TE-268 Text telephone TTY signs
TE-272 Replacement of electronic arrow panel with static arrow sign
TE-273 Next rest area XX miles
TE-275 State police parking only sign
TE-280 Watch for children signs
TE-283 Rest area welcome center signing
TE-285 Truck tip-over sign
TE-287 Headlights on when using wipers
TE-298 Speed determination
TE-299 Signing for Move It Program
TE-300 Cellular pound symbol 77
TE-301 Rest area welcome center signing
TE-306 Traffic signals
TE-306 Traffic signals, Northern Virginia District addendum
TE-311 Overhead and advanced ground mounted street name signs at signalized intersections
MM-312 Inspection and testing of grounding systems
MM-313 Signing for weight restrictions of structures
MM-314 Signing for vertical clearances of structures
MM-316 Engine braking and other noise restriction signs
MM-319 Procurement designs and maintenance of lighting systems
MM-324 W16-5P W16-6P and W16-7P supplemental arrow plaques
MM-326 Expansion (across lane) joints on bridge sign
MM-328 Open joints on bridge sign

MM-330 Commercial vehicle restriction signing
TE-333 Warning sign for steel plates
TE-334 Use of six-inch traffic line markings
TE-336 Horizontal pavement markings M1-1 route shield
TE-337 Clearview highway font
TE-339 Restricted width route signing
TE-340 Speed limit and fine signs in work zones
TE-341 Accessible pedestrian signals - revised
TE-342 Lane encroachment and center lane closure policy for work zone on limited access highways
TE-345 Work zone traffic control training procedures
TE-346 High mast poles - Inspection and maintenance
TE-347 Moratorium on the use of cantilever sign structures with VMS and CMS signs
TE-350.1 Work zone speed analysis
TE-351.2 Transportation management plan requirements
TE-352 Slow roll temp traffic control
TE-353 Pedestrians with disabilities signs
TE-357 Establishing procedures for shop plans, modifications, maintenance, and inspection of traffic structures
TE-358.5 NCHRP 350 Test Requirements – Guardrail
TE-359 Mowing operation with encroachment on limited access highways
TE-360.2 Typical traffic control for pre-storm treatment operations
TE-361 Sign for limiting use and activity on pedestrian swing bridge
TE-362.1 Signing and sealing of plans and documents by licensed professional engineers
TE-363 Use of ballbank indicator device
TE-364 No loitering signs
TE-365 Speed Limit Change Process
TE-369 Warning signs - deer and other large animal crossing
TE-370.0 Variable Speed Limit Implementation Requirements and Guidance
TE-372.0 Guide Signs

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** T&S-159
	DATE: June 30, 1980
SPECIFIC SUBJECT: Steel Grid Deck Sign	**SUPERSEDES:**
DIRECTED TO: District Engineers	**SIGNATURE:** *J. P. Mills, Jr.*

The Department has recently received complaints from motorcyclists and small vehicle operators about the difficulty they encounter when driving on the expansion grates on some of our bridges.

In an effort to warn motorists of the steel grates, an advance warning sign has been designed as shown on the attached Drawing No. 1497 dated June 30, 1980.

Please have this sign installed on each approach to any bridge in your District having a steel grid deck not later than September 1, 1980, and notify this office when the work is completed.

MGA: dws
Attachment
cc: Mr. Leo E. Busser, III
Mr. J. T. @larren
Mr. J. M. Wray, Jr.
Mr. 0. K. Mabry
Mr. W. L. Brittle, Jr.
Mr. H. R. Perkinson, Jr.
Division Heads
Resident Engineers
District Traffic Engineers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Supplemental Signing	**NUMBER:** H&TS-189
SPECIFIC SUBJECT: Signing for Facilities of the Virginia Commission of Game and Inland Fisheries	**DATE:** June 6, 1986 **SUPERSEDES:** T&S-106
DIRECTED TO: District Engineers	**SIGNATURE:** *A. L. Thomas, Jr.*

Expanding public interest in a greater variety of facilities of the Virginia Commission of Game and Inland Fisheries has necessitated a revision in policy on the use of highway signing to provide directional guidance to these facilities. Accordingly, the Virginia Commission of Game and Inland Fisheries, hereinafter referred to as Commission, and the Virginia Department of Highways and Transportation, hereinafter referred to as Department, have jointly developed the following criteria and procedures for such supplemental signing:

1. Signing for designated facilities of the Commission will be permitted on non-limited access highways upon approval of a request therefor from the Commission to the Department. Such requests are to be in writing and directed to the Department's District Highway and Traffic Safety Engineer for the Highway District in which the Commission's facility is located.

2. Commission facilities that may be, identified by supplemental signing are canoe access areas, field trial areas, fish hatcheries, game refuges, game warden headquarters, public boat landings, public fishing lakes and wildlife management areas.

3. Signing for Commission facilities may begin at the Primary Route intersection nearest the facility and follow the safest and most direct routing, as determined by the Department, to the facility.

4. The design, fabrication and installation of the signing shall be in accordance with attached drawing dated June 6, 1986. The number and location of each sign shall be approved by the Department.

5. The Commission shall bear all costs for fabrication, erection maintenance and removal of the signs and their supports.

6. The Commission shall provide the necessary signs and support materials and make the proper installation at the sites, approved by the District Highway and Traffic Safety Engineer, notifying that office in writing when the work is completed.

7. Existing approved signing for Commission facilities may remain in place until due for maintenance replacement, at which time any replacement, removal or modification shall be done in accordance with the provisions of this memorandum.

8. The Department will report any maintenance needs directly to the Commission's Engineer, 4010 West Broad Street, Richmond, Virginia 23230 (SCATS 327-1000).

9. Any requested variance from policy and procedure must have prior concurrence of the Commission's Executive Director and the Department's State Highway and Traffic Safety Engineer.

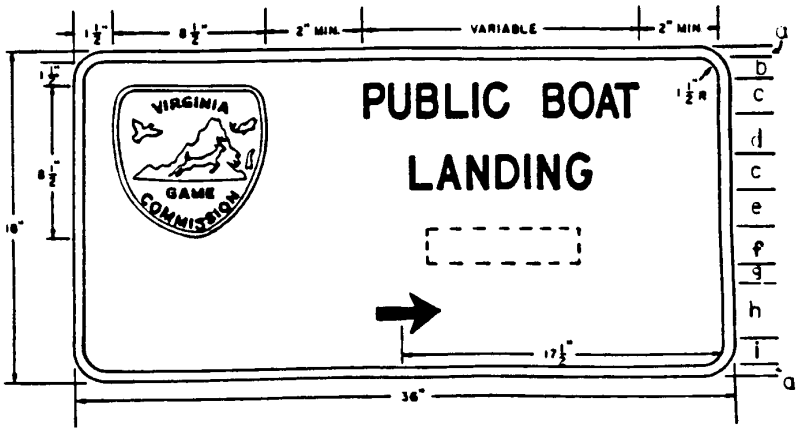
cc: Mr. Ray D. Pethtel
Mr. 0. K. Mcibry
Mr. John M. Wray, Jr.
Directors
Division Administrators
Resident Engineers
District Highway and Traffic Safety Engineers
Virginia Commission of Game and Inland Fisheries

TYPICAL TRAILBLAZER
FOR FACILITIES OF
VIRGINIA COMMISSION OF GAME AND INLAND FISHERIES

DIMENSION KEY
(IN INCHES)

DIMENSIONS	2 LINES OF TEXT			3 LINES OF TEXT		
	ARROW VERT.	ARROW 45°	ARROW HORIZ.	ARROW VERT.	ARROW 45°	ARROW HORIZ.
a	1/2	1/2	1/2	1/2	1/2	1/2
b	1 1/2	2	2	1 1/2	1	1
c	2	2	2	2	2	2
d	2	2	2	2	1 1/2	1 1/2
e	2	2	2 1/2	2	1 1/2	1 1/2
* f	—	—	—	2	2	2
* g	—	—	—	1	1	1 1/2
h	6	5	4 1/2	3	5	4 1/2
i	1 1/2	2	2	1 1/2	1	1

*OMIT f AND g DIMENSIONS ON 2 LINES OF TEXT.



MESSAGE: Text (maximum of 3 lines allowed)..... 2" D
Commission shield..... 8-1/2" X 8-1/2"
Arrow (except vertical arrow with 3 lines of text) ..... 6" X 4-1/2"
(vertical arrow with 3 lines of text ..... 3-1/2" X 2-1/4"

SIGN PANEL:..... 0.080" thick

COLOR COMBINATION:..... C-22

PUNCHING STANDARD:..... VII

SIGN STRUCTURE: ..... - 4"X4" wood post or 1 - 2 lb./lf. U-type steel post.

PLACEMENT OF SIGN:

Lateral Placement:

Rural..... Not less than 6' from edge of shoulder, of if none, 12' from edge of roadway.

Urban .....Not less than 2' from face of curb or never less than 1' when space is limited.

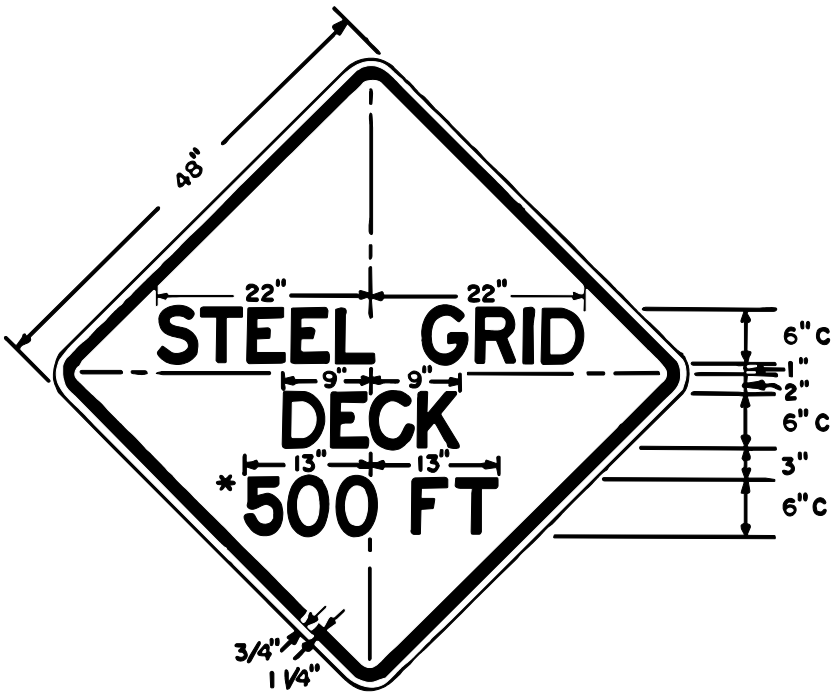
Pavement (curb) top to sign bottom:

Rural..... 5'
Urban ..... 7'

Angle: Sign face with pavement edge: .....93°

Sign panel, structure, materials, and installation shall be in accordance with Virginia Department of Highways and Transportation's Road and Bridge Standards, Section 1401, and the Road and Bridge Specifications, Section 701.

June 6, 1986



SHAPE ..... Diamond

COLOR: Message and Border ..... Black (Non-Reflectorized)

Field ..... Yellow (Reflectorized)

SIZE: Each Side ..... 48 II

MESSAGE: Capitals 6Isc

MARGIN WIDTH 3/411

BORDER WIDTH 11/411

CORNER RADIUS ..... 31'

PUNCHING STANDARD ..... M

ANGLE Sign Face with Pavement Edge ..... 93^0

* Distance may vary. Also, the word "AHEAD" may be used in lieu of the distance.

6-30-80
DR, NO. TA-1497

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Destination Signs	**NUMBER:** TE-192
SPECIFIC SUBJECT: Message Alignment for Signs VG-14 and VG-15	**DATE:** April 24, 1987
	SUPERSEDES:
DIRECTED TO: District Engineers	**SIGNATURE:** *A. L. Thomas, Jr.*

Pursuant to the provisions of Senate Joint Resolution No. 7, (Senate Document No. 18), the message alignment for destination signs VG-14 and VG-15 specified in the Virginia Supplement to the Manual on Uniform-Traffic Control Devices is revised, effective May 1, 1 987, to conform with the message alignment for destination signs VG-17 and VG-18, respectively. This change will reduce the horizontal length of the sign and shall be implemented on all new installations and on all such destination signs requiring replacement where there would be no conflict with minimum post spacing requirements.

To provide documentation of savings to be realized from this change, a detailed inventory of all destination signs installed or replaced with the revised message alignment should be maintained by your District Traffic Engineer.

This memorandum is being issued in conjunction with the Traffic Engineering Division's implementation of the initiatives that the Department has undertaken as a result of its response to Senate Joint Resolution No. 7.

WCN:dws
cc: Mr. Ray D. Pethtel
Mr. 0. K. Mabry
Mr. John M. Wrciy, Jr.
Mr. A. W. Cocites, Jr.
Directors
Division Administrators
Resident Engineers
District Traffic Engineers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Confirmatory Mileage Signs	**NUMBER:** TE-195
	DATE: April 24, 1987
SPECIFIC SUBJECT: Locations for Signs D2-1, D2-2 and D2-3	**SUPERSEDES:**
DIRECTED TO: District Engineers	**SIGNATURE:** *A. L. Thomas, Jr.*

Pursuant to the provisions of Senate Joint Resolution No. 7 (Senate Document No. 18), the locations for confirmatory mileage signs D2-1, D2-2 and D2-3 specified in the Virginia Supplement to the Manual on Uniform Traffic Control Devices are amended, effective May 1, 1987, as follows:

These signs are intended for use on Primary routes (1) leaving municipalities, (2) just beyond interchanges/intersections of Interstate and other Primary routes in rural areas, and (3) at intervals of not less than 10 miles in rural areas where conditions (1) and (2) do not apply

The spacing of existing confirmatory mileage signs shall be adjusted accordingly at the time of normal maintenance replacement or overlay work.

To provide documentation of savings to be realized from this change, a detailed inventory of all such signs removed or that would have been provided under the previous criteria should be maintained by your District Traffic Engineer.

This memorandum is being issued in conjunction with the Traffic Engineering - Division's implementation of the initiatives that the Department has undertaken as a result of its response to Senate Joint Resolution No. 7.

WCN:dws
cc: Mr. Ray D. Pethtel
Mr. 0. K. Mabry
Mr. John M. Wray, Jr.
Mr. A. W. Coates, Jr.
Directors
Division Administrators
Resident Engineers
Traffic Engineers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-197
	DATE: September 3, 1987
SPECIFIC SUBJECT: Signing for Unattended Vehicles	**SUPERSEDES:**
DIRECTED TO: District Engineers	**SIGNATURE:** *A. L. Thomas, Jr.*

The Virginia Department of State Police advise they receive numerous complaints from the public when vehicles left unattended on limited access highways have been towed. The majority of these complaints are a result of the public being unaware that their vehicles may be towed and at their expense. These complaints require investigation by the State Police and result in considerable paperwork and time consumption.

At the request of the State Police, signs indicating that unattended vehicles are subject to towing at the owner's expense were installed at a number of locations in Northern Virginia, and the complaints declined significantly.

Therefore, since signing has shown to be effective in reducing complaints, the attached modified design of the R8-7 sign, designated VR-28, may be used in lieu of the standard RB-7 sign where deemed necessary. Unless circumstances deem otherwise, the smaller size of this sign should be used.

DCF:dws
Attachment
cc: Mr. Ray D. Pethtel
Mr. 0. K. Mabry
Mr. John M. Wray, Jr.
Mr. A. W. Coates, Jr.
Directors
Division Administrators
Resident Engineers
District Traffic Engineers

LAYOUT OF SIGN

Route No.:

Project No.:

City/County:

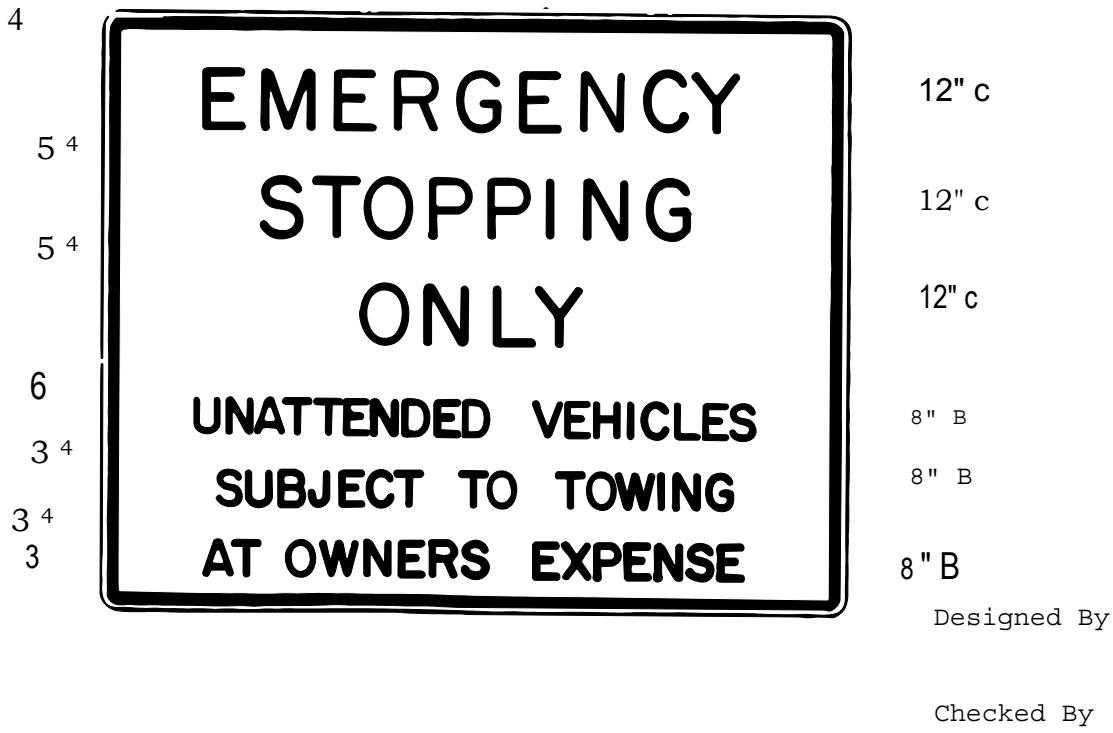
Text No. Sign No. Figure No.

Width 9 Ft. 6 In. Height 8 Ft. 0 In. Sq. Ft. -76

Border W'idth 1/2 In. Margin Width 1. In. Corner Radii 6 In.

Letter Type L- 3 Color Combination C- 1

ATTACH COMPUTER PRINT-OUT



Designed By

Checked By

LAYOUT OF SIGN

Route No.:

project No.:

City/County:

Text No. Sign No.. Figure NO.

Width 5 Ft. 0 In. Height 4- Ft. 0 In. Sq. Ft. 20

Border Width .3/4 In. Margin Width 1/2 In. Comer Radii 3 In.

Letter Type L- I Color Combination C- I

ATTACH COMPUTER PRINT-OUT

2

2⁶

2⁶

3

1°

1⁶

1$

6" c

6 "C

6 "C

,4 " B

4" B

4 "B

Designed By

Checked By

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Drawbridge Signals	**NUMBER:** TE-203
	DATE: February 5, 1988
SPECIFIC SUBJECT: Alternate Typical Protection Details for Drawbridge Approaches on Undivided Roadways	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *A. L. Thomas, Jr.*

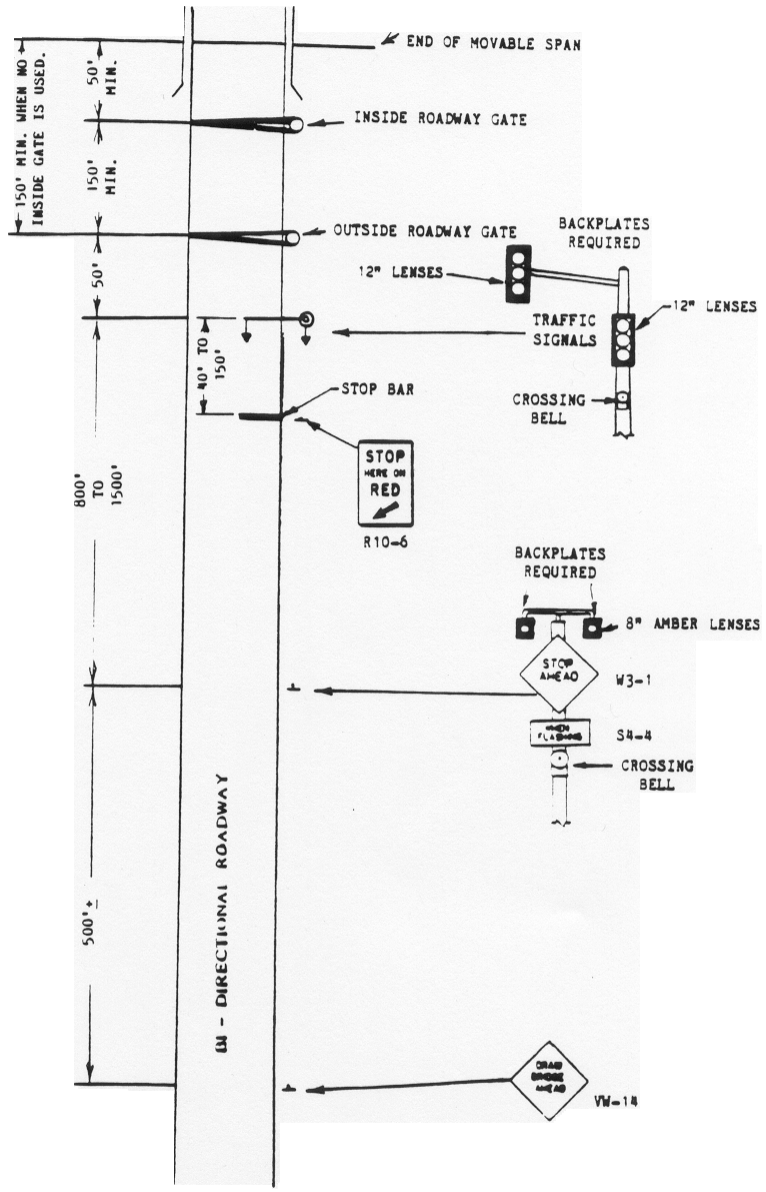
Attached is an alternate typical protection detail that may be used on undivided roadway approaches to drawbridges in lieu of the typical details shown on page 731 of the Virginia Supplement to the MUTCD. This alternate detail was developed for use in areas where there are potential or existing problems with maintenance of the VS-.3 and VS-4 neon signs.

On the alternate detail, the distance from the end of the movable span to the outside gate is 1501 minimum when an inside gate is not used. The standard details in the Virginia Supplement indicate this distance to be 100'+. On projects involving the installation of all new protection equipment, this distance to the outside gate shall be 150' minimum for both the standard and alternate details. On existing installations where neon tubing signs are being replaced with the static signs, this distance to the outside gate shall remain as is to eliminate relocation of the existing equipment.

DCF:dws
cc: Mr. Ray D. Pethel
Mr. O. K. Mabry
Mr. J. S. Hodge
Mr. A. W. Coates Jr.
Directors
Division Administrators
Resident Engineers
District Traffic Engineers

ALTERNATE

TYPICAL
DRAWBRIDGE PROTECTION DETAILS
UNDIVIDED ROADWAY



NOTE:

IN URBAN AREAS SPACING OF TRAFFIC CONTROL DEVICES MAY VARY AS LOCAL CONDITIONS AND APPROACH SPEEDS REQUIRE.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-222
	DATE: August 7, 1990
SPECIFIC SUBJECT: Crossroad Identification Signs	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *A. L. Thomas, Jr.*

Signs fabricated and installed according to the attached standard and as approved by the Chief Engineer shall be used to identify roads crossing the mainline of all limited access highways. If possible within available funding, implementation should be accomplished within a two-year period from the above date.

FMD:gyi
Attachment
cc: Mr. J. S. Hodge
Mr. A. W. Coates, Jr.
Mr. David R. Gehr
Directors
Division Administrators
Resident Engineers
District Traffic Engineers

SIGN NOT TO SCALE
TO BE USED AS A REPRESENTATION ONLY

This sign shall be installed in both directions of travel on limited access roadways to identify the route number and the officially designated street name of crossing roadways.

This sign is not required at interchanges. Where divided roadways cross over or under the limited access roadway, only one set of crossroad identification signs will be required unless spacing between the roadways dictates otherwise.

At limited access roadway underpasses, the sign shall be installed on the bridge over the center of the roadway. Where there are existing bridge mounted signs over the roadway, crossroad identification signs shall be installed on the bridge over the right shoulder. If it is not possible to install the sign on the bridge because of bridge design characteristics, a ground mounted sign shall be installed on the right side of the roadway as close as practical to the approach side of the structure.

At limited access roadway overpasses, ground mounted signs shall be installed on the right side of the roadway near the approach end of the bridge.

SHAPE		Horizontal Rectangle
COLOR	Message and Border: Field:	White (reflectorized) Green (reflectorized)
SIZE	Horizontal: Vertical:	Variable 24"
MESSAGE	Street Name & Rte. Numerals	8"/6" E(M) 8" E(M)
BORDER WIDTH		½"
CORNER RADIUS		4"

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-238
	DATE: May 4, 1993
SPECIFIC SUBJECT: VW-13 Bridge End Warning Sign	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J .L. Butner*

Due to a recent request from Culpeper District, Traffic Engineering Division has decided that the VW-13 warning sign shown on page 215 of the Virginia Supplement to the MUTCD shall now be fabricated with 1 7/8" corner radii. This will eliminate the stocking of two-30" sign blanks, one with rounded corners for other warning signs and one without rounded corners for this sign.

This change is effective for all new VW-13 signs upon the depletion of the existing stock of the non-rounded signs and sign blanks.

DCF/dcf
cc: Mr. Ray D. Pethtel
Mr. A. W. Coates, Jr.
Mr. David R. Gehr
Mr. J. S. Hodge
Directors
Division Administrators
Resident Engineers
District Traffic Engineers

Note: Corrections to this document, as shown in scrip style notes on the two sign layout detail sheets, were made on March 2, 2010.

Formal change to these layout details will be made at a future date.

Mark Hodges

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Project Limit Signs	**NUMBER:** TE-242
	DATE: June 28, 1994
SPECIFIC SUBJECT: Signing of Construction Project Termini	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

A lack of consistency has been observed throughout the state in the type and placement of signs used to designate the beginning termini of construction projects. To develop consistency in the marking of project termini, the following guidelines have been established:

A 48" by 24" "ROAD UNDER CONSTRUCTION" sign shall be placed at the beginning of the project, as per the attached layout, and a 48" by 24" "END CONSTRUCTION" sign shall be placed at the end of the project (on limited access roadways, these signs shall be 60" by 24"). Placement of the "ROAD UNDER CONSTRUCTION" sign 2000'± from the beginning of the project will allow placement of construction warning signs between the project termini sign and the beginning of actual work. All connections within the project limits should be identified with project termini signs. On projects where there is a one time set up of construction signs and the length of the work zone is unchanged, the "ROAD UNDER CONSTRUCTION" sign may be eliminated as directed by the District Traffic Engineer.

To allow ample time for fabrication and distribution of the "ROAD UNDER CONSTRUCTION' sign, implementation will be effective for all projects awarded after January 1, 1995. The attached layout will be incorporated into the Work Area Protection Manual at a later date.

DBR:jbc
cc: Mr. David R. Gehr
Mr. A. W. Coates, Jr.
Mr. J. S. Hodge
Mr. Claude D. Garver, Jr.
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis

END CONSTRUCTION
G20-2
48" x 24"
100FT ±
48" x 24"
Special
ROAD UNDER CONSTRUCTION
100FT ±
2000FT ±
ROAD UNDER CONSTRUCTION
48" x 24"
Special
Project Limits
100FT ±
END CONSTRUCTION
G20-2
48" x 24"
100FT ±
END CONSTRUCTION
G20-2
48" x 24"
2000FT ±
ROAD UNDER CONSTRUCTION
48" x 24"
Special

SHAPE		Horizontal Rectangle	
COLOR	Message and Border:	Black (non-reflectorized)	
	Field:	Orange (reflectorized)	
SIZE		A	B
	Horizontal:	48"	60"
	Vertical:	24"	24"
MESSAGE			
	Line 1 Capitals:	~~5" C~~ 6" B	6" C
	Line 2 Capitals:	~~5" C~~ 6" B	6" C
MARGIN WIDTH		~~5/8"~~ 1/2"	~~5/8"~~ 1/2"
BORDER WIDTH		~~5/8"~~ 3/4"	~~5/8"~~ 3/4"
CORNER RADIUS		3"	3"

SHAPE		Horizontal Rectangle	
COLOR	Message and Border:	Black (non-reflectorized)	
	Field:	Orange (reflectorized)	
SIZE		A	B
	Horizontal:	48"	60"
	Vertical:	24"	24"
MESSAGE		A	B
	Line 1 Capitals:	~~5" C~~	~~5" C~~
		6" B	6" C
	Line 2 Capitals:	~~5" C~~	~~5" C~~
		6" B	6" C
MARGIN WIDTH		~~5/8"~~	~~5/8"~~
		1/2"	1/2"
BORDER WIDTH		~~5/8"~~	~~5/8"~~
		3/4"	3/4"
CORNER RADIUS		~~1 ½"~~	~~1 ½"~~
		3"	3"

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Pavement Markings	**NUMBER:** TE-251
	DATE: August 23, 1994
SPECIFIC SUBJECT: Pavement Marking Policy	**SUPERSEDES:** M-83-72, Sr72-25, T&S-92
DIRECTED TO: District Administrators	**SIGNATURE:** *J .L. Butner*

The adoption of House Joint Resolution #243 (HJR #243) modifies the Department's policies relating to pavement markings on secondary roads. This Memorandum will modify and transfer existing pavement marking location requirements from Maintenance Division's Policy Manual to Traffic Engineering's Manual. This modification and transfer includes changes mandated by RJR #243 and its associated work plan.

Specifically, HJR #243 reduces the minimum traffic counts from 750 to 500 vehicles per day in determining which secondary roads require centerline pavement markings. HJR #2431 s work plan requires each District Traffic Engineer to submit a listing to this Division of roadways that are a minimum of 18, in width, have traffic volumes of at least 500 vehicles per day, and are appropriate for the application of centerline markings. In addition, those secondary roadways meeting the width and volume requirements but identified as inappropriate for the application of centerline markings must be accompanied by supporting documentation. Traffic volumes should be taken from existing secondary road volume tabulations, however seasonal variations may be considered when scheduling future secondary road volume counts. The requested information should be forwarded by Nov. 1, 1994. Marking of these roadways should begin July 1, 1994 and be completed by July 1, 1995.

The aforementioned listing will be used as a database to conduct accident evaluations two years prior, and two years subsequent to installation date. Upon completion of the evaluation phase (July 1, 1997), this Division will forward a draft report, by October 15, 1997, to the Commissioner summarizing its findings.

Listed below are the Department's revised policies regarding warrants for initial application of edgeline and centerline pavement markings on interstate, primary and secondary roadways.

All pavement markings shall conform to the standards set forth in the Manual on Uniform Traffic Control Devices for Streets and Highways and the Virginia Supplement to the Manual on Uniform Traffic Control Devices with such exceptions as may be specifically authorized by the State Traffic Engineer.

CENTERLINE MARKINGS

1. All interstate highways shall be centerlined

2. Centerline markings shall be applied to primary and secondary hard surfaced routes meeting all of the following criteria:

   a. Pavement width is a minimum of 18 feet.

   b. Traffic count is a minimum of 500 vehicles per day (VPD) .

   c. Sections to be centerlined shall be continuous between major points. (As an example, a road may carry over 500 VPD between major points; however, the pavement width is 18 feet or more in width only on a middle portion of the section. The middle portion shall not be centerlined since it would not constitute a continuous section between major points.)

   Exception: Subdivision streets meeting the above criteria shall not be centerlined unless the street is a through traffic artery.

3. At other locations where an engineering study indicates a need for them.

EDGELINE MARKINGS

Edgeline markings shall be applied under the following criteria:

1. All interstate highways.

2. All primary and secondary routes that are not in curb and gutter, are a continuous minimum width of 20 feet between major points and that have been centerlined.

3. Sections of primary routes, not continuously edgelined, on mountain crossings, subject to frequentl fog.

4. All primary and secondary hard surfaced routes not continuously edgelined, shall be edgelined at narrow (3 feet or less horizontal clearance between structure and edge of pavement) and single lane structures. If road and/or bridge restrictions prevent this from being accomplished, then the procedures outlined in TE-223 shall be utilized.

   Exception: Subdivision streets meeting the above criteria shall not be edgelined unless the street is a through traffic artery.

5. At other locations where an engineering study indicates a need for them.

These requirements entirely replace sections 10.221, 10.222 and 10.223 of the Maintenance Policy Manual. However, it should be noted that other sections regarding maintenance replacement of centerline and edgeline pavement markings are still in effect.

MGR/mgr
cc: Mr. David R. Gehr
Mr. A. W. Coatis, Jr.
Assistant Commissioner - Operations
Mr. J. S. Hodge
Division Administrators
Resident Engineers
District Traffic Engineers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Signing	**NUMBER:** TE-252
SPECIFIC SUBJECT: Dry Fire Hydrants	**DATE:** August 31, 1994
	SUPERSEDES:
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

The Department has decided to authorize requests by local fire departments for signing of "DRY FIRE HYDRANTS" on state right of way to better delineate such emergency facilities. Dry fire hydrants are defined as dry non-pressurized fire hydrants located at water sites for drafting of water by fire department equipment. Signing shall be limited to the actual dry fire hydrant location; directional signs to these locations will not be permitted. All work and expenses associated with the fabrication, installation and maintenance of these signs shall be the responsibility of the local fire department. If maintenance is not adequately provided by the fire department, the Department will remove or request that such signs be removed. Any work accomplished within the state right of way shall require the acquisition of all necessary Departmental permits.

Dry fire hydrants sign shall be a maximum size of 24" x 36", shall utilize a blue or red field on a white background and shall be fabricated from encapsulated lens sheeting.

It shall be the fire departments responsibility to ensure compliance with the Outdoor Advertising Laws and Regulations if directional signs are placed on private property.

MGR/mgr
cc: Mr. David R. Gehr
Mr. A. W. Coates, Jr.
Assistant Commissioner - Operations
Mr. J. S. Hodge
Division Administrators
Resident Engineers
District Traffic Engineers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Developer Participation in Traffic Signal Cost	**NUMBER:** TE-253
	DATE: March 16, 1995
SPECIFIC SUBJECT: Method of Determining Developer responsibility for Participation in Traffic Signal Costs	**SUPERSEDES:** H&TS-185
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

The following guidelines have been developed in an effort to obtain an equitable method of determining developer responsibility for participation in funding traffic signal work necessitated by land development:

Condition #1 - Where the proposed development will generate sufficient traffic to warrant signalization, the total cost for design, materials, timing plans, and installation shall be borne by the developer.

Condition #2 - Where development generated traffic and existing highway traffic must be combined to meet the requirements for either the major or minor movements for any hour(s), the developer shall bear 50% of the total cost for design, materials, timing plans, and installation.

Condition #3 - Where an existing traffic signal must be modified to accommodate traffic movements to or from the development, the developer shall bear the total cost for any design, materials, timing plans, installation, and relocation required to accommodate the development traffic.

For larger developments such as regional shopping centers and corporate complexes, the Department reserves the right to require the developer design or have designed the traffic signal, including timing plans; and to install or have installed a complete working installation. Designs and installations shall be in accordance with the current Departmental specifications and standards.

DCF/df
cc: Mr. David R. Gehr
Mr. A. W. Coates, Jr.
Mr. Claude D. Garver, Jr.
Mr. J. S. Hodge
Division Administrators
Resident Engineers
District Traffic Engineers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-254
	DATE: January 3, 1995
SPECIFIC SUBJECT: "Authorized Vehicles Only" Signs	**SUPERSEDES:** TE-249
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

"Authorized Vehicles Only" signs shall be installed at all non-chained crossovers on limited access highways. These signs are necessary to increase motorist safety and also for police enforcement since u-turns on limited access highways are legal unless appropriate signing is installed. This practice is in compliance with AASHTO's A *Policy on U-Turn Median openings on Freeways,* which states that "U-turn median openings should be restricted to use by official and emergency vehicles only. The freeway should be signed to prevent any median crossings by the general public, and this regulation should be enforced".

Installation of "Authorized Vehicles Only" signs should be accomplished at chained crossovers when it is known that motorists frequently attempt to use these crossovers resulting in their backing out into traffic to exit due to the crossover being chained.

All requests for open crossovers should be reviewed by the District Traffic Engineer with final approval determined by the District Maintenance Engineer.

A copy of House Bill No. 697 defining "Authorized Vehicle" is attached for your information.

DCF/df
cc: Mr. David R. Gehr
Mr. A. W. Coates, Jr.
Mr. C. D. Garver
Mr. J. S. Hodge
Division Administrators
Resident Engineers
District Traffic Engineers

CHAPTER 280

An Act to amend and reenact § 46.2-830 of the Code of Virginia, relating to hway signs.

[H 697]

Approved April 4, 1994

Be it enacted by the General Assembly of Virginia:

1. That § 46.2-830 of the Code of Virginia is amended and reenacted as follows:

§ 46.2-830. Uniform marking and signing of highways; drivers to obey signs; enforcement of section.

The Commonwealth Transportation Board may classify, designate, and mark state highways and provide a uniform system of marking and signing such highways under the jurisdiction of the Commonwealth. Such system of marking and signing shall correlate with and, so far as possible, conform to the system adopted in other states.

All drivers of vehicles shall obey lawfully erected signs.

No provision of this section relating to the prohibition of disobeying signs or violating local traffic signals, markings, and lights shall be enforced against an alleged violator if, at the time and place of the alleged violation, any such sign, signal, marking, or light is not in proper position and sufficiently legible to be seen by an ordinarily observant person.

"Authorized vehicle," when used on any sign limiting crossovers on divided highways to use by "authorized vehicles," shall mean (i) Department of Transportation vehicles, (ii) law-enforcement vehicles, (iii) emergency vehicles as defined in § 46.2-920, (iv) towing and recovery vehicles operating under the direction of law-enforcement officers, (v) vehicles for which permits authorizing use of such crossovers have been issued by the Department of Transportation, and (vi) other vehicles operating in medical emergency situations.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-255
	DATE: March 27, 1995
SPECIFIC SUBJECT: Signing for Adopt-A-Highway Litter Control	**SUPERSEDES:** TE-230
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

Specifications for the signing utilized with the Adopt-A-Highway Litter Control program are attached. The sign displaying the name of the organization adopting the section of roadway is basically unchanged with only added measurements for those not indicated previously in TE-230. In accordance with the Adopt-A-Highway Safety Committee recommendations, the "CLEANUP CREW WORKING' signs shall now be 48" diamond mesh signs. Where right of way or geometric conditions prevent the use of 48 " signs, 36 " diamond mesh signs may be used.

The effective date for this change is July 1, 1995 for new Adopt-A-Highway sites. For existing sites, the existing signs shall be replaced during normal maintenance replacement in accordance with the above requirements.

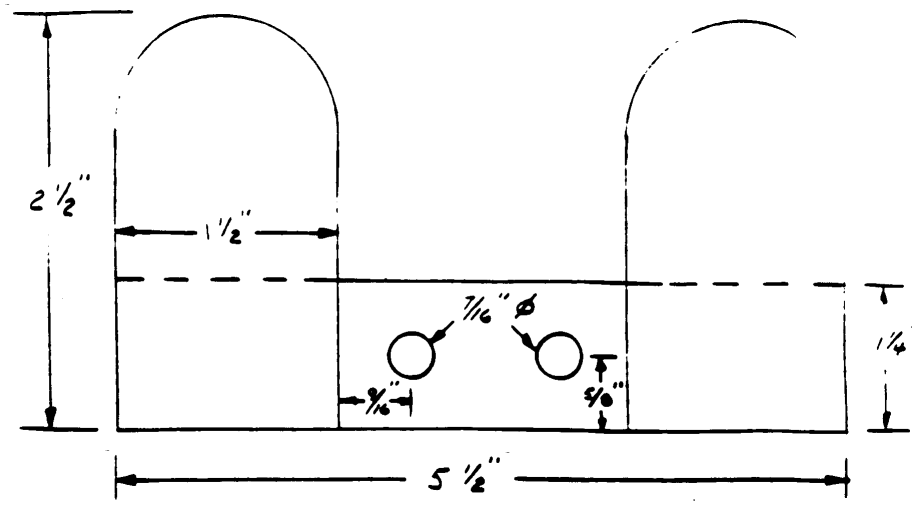
DCF/df
cc: Mr. David R. Gehr
Mr. A. W. Coates, Jr.
Mr. Claude D. Garver, Jr.
Mr. J. S. Hodge
Division Administrators
Resident Engineers
District Traffic Engineers

NOTE: BOTH LOGOS TO BE CENTERED HORIZONTALLY BETWEEN "ADOPT" AND THE SIGN BORDER.

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	White (Reflectorized)
	Field:	Blue (Reflectorized)
	Heart Loge:	Blue/White (Reflectorized)
	Cardinal and Dogwood:	Special Decal (reflectorized)
SIZE		
	Horizontal:	36"
	Vertical:	24"
MESSAGE	Line 1 Capitals:	2" D
	Line 2 Capitals:	2" D
	Line 3 Capitals:	2" D
	Horizontal Line:	½"
	Line 4 Capitals:	2" D
	Line 5 Capitals:	2" D
	Heart Logo:	7" x6"
	Cardinal and Dogwood:	6" x 8" (St'd. from VG-12)
BORDER WIDTH		½"
CORNER RADIUS		1 ½"

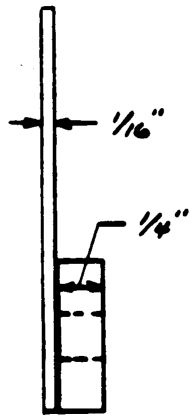
Sign B shall be installed to wam motorists of ongoing cleanup operations under the Adopt-A-Highway Litter Control Program. When R/W or geometric conditions dictate the need for a smaller size sign, Sign A may be used. Signs shall be erected by the participants below the signs indicating the participant's or organization's name that has adopted that section of roadway.

SHAPE		Diamond Mesh	
COLOR	Line 1		
	Message and Border:	Black (Non-Reflectorized)	
	Field:	Orange (Non-Reflectorized)	
SIZE		A	B
	Each side:	36"	48"
MESSAGE	Line 1 Capitals:	5" C	7" C
	Line 2 Capitals:	5" C	7" C
	Line 3 Capitals:	5" C	7" C
MARGIN WIDTH		5/8"	¾"
BORDER WIDTH		7/8"	1 ¼"
CORNER RADIUS		2 ¼"	3"



FRONT VIEW

Not to scale



SIDE VIEW

Two vertical sections of bracket shall be welded to the horizontal section. Bracket shall be fabricated from galvanized steel. Galvanization shall be repaired after the fabrication process in accordance with specifications. All rough surfaces shall be removed. Aluminum may be used in lieu of the steel provided thicknesses are adjusted as necessary to provide a substantial support for the sign.

ROLL-UP SIGN ATTACHMENT BRACKET

From: Hodges, Mark T.
Sent: Wednesday, March 29, 2006 9:17 AM
To: District Traffic Engineers
Cc: Barrett, James R., C.P.E.S.C.; Bonner, Kellie M.; Mayes, Donna Purcell; Khoury, Raymond J. 'Ray', P.E.
Subject: A Best Practice

Hello all:

Last fall we received a suggestion asked that we consider making the "Adopt a Highway" sign in a generic format instead of specific to the first organization that adopts a particular section of the road. In essence, the suggestion was to fabricate the sign using the "1-800 VA Pride" message in the space set aside for the organization name and using an attachable panel to display the name of the organization. Thus, if the organization withdraws later, the panel can be removed while the road section is "up for adoption".

This suggestion appeared to have merit and I sent an e-mail recommending that you make the decision as to how your respective Districts would proceed in the future. No formal change to TE-255 was made as we thought this was a judgment call best left to you.

Sometime during the last two weeks, HR received an ESP that promoted this same concept. As this had been addressed months ago, the ESP was rejected; however, I promised HR that the concept would be reiterated as a best practice recommendation, thus this writing.

Proceed as you will, but please print and attach this statement to your hard copy of TE-255 for the sake of documentation.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION
MEMORANDUM

GENERAL SUBJECT: PAVEMENT MARKINGS	**NUMBER:** TE-261.1 **TO SUPERSEDE:** TE-261
SPECIFIC SUBJECT: TYPE B, CLASS VI PAVEMENT MARKINGS	**PROJECTED DATE:** September 19, 2011 **SUNSET DATE:** None
DIRECTED TO: District Administrators State L&D Engineer State Maintenance Engineer State Materials Engineer State Construction Engineer Regional Operations Directors Regional Traffic Engineers Regional Operations Maintenance Managers District Maintenance Engineers	**SIGNATURE:** R. J. Kilcoyne

The Department is revising its policy on the use of Type B, Class VI pavement markings to increase flexibility and reduce constructability concerns. This memorandum outlines areas where Type B, Class VI markings shall be used and areas where they may be used subject to engineering judgment.

Limited Access Highways

The figure at the end of this memorandum provides guidance for when to use Type B, Class VI markings on limited access roadways. The guidance in that diagram is summarized as follows:

- If the remaining pavement surface service life is 6 years or more:
  - Type B, Class VI markings shall be used for all lane division markings, including:
    - Skip lines between through lanes
    - Dotted lines to separate through lanes from deceleration lanes
    - Solid lines separating through lanes from deceleration/acceleration lanes
    - Solid and skip lines used to separate multiple exit lanes

- Durable markings specified as being Type B in the *VDOT Road and Bridge Specifications* shall be used for all other markings (edge lines, gore areas, and all ramp markings). Selection of the marking material will be based on engineering judgment. Examples of appropriate materials may include B-VI tape, thermoplastic, epoxy, or any other approved Type B material.

- If the remaining pavement surface service life is between 3 years and 5 years:
  - Durable markings specified as being Type B in the *VDOT Road and Bridge Specifications* shall be used for all markings. Selection of the marking material will be based on engineering judgment. Examples of appropriate materials may include tape, thermoplastic, epoxy, polyurea or any other approved Type B material. However, Type B, Class VI markings may not be a cost-effective choice when the pavement surface life is in this category.
- If the remaining pavement surface service life is less than 3 years:
  - Any marking material specified as Type A or Type B in the *VDOT Road and Bridge Specifications*, may be used for all markings. Selection of the marking material is based on engineering judgment.

Other High Volume Highways

The installation of Type B, Class VI pavement markings on high volume roadways other than limited access highways may be appropriate and is allowed at the discretion of the Regional Traffic Engineer, but shall be accomplished in accordance with the limitations outlined for Limited Access Highways.

Installation of Type B, Class VI markings

Regardless of the pavement type (asphalt concrete or hydraulic cement concrete), installation shall be as provided by the latest *VDOT Road and Bridge Specifications* and any relevant revisions.

Proper records (Form C-85) needed for replacement of Type B, Class VI markings shall be maintained by the Regional Operations Maintenance Manager's office. This requirement is based on life cycle cost analysis and the current warranty period.

If there is insufficient contrast between hydraulic cement concrete pavements and white pavement markings, the use of Type B, Class VI contrast pavement markings consisting of white pavement markings with black non-reflective borders should be considered for lane lines.

When choosing among different marking material alternatives, the life cycle cost and compatibility between different marking materials for restriping should be considered. Table 1 summarizes typical service life values for different marking materials. Table 2 summarizes the compatibility between different marking materials when restriping.

Table 1. Typical Service Life of Different Marking Materials.

Marking Material	Typical Service Life[1]
Latex Paint	1 Year
Epoxy	3 Years
Thermoplastic	3 Years
Patterned Preformed Tape	6 Years

1: From 2001 Virginia Transportation Research Council Report, "Determining the Effectiveness of Pavement Marking Materials" by Cottrell and Hanson.

Table 2. Pavement Marking Material Compatibility Matrix.

If Existing Material is:	If Desired New Material is:			
	Latex Paint	**Thermoplastic**	**Epoxy**	**B-6 Tape**
Latex Paint	Compatible	If existing is 90% removed	If existing is 90% removed	Not Compatible
Thermoplastic	Compatible	Compatible	If existing is 90% removed	Not Compatible
Epoxy	Compatible	Not Compatible	If existing is 90% removed	Not Compatible
B-6 Tape	Compatible	Not Compatible	Not Compatible	Not Compatible

Note: "Not Compatible" means that the desired new pavement marking material cannot be applied unless the existing material is eradicated in accordance with sections 512 and 704 of the VDOT *Road and Bridge Specifications*. "Compatible" implies that the existing pavement marking is still well-adhered to the pavement.

CC: Mr. Greg Whirley
Mr. Charlie A Kilpatrick
Ms. Constance S. Sorrell
Mr. Malcolm T. Kerley, P.E.
Director of Research, VTRIC
Ms. Irene Rico
Division Administrators

Pavement Marking Decision Tree:
Limited Access Roads (Freeways and Expressways)

(START)
Estimated remaining pavement surface service life

≥ 6 years

All lane division lines: B-VI tape shall be used.

Edge lines, gore areas, and all ramp markings:
Durable markings (Type B markings) shall be used. Use Engineering Judgment to choose between:

- B-VI tape
- Thermoplastic
- Epoxy
- Other approved Type B marking material

3 to 5 years

All Markings: Durable markings (Type B markings) shall be used for all markings. Use Engineering Judgment to choose between:

- B-VI tape
- Thermoplastic
- Epoxy
- Other approved Type B marking material

< 3 years

All Markings: Durable markings not required. B-VI tape shall not be used. Use Engineering Judgment to choose between:

- Thermoplastic
- Epoxy
- Paint
- Other approved Type A or B materials

Notes:

- Note that thermoplastic should not be used on hydraulic cement concrete, unless properly primed.
- When selecting a marking material, consider the anticipated service life of the material shown in Table 1.
- When re-striping, ensure that markings can be placed on top of existing marking material or eradicate existing material completely. Consult Table 2 for guidance on compatibility between marking materials.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signals	**NUMBER:** TE-266
SPECIFIC SUBJECT: Traffic Signal Head Color	**DATE:** February 28, 1996
	SUPERSEDES:
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

In order to promote uniformity throughout the districts, it has been decided that traffic signal heads and beacons maintained by the Department shall be highway yellow in color except traffic signal heads at emergency traffic signal installations which shall be red in color. Highway yellow has been used as the color for traffic signal heads at the majority of intersections in Virginia and the *MUTCD* states it is the desirable color to obtain the best possible contrast with the visual background. On emergency traffic signals, the color red is another indication to the motorists that the signals at that particular installation are for emergency purposes.

The effective date for these requirements is immediately for new traffic signal installations. For existing installations, the existing color, if different than that-required above, shall be changed to the correct color when all the signal heads are repainted or replaced for maintenance. Changing the color to match the above requirements when modifying a signal installation should be accomplished if it is feasible based upon the work being accomplished for the modification. The determination of the feasibility is the responsibility of the District Traffic Engineer.

DCF/df
cc: Mr. David R. Gehr
Mr. A. W. Coates
Mr. Claude D. Garver, Jr.
Mr. J. S. Hodge
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

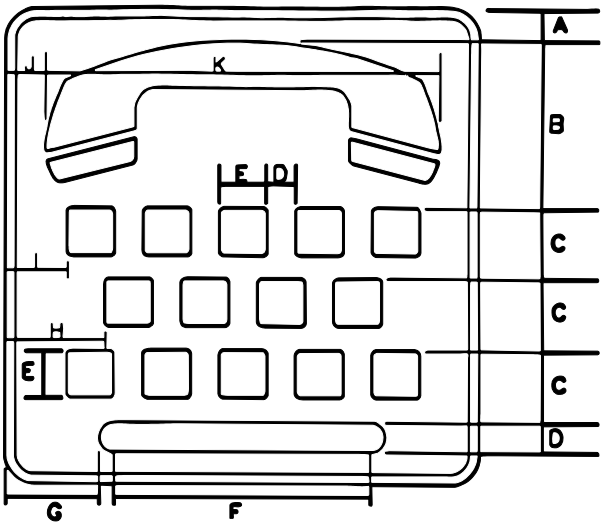
GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-268
	DATE: June 14, 1996
SPECIFIC SUBJECT: Text Telephone (TTY) Signs	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

The Department in its initiative to provide pay telephone service in our rest areas and welcome centers for individuals with speech and hearing impairments has had text telephone equipment installed. In order to inform individuals that this equipment now exists, it has been decided that text telephone signs shall be installed within and in advance of the rest areas and welcome centers.

Text telephone signing within the rest areas and welcome centers is being accomplished by others for the Department and will not need to be accomplished by state forces. Text telephone signing in advance of the rest areas and welcome centers will need to be installed by the Department. These signs shall be installed at the same locations as the existing telephone signs and should be the same size. If existing telephone signs are installed at both the advance signing and point of action locations, text telephone signing shall be installed at both locations. If there currently is no telephone signing on the highway for the rest area and welcome center, both telephone and text telephone signs shall be installed at least at the advance signing location. The District Traffic Engineer at his discretion may install the signs at both the advance and point of action locations. If possible, without extensive installation modifications of the existing telephone signs, the text telephone signs should be installed beside, above or below the existing telephone signs, however, the installation shall not affect the breakaway capability of the structures.

The design for the text telephone signs to be installed in advance of the rest areas and welcome centers is attached. Installation of these signs shall be accomplished by July 31, 1996.

cc: Mr. David R. Gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson



SHAPE	Square	
COLOR		
Message and Border:	White (Reflectorized)	
Field:	Blue (Reflectorized)	
SIZE	A	B
Horizontal:	24"	30"
Vertical:	24"	30"
MESSAGE	See Table Below	
BORDER WIDTH	1/2”	3/4"
CORNER RADIUS	1-1/2"	1- 7/8"

SIGN SIZE	DIMENSIONS (INCHES)										
	A	B	C	D	E*	F	G	H	I	J	K
A (24" X 24")	1-5/8	8-3/8	3-5/8	1-1/2	2-3/8	13	4-3/4	5	3-1/16	2	20
B (30" X 30")	2	10-1/2	4-1/2	1-7/8	3	15	6-9/16	6-3/16	3-3/4	2-1/2	25

* Comer radius is 0.25' for the 2-3/8" square and 0.30" for the 3' square.
Telephone symbol shall be in accordance with the Federal *Standard Highway Signs Booklet.*

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zone Safety	**NUMBER:** TE-272
SPECIFIC SUBJECT: Replacement of Electronic Arrow Panel With Static Arrow Sign	**DATE:** October 24, 1996 **SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

Recently, on an experimental basis, electronic arrow panels on long term lane drop operations on primary and secondary routes were replaced with 4811 by 9611 static arrow signs. The static signs were installed after approximately two weeks or more display of the electronic arrow panels. Due mostly in part to the familiarity of the location and the knowledge of the existing lane drop condition by the motorists using these routes, there were no observable safety problems or lack in the effectiveness of the lane closure by replacing the electronic arrow panels with the static signs in these operations. By implementing this replacement, a decrease was realized in the maintenance of the arrow panel, the noise and air pollution production of the arrow panel, as well as the daily cost of this device.

Therefore, replacing the electronic arrow panel in long term lane drop situations (greater than two weeks) with-a static arrow sign is allowable under the following conditions:

- They shall only be used on non-limited access Primary and Secondary Routes;
- The electronic arrow panel must be in operation for a minimum of two weeks prior to being replaced (on change of traffic patterns, the electronic arrow panels must be used for a two week time period to allow motorists to become accustomed to the new pattern) and;
- Must be approved by the District Traffic Engineer.

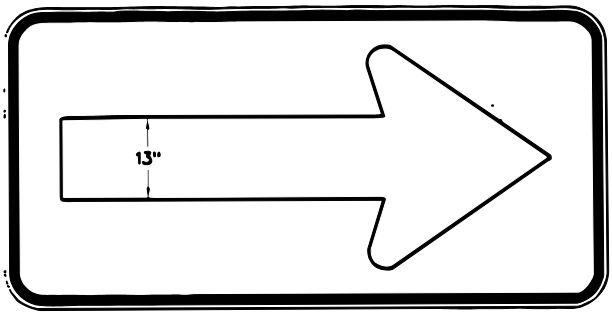
The mounting height of the static arrow sign shall be the

same as the flashing arrow panel, a minimum of seven (7) feet from the bottom of the sign to the roadway elevation. During the two week period when the flashing arrow panel is in use, the static arrow sign may be placed under the flashing panel for greater recognition when the devices are switched.

A copy of the static arrow sign layout is attached for your information. This change is effective immediately.

DBR/
Attachment

cc: Mr. David R. Gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
District safety Officers



SHAPE		Horizontal Rectangle
COLOR	Message and Border:	Black (Non-reflectorized)
	Field:	Fluorescent Orange (Reflectorized)
SIZE		
	Horizontal:	96"
	Vertical:	48"
MESSAGE	Symbol:	Arrow (See Note)
MARGIN WIDTH		¾"
BORDER WIDTH		1 ½"
CORNER RADIUS		6"

Note: Arrow is standard arrow used on a WI-6 sip (page 2-7, Standard Highway Signs Booklet), except it is enlarged 200%.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-273
SPECIFIC SUBJECT: "NEXT REST AREA - XX MILES" Sign	**DATE:** April 8, 1997 **SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

The number of comments received from motorists about our rest areas has revealed that information regarding the distance to the next rest area is important to many travelers. The comment heard most often is that, if they knew it was a significant distance to the next one, they could plan an interim stop at an exit along the way.

Signs indicating the distance to the next rest area have been installed on roadways opposite from rest areas where there is none in the immediate vicinity in that direction. There have also been signs installed in conjunction with the advance rest area signs at a few isolated locations.

For consistency across the state, signs designed in accordance with the attached specifications shall be installed on the approaches to <u>all</u> rest areas on the interstate system between the existing REST AREA advance sign and the ramp to the rest area. The most desirable location of this sign is immediately following the advance rest area sign.

Where the next rest area is in an adjoining state, the distance to that facility shall be indicated in advance of the last rest area in Virginia on that route.

The installation of these signs shall be completed not later than October 1, 1997.

cc: Mr. David R. Gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	White (Reflectorized)
	Field:	Blue (Reflectorized)
SIZE		
	Horizontal:	126"
	Vertical:	48"
MESSAGE	Line 1 Capitals:	10" D (See Note)
	Line 2 Capitals:	10" D
BORDER WIDTH		1 ½"
CORNER RADIUS		6"

Note: Vertical spacing between the message and the border is 8 ½". Vertical spacing between the lines of message is 8". Spacing between letters on line I shall be accomplished at 85 % of the normal spacing.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-275
	DATE: February 4, 1997
SPECIFIC SUBJECT: "STATE POLICE PARKING ONLY" Sign	**SUPERSEDES:** TE-269
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

Last year, the Department in an effort to provide parking for the Virginia State Police and to promote security in our rest areas and welcome centers installed a "STATE POLICE PARKING ONLY" sign for one parking space at each location with the exception of the truck rest area at Dumfries. Since the recent problems that have occurred at some of these locations, it has now been determined that these signs shall be relocated from their existing locations to the parking space immediately to the right of the handicapped parking spaces in the car parking section.

Relocation of these signs shall be accomplished by February 28, 1997.

DCF/df
Attachment
cc: Mr. David R. Gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Ms. Kelly True

SHAPE		Vertical Rectangle
COLOR	Message and Border:	Green (Reflectorized)
	Field:	White (Reflectorized)
SIZE		
	Horizontal:	24"
	Vertical:	30"
MESSAGE	Line 1 Capitals:	5" C
	Line 2 Capitals:	5" C
	Line 3 Capitals:	5" C
	Line 4 Capitals:	5" C
MARGIN WIDTH		3/8"
BORDER WIDTH		5/8"
CORNER RADIUS		1 ½"

Note: Vertical spacing between the message and the border is 1 ¾". Vertical spacing between the lines of messages is 1-1/2".

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-280
	DATE: June 11, 1997
SPECIFIC SUBJECT: "Watch for Children" Signs	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

The 1997 General Assembly enacted an amendment to the Code of Virginia, adding §33.1-210.2 (copy attached) regarding the installation and maintenance of "'signs alerting motorists that children may be at play nearby."

In accordance with this new law, effective July 1, 1997, counties may request that VDOT install and maintain this type of signing. The following process has been established for handling all such requests:

- The request should be submitted by the county to the local VDOT resident engineer. All requests must be in the form of a resolution directed to the Transportation Commissioner.

- The resolution shall include the source of funding for the installation of signs: (i) out of the secondary system construction allocation to the affected county; (ii) from direct contributions or grants made for such purpose to the governing body; or (iii) from such other source as may be provided by the governing body. In all cases the costs of maintaining such signs shall be paid out of the secondary system maintenance allocation to the affected county.

- The resolution shall also include the location(s) where the signs are desired. However, VDOT reserves the right to review all signing plans and make the final determination as to the exact number and location of signs.

- Upon receipt of the resolution from the county, the resident engineer, with assistance from the district traffic- engineer as necessary, shall review the request and conduct a field review to ensure the proposed signs will be effectively located and will not be in conflict with any other traffic control devices.

- Generally, WATCH FOR CHILDREN signs shall be installed only on secondary routes within residential areas. Any requests to install such signs on primary routes shall be forwarded to the state traffic engineer for review.

- Within thirty (30) days of receipt of the resolution, a written response shall be provided to the governing body of the county granting or denying the request. If the request is granted, the response should include any recommended changes to the signing plan proposed by the county.

- All signs installed by VDOT under this policy shall be designed in accordance with the attached standards.

FMD:gjt
Attachment
c: Mr. David R. gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson

SHAPE		Diamond		
COLOR	Message and Border:	Black (Non-reflectorized)		
	Field:	Yellow (Reflectorized)		
SIZE		A	B	C
	Each Side:	30"	36"	48"
MESSAGE	Line 1 Capitals:	4"C	5"C	6"D
	Line 2 Capitals:	4" C	5" C	6"D
MARGIN WIDTH		½"	5/8"	¾"
BORDER WIDTH		¾"	7/8"	1 ¼"
CORNER RADIUS		1 ½"	2"	3"

CHAPTER 167

An Act to amend the Code of Virginia by adding a section numbered 33.1-210.2, relating to erection of certain warning signs in counties. [S 8741

Approved March 8, 1997

Be it enacted by the General Assembly of Virginia:

That the Code of Virginia is amended by adding a section numbered 33.1-210.2 as follows:

@33.1-210.2' Installation and maintenance of certain signs in counties.

The governing body of any county may by resolution request the Commissioner to install and maintain, at locations specified in such resolution, signs alerting motorists that children may be at play nearby. Upon receipt of such resolution the Commissioner shall, within thirty days, respond in writing to such governing body granting or deny4ng the request. The cost of installation of signs installed under this section shall be pai4 at the option of the governing body, either (i) out of the secondary system construction allocation to the affected county, (ii) from direct contributions or grants made for such purpose to the governing body, or (iii) from such other source as may be provided by the governing body and the cost of maintaining such signs shall be paid out of the secondary system maintenance allocation to the affected county.

The provisions of this section shall not apply to any county that has withdrawn its roads from the secondary system of state highways under the provisions of § II of Chapter 415 of the Acts of 1932 and has not elected to return.

Go to (General Assemb!y Rome

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-283
SPECIFIC SUBJECT: Rest Area/Welcome center Signing	**DATE:** July 23, 1997
	SUPERSEDES:
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

In an effort to promote security in our rest areas and welcome centers and to promote the *CRUSH CRIME* program, the Department, in cooperation with the State Police, has decided to install "REST AREA PATROLLED BY STATE POLICE FOR EMERGENCY DIAL 1-800- XXX-XXXX CELLULAR #77" and "CRUSH CRIME" signs at each location

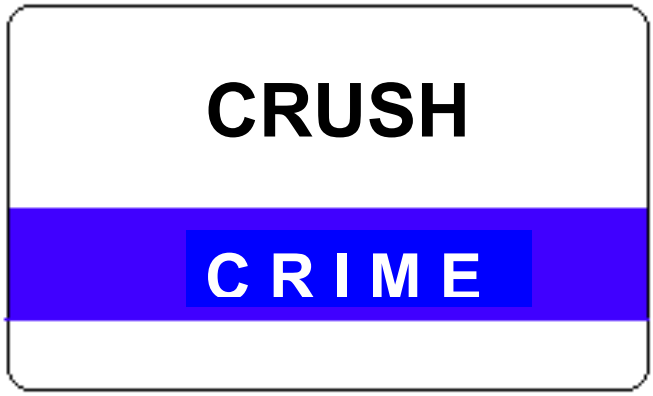
The 800 number displayed on the sign shall be the State Police's Division Headquarters number for the area where the rest area/welcome center is located. Signs should be installed in the vicinity of the building in an area where it will be easily viewed by the public, but where the possibility of pedestrians accidentally making contact with the sign doesn't exist. Signs shall not be installed on the ramps. The exact location of the signs will be deten-nined by the Central Office Maintenance Division in cooperation with the State-Police's crime prevention specialist except for the location in Accomack County. The District Traffic Engineer in cooperation with the State Police's crime prevention specialist should determine the exact location in Accomack County. The signs shall be installed on the same post with the "CRUSH CRIME" sign on the bottom. Distance to the bottom of the "CRUSH CRIME' sign should be four feet with one inch spacing between the two signs. Installation of the signs shall be accomplished by August 29, 1997.

DCF/df
Attachments
MR. David R. Gehr
Lt. Col. W. G. Massengill
Major J. B. Scott
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Ms. Ms. Cyndi Ward

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	White (Reflectorized)
	Field:	Blue (Reflectorized)
SIZE		
	Horizontal	48"
	Vertical	36"
MESSAGE	Line 1 Capitals:	4" D
	Line 2 Capitals:	4" D
	Line 3 Capitals:	4" D
	Line 4 Capitals:	2" C
	Line 5 Capitals:	2" C
	Line 6 Capitals:	2" C
MARGIN WIDTH		¾"
CORNER RADIUS		2"

Vertical spacing between the message and the border is 2 7/8". Vertical spacing between the lines of the 4" message is 2 ½". Vertical spacing between the 4" message and the 2" message is 2". Vertical spacing between the lines of the 2" message is 2".

PIM#: 768-000507-N



SHAPE			Horizontal Rectangle
COLOR	Line 1		
		Message:	Blue (Reflectorized)
		Field:	Yellow (Reflectorized)
		Border:	White (Reflectorized)
	Line 2		
		Message:	White (Reflectorized)
		Field:	Blue (Reflectorized)
		Border:	White (Reflectorized)
SIZE			
		Horizontal	24"
		Vertical	12"
MESSAGE			
	Line 1	Capitals:	4" (AutoCAD Style 361)
	Line 2	Capitals:	2" (AutoCAD Style 361)*
BORDER WIDTH			7/8"
CORNER RADIUS			1 ½ "

Note: Vertical spacing between the border and the yellow/blue field separation point is 6 7/8". Messages shall be centered vertically and horizontally within its field.

*Message lengthened to be the same length as line 1.

PIM#: 768-000499-N

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Signs	**NUMBER:** TE-285
	DATE: May 26, 1998
SPECIFIC SUBJECT: Truck Tip-Over Sign	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

To provide sufficient warning of sharp curves or loops where high bed trucks may tip over when exceeding the safe speed and to promote sign uniformity, standard truck tip-over signs have been designed. To facilitate the various configurations of roadway geometrics, three designs have been accomplished. 'Me sign design actually used at a site shall be as required to reasonably match the roadway geometrics.

These signs shall be installed at locations where there are documented problems of trucks tipping over or other locations where the District Traffic Engineer's engineering judgement deems their installation necessary.

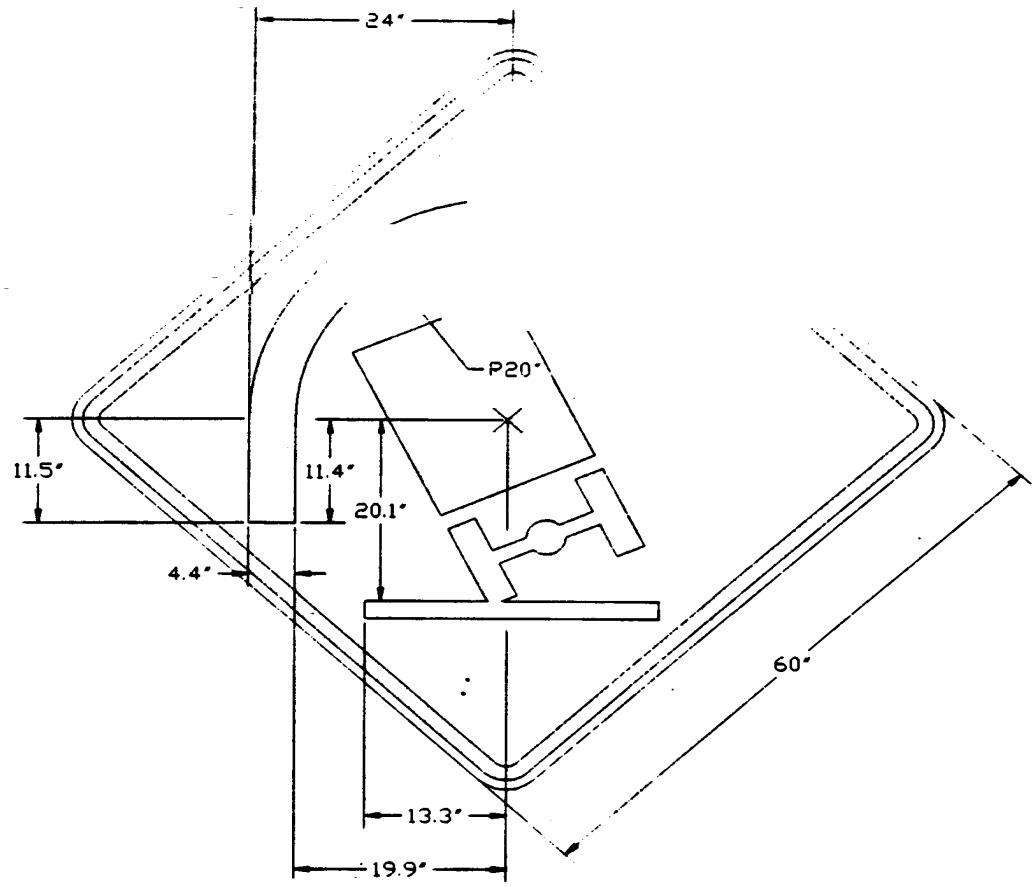
The 48" x 48" signs shall be used at all locations except 60' x 60" signs may be used when required by the District Traffic Engineer. Standard W13-1 (36" x 36") advisory speed plate signs shall be installed below the truck tip-over signs. In addition to the signs, hazard identification beacons may be installed where the District Traffic Engineer's judgment deems their installation necessary.

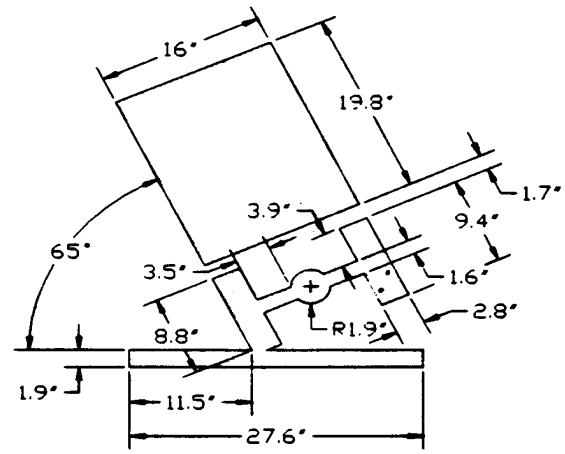
The memorandum is effectively immediately for all new installations. Existing truck tip-over signs not conforming to the attached sign designs shall be replaced with these standard designs at maintenance replacement time.

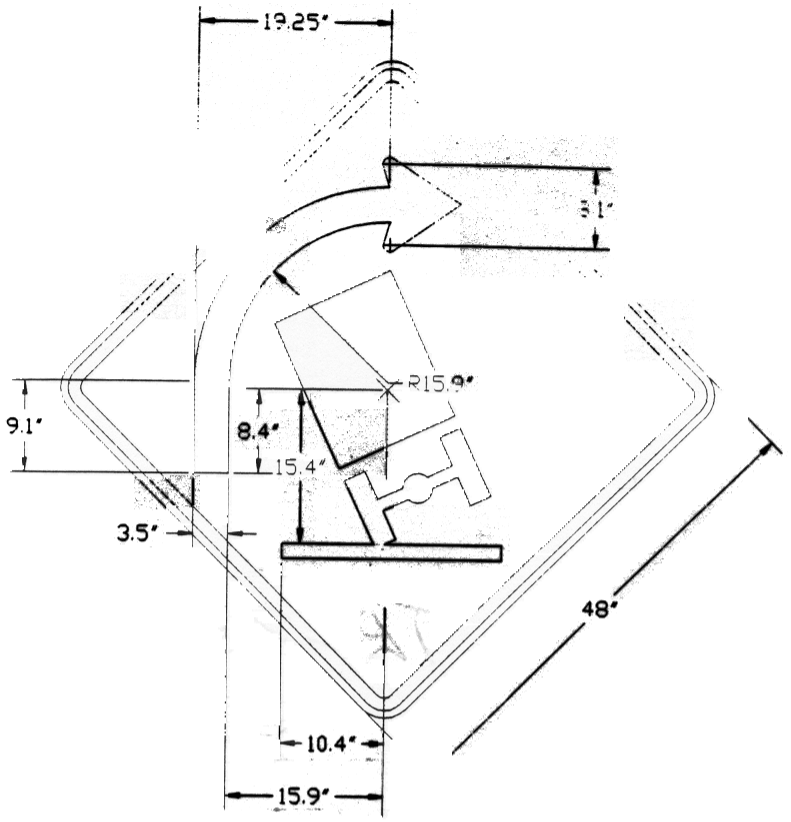
DCF/df

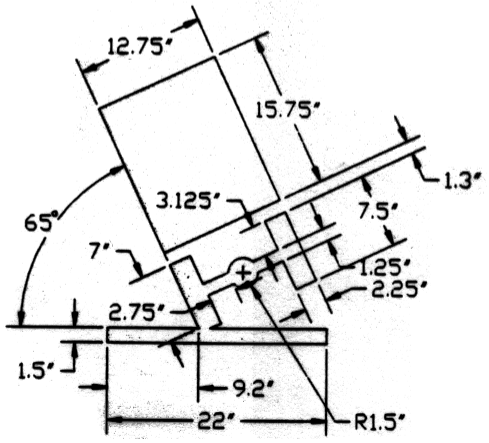
Cc: Mr. David R. Gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kotakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis

SHAPE		Diamond	
COLOR	Message and Border:	Black (Non-reflectorized)	
	Field:	Yellow (Reflectorized)	
SIZE		A	B
	Each Side	48"	48"
MESSAGE	Symbols:	See Attached Sheets	
MARGIN WIDTH		¾"	1"
BORDER WIDTH		1 ¼"	1 ½"
CORNER RADIUS		3"	3 ¾"


24"
P20"
11.5"
11.4"
20.1"
4.4"
60"
13.3"
19.9"


16"
19.8"
1.7"
3.9"
9.4"
65°
3.5"
1.6"
2.8"
R1.9"
8.8"
1.9"
11.5"
27.6"


19.25"
3.1"
R15.9"
9.1"
8.4"
15.4"
3.5"
48"
10.4"
15.9"


12.75"
15.75"
1.3"
3.125"
7.5"
65°
7"
1.25"
2.25"
2.75"
1.5"
9.2"
22"
R1.5"

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

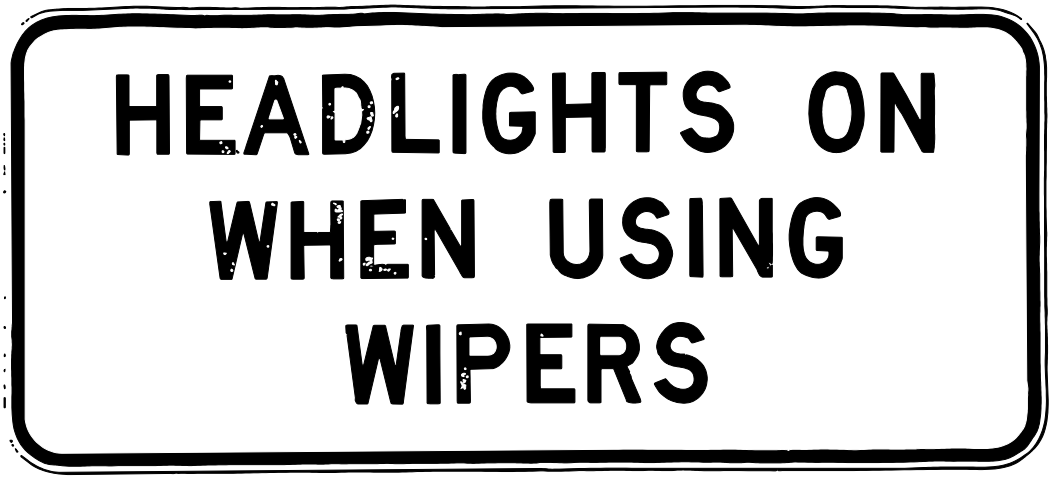
MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-287
	DATE: June 22, 1998
SPECIFIC SUBJECT: "Headlights On When Using Wipers" Signing	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *J. L. Butner*

The 1997 General Assembly enacted legislation through Section 46.2-1030 of the Code of Virginia that requires motorists to have the vehicle's headlights on when using the windshield wipers except in those instances when the wipers are used intermittently. The Department has decided to install signs- notifying motorists of this requirement on interstate and other major routes at or near the State boundary facing traffic entering Virginia.

The designs for this sign are attached and installation shall be accomplished by September 1, 1998.

DCF:df
Attachment
cc: Mr. David R. Gehr
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R.- Kolakowski
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis



This sign is intended for use to inform motorists that headlights are to be on when using windshield wipers as prescribed by Section 46.2-1030 of the Code of Virginia. It shall be erected on the interstate and other major routes at or near the State boundary facing traffic entering Virginia. Sign A shall be erected on primary and secondary highways and Sign B shall be erected on interstate highways.

SHAPE		Horizontal Rectangle	
COLOR	Message and Border:	Black (Non-reflectorized)	
	Field:	White (Reflectorized)	
SIZE		A	B
	Height	42"	48"
	Width	60"	108"
MESSAGE	Line 1 Capitals:	6" C	8" C
	Line 2 Capitals:	6" C	8" C
	Line 2 Capitals:	6" C	8" C
	Line 3 Capitals:	6" C	8" C
MARGIN WIDTH		3/4"	¾"
BORDER WIDTH		1 ¼"	1 ¼"
CORNER RADIUS		3"	6"

Note 1: Horizontal spacing between letters on Line I for Sign A only shall be accomplished at 70% of the normal spacing

Note 2: Vertical spacing between the lines of text and the border is 5 ½" for Sign A and 5" for Sign B. Vertical spacing between lines of text is 4 ½" for Sign a and 5" for Sign B.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Signs and Pavement Markings	**NUMBER:** TE-298
	DATE: June 12, 2000
SPECIFIC SUBJECT: Speed Determination	**SUPERSEDES:** TE-209
DIRECTED TO: District Administrators	**SIGNATURE:** *G. A. Venable*

The General Assembly enacted legislation (copy attached) amending Section 46.2-882 of the Code of Virginia that will allow the use of aircraft (airplanes or helicopters) for enforcement of the speed limit on the interstate highways beginning July 1, 2000.

To support this legislation, the Department has been requested by the Virginia State Police (VSP) to install pavement markings at locations determined by the VSP on the interstate highways. These pavement markings will be used with the VASCAR (visual average speed computer and recorder) units within the aircraft as a point of reference to determine the speeds of the vehicles. These pavement markings shall be installed in accordance with the attached pavement marking detail.

The Department has also been requested by the VSP to modify our existing signing "Speed Checked By Radar And Vascar" (TE-209) and to install new signing along the interstate highways indicating that aircraft are enforcing the speed limits. While the change in our existing signing was only requested for the interstate highways at the state line, it has been determined for uniformity that all existing signs need to be changed regardless of where they are located. These signs shall be in accordance with the attached sign designs.

This work should be completed no later than August 1, 2000.

cc: Mr. Charles D. Nottingham
Mr. A. V. Bailey, II
Mr. T. F. Boyd
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Mr. P. R. Kolakowski
Ms. C. S. Sorrell
Mr. J. C. Southard
Mr. John B. Scott
Mr. Roberto Fonseca
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis

CHAPTER 365

An Act to amend and reenact § 46.2-882 of the Code of Virginia, relating to determination of vehicle speeds; devices used to determine vehicle speeds.

[H 164]

Approved April 3, 2000

Be it enacted by the General Assembly of Virginia:

1. That § 46.2-882 of the Code of Virginia is amended and reenacted as follows:

§ 46.2-882. Determining speed with various devices; certificate as to accuracy of device; arrest without warrant.

The speed of any motor vehicle may be determined by the use of (i) a laser speed ~~detection~~ *determination* device, (ii) radar, ~~or~~ (iii) a microcomputer device that is physically connected to an odometer cable and both measures and records distance traveled and elapsed time to determine the average speed of a motor vehicle*, or (iv) a microcomputer device that is located aboard an airplane or helicopter and measures and records distance traveled and elapsed time to determine the average speed of a motor vehicle being operated on highways within the Interstate System of highways as defined in § 33.1-48*. The results of such determinations shall be accepted as prima facie evidence of the speed of such motor vehicle in any court or legal proceeding where the speed of the motor vehicle is at issue.

In any court or legal proceeding in which any question arises about the calibration or accuracy of any laser speed ~~detection~~ *determination* device, radar, or microcomputer device as described in this section used to determine the speed of any motor vehicle, a certificate, or a true copy thereof, showing the calibration or accuracy of the speedometer of any vehicle or of any tuning fork employed in calibrating or testing the device, and when and by whom the calibration was made, shall be admissible as evidence of the facts therein stated. No calibration or testing of such device shall be valid for longer than six months.

The driver of any such motor vehicle may be arrested without a warrant under this section if the arresting officer is in uniform and displays his badge of authority and if the officer has observed the registration of the speed of such motor vehicle by the laser speed ~~detection~~ *determination* device, radar, or microcomputer device as described in this section, or has received a radio message from the officer who observed the speed of the motor vehicle registered by the laser speed ~~detection~~ *determination* device, radar, or microcomputer device as described in this section. However, in case of an arrest based on such a message, such radio message shall have been dispatched immediately after the speed of the motor vehicle was registered and furnished the license number or other positive identification of the vehicle and the registered speed to the arresting officer.

Law-enforcement officers shall not have the authority to use laser speed ~~detection~~ *determination* devices~~,~~ *or* radar, ~~or microcomputer devices~~ as described herein in airplanes or helicopters for the purpose of determining the speed of motor vehicles.

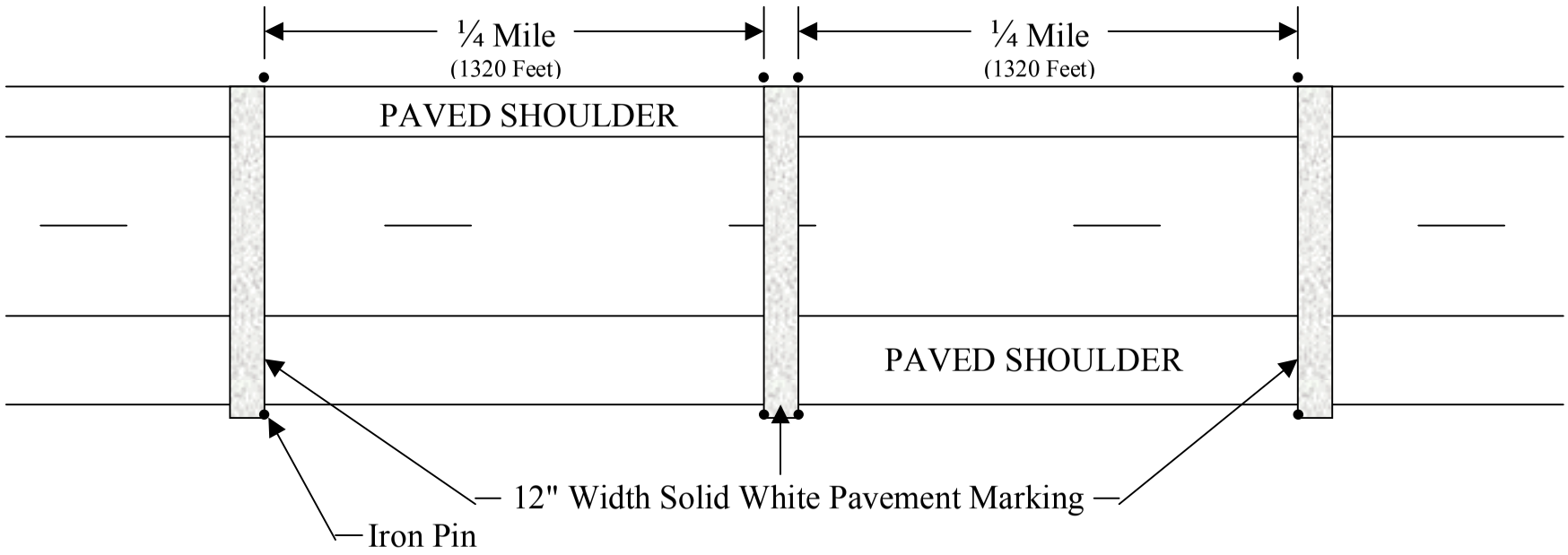
State Police officers may use laser speed determination devices, radar, and/or microcomputer devices as described in this section. All localities may use radar; (i) counties having populations of at least 85,000 but less than 150,000 and towns within such counties; (ii) towns having populations of at least 14,000 but less than 15,000 and located within a county operating under the urban county executive form of government; and (iii) counties having the county manager form of government may use laser speed ~~detection~~ *determination* devices to measure speed. Any county, city or town located within the

boundaries of Planning District No. 8 may use laser speed ~~detection~~ *determination* devices, radar, or both to measure speed. The Cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park and the Counties of Arlington, Fairfax, Loudoun, and Prince William and towns within such counties may use microcomputer devices as described in this section.

The Division of Purchases and Supply, pursuant to § 2.1-446, shall determine the proper equipment used to determine the speed of motor vehicles and shall advise the respective law-enforcement officials of the same. Police chiefs and sheriffs shall ensure that all such equipment and devices purchased on or after July 1, 1986, meet or exceed the standards established by the Division.

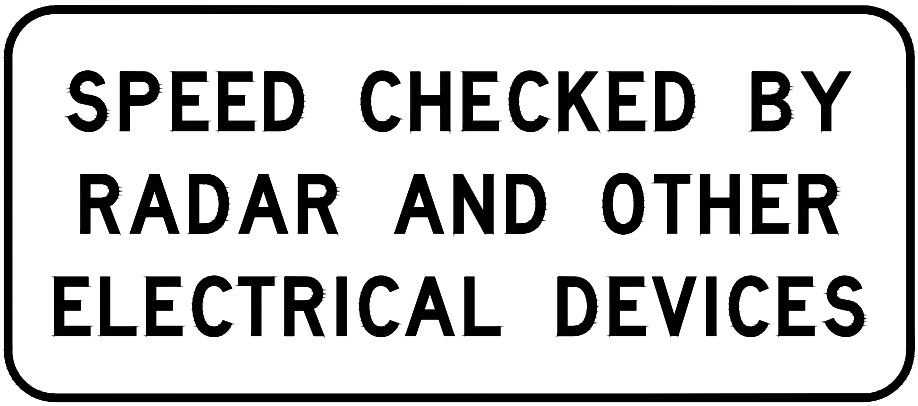
~~The Department of State Police shall acquire no more than two microcomputer devices as described herein.~~ Law-enforcement officers ~~utilizing~~ *using motor vehicle-based* microcomputer devices or laser speed ~~detection~~ *determination* devices as provided for in this section shall, on request of any affected motorist, permit such motorist to observe the reading on the device. *Nothing in this section, however, shall require any law-enforcement officer to allow affected motorists to observe any reading on any microcomputer device on any airplane or helicopter.*

PAVEMENT MARKING DETAIL
AERIAL SPEED ENFORCEMENT



NOTES

1. The location of the pavement marking at each site shall be determined with survey equipment that will provide accuracy within three to five hundredths of a foot for each pin location.
2. Pin locations shall be one foot from the paved shoulder at the locations shown above. When the paved shoulder continues to a barrier, etc., the pin shall be located as close to the barrier, etc. as possible.
3. Edge of the pavement markings shall align with the center of the iron pins on both sides of the roadway.



This sign is to inform motorists that speed is checked by radar speed meters or other electrical devices and shall be erected on the Interstate and Primary Systems at or near the State boundary facing traffic entering Virginia. Sign B may be erected on the Primary System at points designated by the State Police and where R/W is inadequate for Sign C. Sign A is intended to be used only on the Primary System where R/W is inadequate for Sign B.

SHAPE		Horizontal Rectangle		
COLOR	Message and Border:	White (Reflectorized)		
	Field:	Black (Non-Reflectorized)		
SIZE		**A**	**B**	**C**
	Height:	30”	42”	54”
	Width:	54”	96”	126”
MESSAGE	Line 1 Capitals:	4” C	6“ D	8” D
	Line 2 Capitals:	4” C	6“ D	8” D
	Line 3 Capitals:	4” C	6“ D	8” D
BORDER WIDTH		½”	$^{7}/_{8}$"	1”
CORNER RADIUS		3”	5”	7”

Notes: Vertical spacing between the message and the border is 5“ for Sign A, $6^{5}/_{8}$” for Sign B and 8” for Sign C. Vertical spacing between the lines of message is 3½ “ for Sign A, 4½” for Sign B and 6” for Sign C.

This sign is to inform motorists that the speed limit is enforced by aircraft and is to be installed as a deterrent to speeders on the Interstate System. Signs on the Interstate System should be located after interchanges having significant volumes. The specific interchanges shall be as determined between the Virginia State Police and the District Traffic Engineer's personnel.

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	White (Reflectorized)
	Field:	Black (Non-Reflectorized)
SIZE	Height:	54"
	Width:	90"
MESSAGE	Line 1 Capitals:	8" D
	Line 2 Capitals:	8" D
	Line 3 Capitals:	10" D
BORDER WIDTH		1"
CORNER RADIUS		7"

Notes: Vertical spacing between the message and the border is 7". Vertical spacing between the lines of message is 6".

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-299
	DATE: August 30, 2000
SPECIFIC SUBJECT: Signing for "Move It" Program	**SUPERSEDES:** TE-295
DIRECTED TO: District Administrators	**SIGNATURE:** *Ilona O. Kastenhofer*

The Department has been requested by the State Police to remove the word "EMERGENCY" from Cellular #77 signing due to legislation (Senate Bill 148) passed during the 2000 session of the General Assembly. This legislation prevents any public safety agency from advertising or otherwise promoting the use of any number for emergency response service other than 911.

Since this request affects the alternate signing used with the MOVE-IT program, the Department's amended policy regarding this program is as follows:

In response to House Joint Resolution No. 570 (attached), the Virginia Department of Transportation, the Department of Motor Vehicles and law enforcement agencies are attempting to reduce traffic congestion by expanding the MOVE-IT program currently used in various locations. The major thrust of this effort is a public education program in cooperation with DRIVE SMART Virginia. HJR 570 also requests the Department to install signs "along the highways of the Commonwealth, at places of major highway construction, and at places where traffic congestion is known to occur" which advise motorists involved in accidents or breakdowns to move their vehicles from the travel lane(s) if they are capable of being moved.

The attached signs have been designed for use in conjunction with this program. The sign without a phone number is intended for use at any location. As an option, the alternate sign can be used on the interstate system. In addition, the Northern Virginia District can continue to use its previous sign design since it more accurately reflects the State Police initiative relative to reporting emergency and non-emergency events in that area.

Signs should be installed prior to major construction sites and at places of recurring traffic congestion. When used in conjunction with construction projects, care should be taken when locating the signs so that the effectiveness of any work zone signing is not compromised. In addition, these signs can be installed along highways in other locations as deemed appropriate.

The use of these signs should be considered for existing and new construction projects and locations with recurring congestion upon receipt of this memorandum. They should be

installed at other locations as soon as possible but no later than December 29, 2000. Signs currently in place which are not in accordance with the attached designs may remain in place until normal maintenance requires that they be replaced with the exception that the modification of the sign to replace the word "EMERGENCY" with "ASSISTANCE" shall be accomplished by October 1, 2000.

DCF/df

cc: Mr. Charles D. Nottingham
Col. W. Gerald Massengill
Lt. Col. John B. Scott
Mr. A. V. Bailey, II
Mr. T. F. Boyd
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Ms. C. S. Sorrell
Mr. J. C. Southard
Mr. Roberto Fonseca
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis

HOUSE JOINT RESOLUTION NO. 570

Requesting the Department of Transportation and the Department of Motor Vehicles to take certain actions to reduce traffic congestion along highways at major construction sites and places of common traffic congestion.

Agreed to by the House of Delegates, February 9, 1999

Agreed to by the Senate, February 18, 1999

WHEREAS, every day highway accidents and incidents impede mobility on urban, suburban, and rural highways; and

WHEREAS, the traffic congestion caused by these accidents and incidents creates significant safety hazards and causes excessive delays that result in costs for the traveling public and public safety agencies; and

WHEREAS, studies published by the U.S. Department of Transportation, Federal Highway Administration indicate that (i) by 2005 the impact of accident and incident-related delays in terms of hours of delay, wasted fuel, and excess road-user costs are expected to increase by five times the level experienced during 1995; (ii) 50 to 60 percent of highway congestion is due to incidents; and (iii) 20 percent of all accidents are a result of a previous incident; and

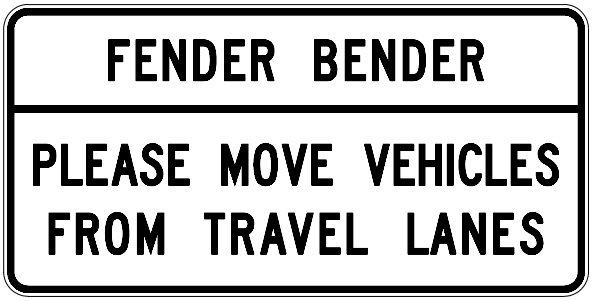
WHEREAS, §§ 46.2-888 and 46.2-894 of the Code of Virginia permit operators of motor vehicles that have been involved in an accident to move such vehicles to prevent the obstruction of the regular flow of traffic, and the Department of Transportation has publicized the value of moving such vehicles in the "MOVE IT" program; and

WHEREAS, the further education of drivers using Virginia highways about the benefits and responsibilities of stopping without obstructing traffic after a noninjury accident is essential to reducing traffic congestion and accidents; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Department of Transportation and the Department of Motor Vehicles, in conjunction with law-enforcement agencies, be requested to take certain actions to reduce traffic congestion along highways at major construction sites and places of common traffic congestion and to implement a public education campaign to inform motor vehicle operators of the benefits of the "MOVE IT" program; and, be it

RESOLVED FURTHER, That the Department of Transportation be requested to place signs along the highways of the Commonwealth, at places of major highway construction, and at places where traffic congestion is known to occur and that those signs advise motorists to move any motor vehicle that is capable of being moved away from the lanes of travel on public highways after any accident or breakdown; and, be it

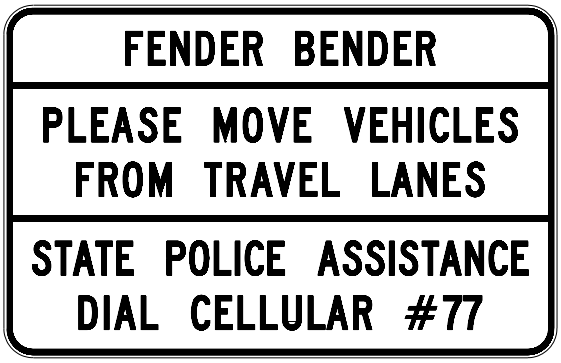
RESOLVED FINALLY, That the Clerk of the House of Delegates transmit copies of this resolution to the Commonwealth Transportation Commissioner and the Commissioner of the Department of Motor Vehicles in order that they may be apprised of the sense of the General Assembly in this matter.



This sign is intended for use at major construction sites, at places of recurring traffic congestion and at other locations along the highway as deemed appropriate. Sign B shall be used on the Interstate routes and Sign A on all other routes.

SHAPE		Horizontal Rectangle	
COLOR	Line 1		
	Message and Border:	Black (Non-reflectorized)	
	Field:	Yellow (Reflectorized)	
	Solid Bar:	Black (Non-reflectorized)	
	Lines 2 & 3		
	Message and Border:	Black (Non-reflectorized)	
	Field:	White (Reflectorized)	
		A	**B**
SIZE	Horizontal:	72"	132”
	Vertical:	36"	54”
MESSAGE	Line 1 Capitals:	5" C	8" C
	Solid Bar:	¾"	1¼"
	Line 2 Capitals:	5" C	8" C
	Line 3 Capitals:	5" C	8" C
MARGIN WIDTH		½"	¾"
BORDER WIDTH		¾"	1¼"
CORNER RADIUS		3"	7"

Notes: Vertical spacing between Line 1 and the border and the solid bar is 3⅛" for Sign A and 4¼" for Sign B. Vertical spacing between Line 2 and the solid bar is 4" for Sign A and 5⅛" for Sign B. Vertical spacing between Lines 2 and 3 is 3½" for Sign A and 6" for Sign B. Vertical spacing between Line 3 and the border is 4" for Sign A and 5⅛" for Sign B. Horizontal spacing on Line 2 for Sign A is at 70% of the normal spacing and spacing between words on this line is reduced to 4".



This sign is intended for use on the interstate routes as an alternate sign (to the same sign without Lines 4 and 5) at major construction sites, at places of recurring traffic congestion and at other locations along the highway as deemed appropriate.

SHAPE		Horizontal Rectangle
COLOR	Line 1	
	Message and Border:	Black (Non-reflectorized)
	Field:	Yellow (Reflectorized)
	Solid Bar:	Black (Non-reflectorized)
	Lines 2 & 3	
	Message and Border:	Black (Non-reflectorized)
	Field:	White (Reflectorized)
	Solid Bar:	Black (Non-reflectorized)
	Lines 4 & 5	
	Message and Border:	White (Reflectorized)
	Field:	Blue (Reflectorized)
SIZE	Horizontal:	132"
	Vertical:	84"
MESSAGE	Line 1 Capitals:	8" C
	Solid Bar:	1¼"
	Line 2 Capitals:	8" C
	Line 3 Capitals:	8" C
	Solid Bar:	1¼"
	Line 4 Capitals:	8" C
	Line 5 Capitals, Symbol & Numerals:	8" C
MARGIN WIDTH		¾"
BORDER WIDTH		1¼"
CORNER RADIUS		7"

Notes: Vertical spacing between Line 1 and the border and the solid bar is 4¼". Vertical spacing between Line 2 and the solid bar is 4¾". Vertical spacing between Lines 2 and 3 is 5". Vertical spacing between Line 3 and the solid bar is 4¾". Vertical spacing between Line 4 and the solid bar is 4¾". Vertical spacing between Lines 4 and 5 is 5". Vertical spacing between Line 5 and the border is 4¾". Horizontal spacing on Line 4 is 75% of the normal spacing.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-300
	DATE: August 30, 2000
SPECIFIC SUBJECT: Cellular #77 Signing	**SUPERSEDES:** TE-281
DIRECTED TO: District Administrators	**SIGNATURE:** *Ilona O. Kastenhofer*

The Department has been requested by the State Police to remove the word "EMERGENCIES" from the Cellular #77 signing due to legislation (Senate Bill 148) passed during the 2000 session of the General Assembly. This legislation prevents any public safety agency from advertising or otherwise promoting the use of any number for emergency response service other than 911.

Due to this request, the Department's amended policy concerning Cellular #77 is as follows:

The State Police answer Cellular #77 in all areas of the state while Cellular #911 will be answered by the local police departments instead of the State Police in most jurisdictions. In cooperation with the State Police, the Department will install on all interstate roadways "DIAL CELLULAR #77 FOR STATE POLICE" signs except in the Northern Virginia District where the signs that have been designed for the *MOVE IT* Program will be installed. This signing shall be installed near the state line and at intervals along the roadways. The spacing is recommended to be 20-mile intervals for rural areas with a reduced spacing for urban areas. The exact spacing shall be as determined by the District Traffic Engineer with input from the State Police. When the roadway does not begin at the state line, the first sign shall be installed near the beginning of the roadway.

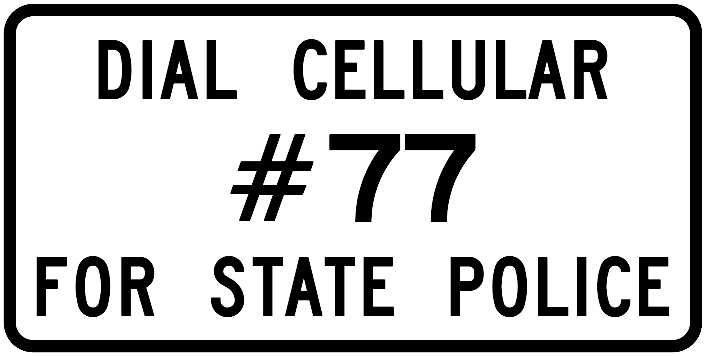
Existing "EMERGENCIES - DIAL CELLULAR #77 FOR STATE POLICE" signs installed in accordance with Traffic Engineering Memorandum #TE-281 shall be modified or replaced as determined by the District Traffic Engineer to remove the word "EMERGENCIES". Existing "STATE POLICE #77" signs installed in the Northern Virginia District will be replaced with the signing for the *MOVE IT* Program. The signing for the *MOVE IT* program may also be installed on non-interstate roadways within the Northern Virginia District. Determination of those locations will be made by the Traffic Operations Center with input from the State Police.

The sign design for the "DIAL CELLULAR #77 FOR STATE POLICE" sign is attached. The sign design for the Northern Virginia District where Cellular #77 will be used with the *MOVE IT* Program has been developed by the District and is not attached.

This signing shall not be installed within the welcome centers and rest areas. Other signing has been developed for those areas and is addressed by a separate memorandum.

This memorandum is effective immediately for all new installations and modification of existing signs shall be accomplished by October 1, 2000.

DCF/df
Attachment
cc: Mr. Charles D. Nottingham
Col. W. Gerald Massengill
Lt. Col. John B. Scott
Mr. A. V. Bailey, II
Mr. T. F. Boyd
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Ms. C. S. Sorrell
Mr. J. C. Southard
Mr. Roberto Fonseca
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis



SHAPE		Horizontal Rectangle
COLOR	Message and Border:	White (Reflectorized)
	Field:	Blue (Reflectorized)
SIZE	Horizontal:	78”
	Vertical:	36”
MESSAGE	Line 1 Capitals:	6" D
	Line 2 Symbol and Numerals:	8" E(M)
	Line 3 Capitals:	6" D
BORDER WIDTH		⅞"
CORNER RADIUS		4"

Notes: Vertical spacing between the message and the border is 3⅛". Vertical spacing between the lines of message is 4". Spacing between letters on line 3 shall be accomplished at 60% of the normal spacing.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-301
	DATE: August 30, 2000
SPECIFIC SUBJECT: Rest Area/Welcome Center Signing	**SUPERSEDES:** TE-283
DIRECTED TO: District Administrators	**SIGNATURE:** *Ilona O. Kastenhofer*

The Department has been requested by the State Police to remove the word "EMERGENCY" from Cellular #77 signing due to legislation (Senate Bill 148) passed during the 2000 session of the General Assembly. This legislation prevents any public safety agency from advertising or otherwise promoting the use of any number for emergency response service other than 911.

Since this request affects the signing used with the *CRUSH CRIME* program, the Department's amended policy regarding this program is as follows:

In an effort to promote security in our rest areas and welcome centers and to promote the *CRUSH CRIME* program, the Department, in cooperation with the State Police, has decided to install "REST AREA PATROLLED BY STATE POLICE FOR ASSISTANCE DIAL 1-800-XXX-XXXX CELLULAR #77" and "CRUSH CRIME" signs at each location.

The 800 number displayed on the sign shall be the State Police's Division Headquarters number for the area where the rest area/welcome center is located. Signs should be installed in the vicinity of the building in an area where it will be easily viewed by the public, but where the possibility of pedestrians accidentally making contact with the sign doesn't exist. Signs shall not be installed on the ramps. The exact location of the signs will be determined by the Central Office Maintenance Division in cooperation with the State Police's crime prevention specialist except for the location in Accomack County. The District Traffic Engineer in cooperation with the State Police's crime prevention specialist should determine the exact location in Accomack County. The signs shall be installed on the same post with the "CRUSH CRIME" sign on the bottom. Distance to the bottom of the "CRUSH CRIME" sign should be four feet with one inch spacing between the two signs. This memorandum is effective immediately and modification of the existing signs to change the word "EMERGENCY" to "ASSISTANCE" shall be completed by October 1, 2000.

DCF/df
Attachments
cc: Mr. Charles D. Nottingham
Col. W.Gerald Massengill
Lt. Col. John B. Scott
Mr. A. V. Bailey, II
Mr. T. F. Boyd
Mr. J. G. Browder, Jr.
Mr. Claude D. Garver, Jr.
Ms. C. S. Sorrell
Mr. J. C. Southard
Ms. Barbara Bolton
Mr. Roberto Fonseca
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Ms. Cyndi Ward
Mr. Dan Dennis

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	White (Reflectorized)
	Field:	Blue (Reflectorized)
SIZE	Horizontal:	48"
	Vertical:	36"
MESSAGE	Line 1 Capitals:	4" D
	Line 2 Capitals:	4" D
	Line 3 Capitals:	4" D
	Line 4 Capitals:	2" C
	Line 5 Numerals:	2" C
	Line 6 Capitals, Symbol & Numerals:	2" C
BORDER WIDTH		⅝"
CORNER RADIUS		2"

Notes: Vertical spacing between the message and the border is 2⅞". Vertical spacing between the lines of the 4" message is 2½". Vertical spacing between the 4" message and the 2" message is 2". Vertical spacing between the lines of the 2" message is 2".

SHAPE		Horizontal Rectangle
COLOR	Line 1	
	Message:	Blue (Reflectorized)
	Field:	Yellow (Reflectorized)
	Border:	White (Reflectorized)
	Line 2	
	Message:	White (Reflectorized)
	Field:	Blue (Reflectorized)
	Border:	White (Reflectorized)
SIZE	Horizontal:	24"
	Vertical:	12"
MESSAGE	Line 1 Capitals:	4" (AutoCAD Style 361)
	Line 2 Capitals:	2" (AutoCAD Style 361)*
BORDER WIDTH		⅞"
CORNER RADIUS		1½"

Notes: Vertical spacing between the border and the yellow/blue field separation point is 6⅞". Messages shall be centered vertically and horizontally within its field.

* Message lengthened to be the same length as Line 1.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signals	**NUMBER:** 306
SPECIFIC SUBJECT: Calculation of Clearance Intervals	**DATE:** August 16, 2001
	SUPERSEDES:
DIRECTED TO: District Administrators	**SIGNATURE:** Ilona O. Kastenhofer

In an effort to establish consistency throughout the Commonwealth, this memorandum will govern the method in which the timing of the yellow change intervals and all red intervals is established.

The formula recommended by the Institute of Transportation Engineers will be employed in the following manner:

$$\textbf{yellow change interval} = t + V/(2a \pm 64.4g)$$

where:

- **yellow change interval** = the length of the yellow phase and is expressed in seconds.
- **t** = the perception reaction time expressed in seconds. This is 1 second unless the engineer responsible determines that the situation warrants increasing it to 1.5 seconds.
- **V** = the posted speed expressed in feet/second.
- **a** = the deceleration rate expressed in feet/second^2. This should be 10 ft/sec^2 under typical conditions. Engineers may decrease this to 8 or 9 feet/second^2 if conditions warrant such as heavy truck traffic or increase to 11 or 12 feet/second^2 if warranted.
- **g=** the grade of approach (percent/100); use + for a positive grade and – for a negative grade
- minimum yellow time should be 3 seconds and the maximum should be 6 seconds.

all red interval = (w+l)/V

where:

- **all red interval** = the length of the all red phase expressed in seconds, and follows the yellow change interval.
- **w** = width of intersection, curb to curb expressed in feet.
- **l** = vehicle length, taken as 20 feet.
- **V** = posted speed in feet/second.
- minimum all red interval should be 1 second and the maximum should be 3 seconds. Longer all reds can be used at the engineer's discretion where extreme conditions warrant.

General

- all timings will be calculated to the nearest tenth of a second
- if rounding to the nearest half second is desired, it should be done in the following manner:

.0 to .1 – rounded down to whole number
.2, .3, .4 – rounded up to next half second
.6 – rounded down to half second
.7, .8, .9 rounded up to next whole number

In all cases of developing signal timings, engineering judgment governs final decisions.

cc: Mr. Charles D. Nottingham
Mr. A. V. Bailey, II
Mr. T. F. Boyd
Mr. Claude D. Garver, Jr.
Ms. C. S. Sorrell
Mr. J. C. Southard
Mr. C. F. Gee
Mr. Roberto Fonseca
Division Administrators
Resident Engineers
District Traffic Engineers
Ms. Kathe Jefferson
Mr. Dan Dennis

NoVA Addendum to Memorandum TE-306

The enclosed guidelines are to be used in the implementation of the Memorandum TE-306. These guidelines are provided for additional clarification and to address the left turn clearances. **But engineering judgment shall govern final decisions at all the time.**

Minimum Clearances:

Yellow Change Interval – 4 seconds.
All Red Clearance Interval – 1 second.

Additional Clarification: Since at present there are no signals in NoVA district with Yellow clearance interval less than 4 seconds and All Red clearance interval less than 1 second, minimum Yellow interval of 4 seconds and minimum All Red interval of 1 second should be used.

Through Movements

Yellow Change Interval calculation - Use memorandum TE-306.
All Red Clearance Interval calculation - Use memorandum TE-306.

Additional Clarification: For typical roadway and driver conditions, the following table may be used. (Deceleration rate of 10 ft/sec^2, posted speed, 1 sec. reaction time)

Yellow Change Interval

	Grade of Approach								
	Uphill					Downhill			
Speed (mph)	+4%	+3%	+2%	+1%	Level	-1%	-2%	-3%	-4%
25	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
30	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
35	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
40	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5
45	4.0	4.0	4.0	4.5	4.5	4.5	4.5	5.0	5.0
50	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	5.5
55	4.5	5.0	5.0	5.0	5.0	5.5	5.5	5.5	5.5

All Red Clearance Interval

Speed (mph)	Width of the Roadway to Clear 20	30	40	50	60	70	80	90	100
25	1.0	1.5	1.5	2.0	2.5	2.5	3.0	3.0	3.0
30	1.0	1.0	1.5	1.5	2.0	2.0	2.5	2.5	3.0
35	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.5
40	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0
45	1.0	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0
50	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5
55	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5

Protected *Lead* Left Turns from four way intersections and *mainline* T-intersections

Additional Clarification:

Yellow interval: Speed limits are not posted for the left turn bays and speeds vary significantly along the turn bay depending on whether a vehicle started from the stop condition or entered the turn bay from the mainline. Typically vehicles travel less than 40 mph in the left turn bay within the dilemma zone. There fore under typical conditions, Yellow change interval of 4 seconds may be used.

All Red Interval: Typically vehicles turn left at an average speed of 20 to 25 mph (speeds vary at different points within the intersection) through the intersection. Therefore All Red Clearance intervals may be calculated using a speed of 20 to 25 mph in the memorandum TE-306.

(At all non-typical intersections including but not limited to where the grades are steep, one of the through lanes become left turn lanes, intersections are too wide or too narrow, the left turns are made at diagonal or the observed left turn speeds are lower or higher; Yellow and All Red intervals should be calculated using location specific parameters.)

Protected *Lag* Left Turns from four way intersections and *mainline* T-intersections

Additional Clarification:

Yellow interval: In this case, since it will be confusing for drivers to see different yellow times for the left turns and through movements, the use of mainline yellow interval for the left turn phases may be appropriate.

All Red Interval: Typically vehicles turn left at an average speed of 20 to 25 mph (speeds vary at different points within the intersection) through the intersection. Therefore All Red Clearance intervals may be calculated using a speed of 20 to 25 mph in the memorandum TE-306.

(At all non-typical intersections including but not limited to where the grades are steep, one of the through lanes become left turn lanes, intersections are too wide or too narrow, the left turns are made at diagonal or the observed left turn speeds are lower or higher; Yellow and All Red intervals should be calculated using location specific parameters.)

Left turns from the *Shaft* of a T-intersection

Additional Clarification:

Yellow interval: In this case, as the roadway approaches the end of the shaft, vehicles may be traveling at the posted speed of the roadway within the dilemma zone and therefore use the posted speed and memorandum TE-306.

All Red Interval: Typically vehicles turn left at an average speed of 20 to 25 mph (speeds vary at different points within the intersection) through the intersection. Therefore All Red Clearance intervals may be calculated using a speed of 20 to 25 mph in the memorandum TE-306.

(At all non-typical intersections including but not limited to where the grades are steep, one of the through lanes become left turn lanes, intersections are too wide or too narrow, the left turns are made at diagonal or the observed left turn speeds are lower or higher; Yellow and All Red intervals should be calculated using location specific parameters.)

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-311
	DATE: May 21, 2003
SPECIFIC SUBJECT: Overhead and Advance Ground Mounted Street Name Signs at Signalized Intersections	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

The Department has identified that to install overhead and advance ground mounted street name signs will provide benefits for the motoring public and to that end has developed the following directive. Overhead and/or advance ground mounted street name signs shall be erected at all proposed and reconstructed Department maintained signalized intersections in accordance with this directive. Design details for these signs are attached. The display of block numbering on street name signs is at the discretion of the District Traffic Engineer; however, it is recommended that they be considered for highly urbanized locations. Color of the street name signs shall be a white message on a green background except where other colors are already established and displayed for a specific section of counties/towns. In those locations, the established color may be used.

All proposed traffic signal structures shall be designed to accommodate the installation of the overhead street name signs with the following exceptions where the District Traffic Engineer has the option of only installing advance ground mounted street name signs:

- Mast arm pole installations where the sign due to its horizontal dimension cannot be placed on the mast arm. This option is only allowed when the use of smaller letters as indicated on the attached sign designs does not allow for the installation of the signs on the mast arms.
- Mast arm pole installations where the angle of the mast arm to the roadway is not applicable to such installation
- Strain pole installations

Mast arm poles that are generic in nature and designed for non-specific locations, such as those for regional signal projects, shall be designed using street name signs having dimensions of twelve (12) feet in length and two and one-half (2½) feet in height (30 square feet).

Street name signs should be installed on the mast arm between the mast arm pole and the first traffic signal head. Signs shall be located within that distance to provide optimum viewing for the motorist but shall be no closer than two (2) feet to the housing of the traffic signal head. Sign placement on arms for mast arm poles that are generic in nature will depend upon the design parameters set for those poles under that specific contract and shall be verified prior to installation. If the District Traffic Engineer decides to install street name signs on those structures listed in the exceptions above, the street name signs shall be installed on the traffic signal pole. The sign displaying the next block number for through motorists is intended to be installed on the traffic signal pole. Signs mounted on the traffic signal pole shall be installed centered on the pole unless the structure was designed to accommodate the loadings of an offset sign installation. It is the intent that all overhead signing be installed on the traffic signal pole or mast arm on the far right side of the intersection for the through traffic unless such does not exist such at tee intersections for the trunk street, median installed traffic signal poles, etc. In those situations, the signs shall be installed on the applicable pole/arm for the approach.

If the crossing street is an entrance to a shopping center that has no official street name, the name of the shopping center shall not be used on the sign; the generic message "Shopping Center Ent" should be displayed. If the crossing street is an entrance to a commercial development other than a shopping center, the generic message “Commercial Ent” should be displayed. If the crossing street is an entrance to a small business, such as a fast food business, a hardware store, etc., reference to the entrance shall be displayed on the sign only if an official street name has been assigned to the entrance by the local jurisdiction. Engineering judgment shall be used in determining whether an entrance should be signed.

Advance ground mounted street name signs should also be installed on an approach at signalized intersections in accordance with the following:

- Where there are three (3) or more through lanes and the posted speed limit is 45 mph or greater
- On approaches where overhead street name signs are not installed

Advance ground mounted street name signs may also be installed on an approach where the posted speed limit is less than 45 mph and/or there is less than three (3) through lanes; however, this should be limited to locations where there is a high demand for traffic to turn onto the intersecting street. Dual indication of the advance ground mounted street name signs should be accomplished when determined necessary by the District Traffic Engineer.

These requirements are effective immediately for those projects that have not been turned in for advertisement. For those existing intersections that currently have street name signs installed on traffic signal structures that do not conform to these requirements, those signs may remain in place until maintenance replacement time. While it is not mandated, it is recommended that all street name signs on an approach at an intersection be converted to the designs outlined herein at the time of maintenance

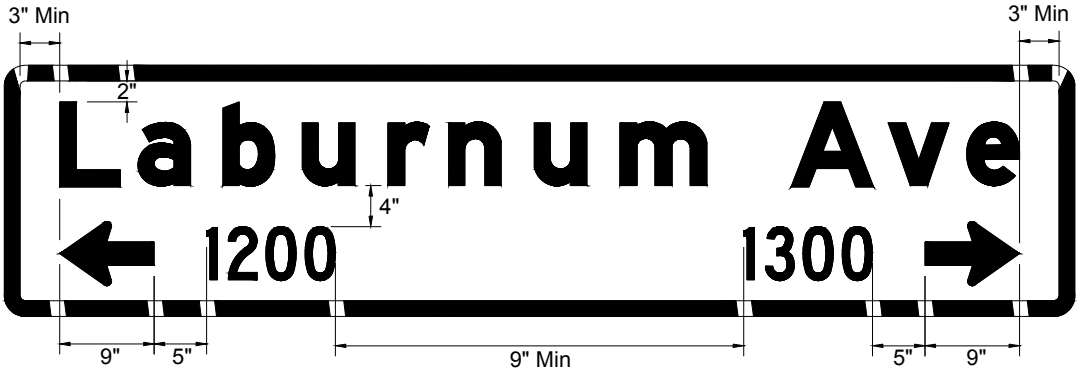
replacement even if only one sign needs maintenance replacement. If the designs outlined herein cannot be installed due to overloading of the structure at maintenance replacement time, the existing design may continue to be used.

Installation of these signs at existing signalized intersections not having overhead and advance street name signs is at the decision of the district with no final installation date being required.

The design of existing structures may need to be reviewed by the District Structure and Bridge Engineer to determine whether the structure can handle the additional loading prior to sign installation. Traffic Engineering Memorandum No. TE-310 shall be used to determine whether the structure design needs to be reviewed.

While this memorandum has tried to address the major issues related to the design and installation of overhead and ground mounted advance street name signs, it is recognized that variances from this memorandum may be needed to conform to unique situations. Therefore, when variances are needed, a request with sufficient background information shall be submitted to the State Mobility Management Engineer for approval.

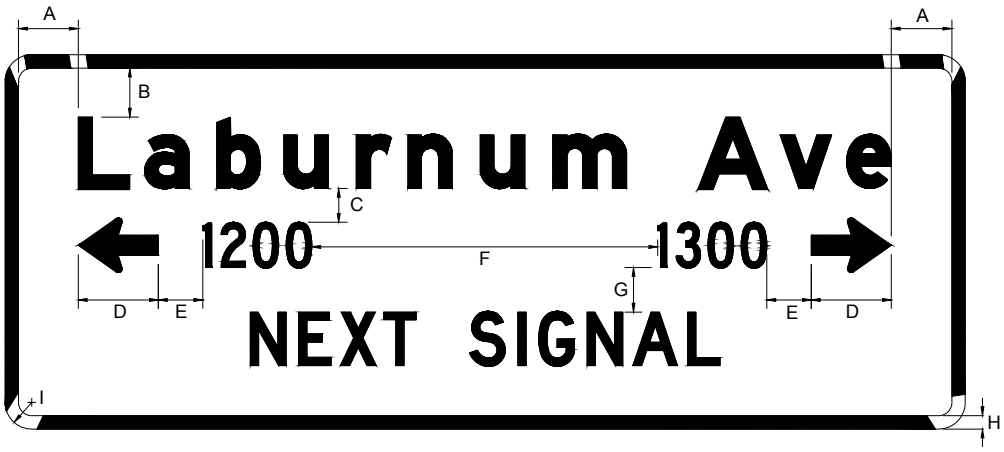
cc: Mr. Philip A. Shucet
Mr. Claude D. Garver, Jr., P.E.
Dr. Gary R. Allen
Mr. C. Frank. Gee, P.E.
Mr. Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca
District Structure and Bridge Engineers
District Traffic Engineers
Division Administrators
Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis



This sign is intended to be used on traffic signal structures to display the street name and block numbers.

SHAPE			Horizontal Rectangle
COLOR		Message and Border:	White (Reflectorized)
		Field:	Green (Reflectorized)
SIZE		Horizontal:	Variable
		Vertical:	24"
MESSAGE	Line 1	Upper/Lower Case:	8"/6" E(M)
	Line 2	Numerals:	5" C
BORDER WIDTH			1½"
CORNER RADIUS			2"

Notes: Line 1 shall be centered horizontally on the sign. Arrow tips shall be aligned with the left and right edges of the text except when text length is insufficient. Series B series numerals may be used on Line 2 when text length is insufficient provided such use allows for a better design. Arrows shall be the same as shown on Page 3-38 of the Standard Highway Signs book. 6"/4½" E(M) characters may be used for Line 1 and 4" C for Line 2 on new structures if sufficient space will not exist for the larger sign installation, and on existing structures if the same is true or if the structure cannot support the additional loading of the larger sign but can support the reduced sign size loading. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.



This sign is intended to be ground mounted in advance of a traffic signalized intersection to display the street name and block numbers. Sign size B shall only be used where right-of-way or geometrics do not allow the installation of the larger sign.

SHAPE			Horizontal Rectangle	
COLOR		Message and Border:	White (Reflectorized)	
		Field:	Green (Reflectorized)	
			A	**B**
SIZE		Horizontal:	Variable	Variable
		Vertical:	42"	36"
MESSAGE	Line 1	Upper/Lower Case:	8"/6" E(M)	6"/4½" E(M)
	Line 2	Numerals:	5" C	4" C
	Line 3	Capitals:	6" D	4" D

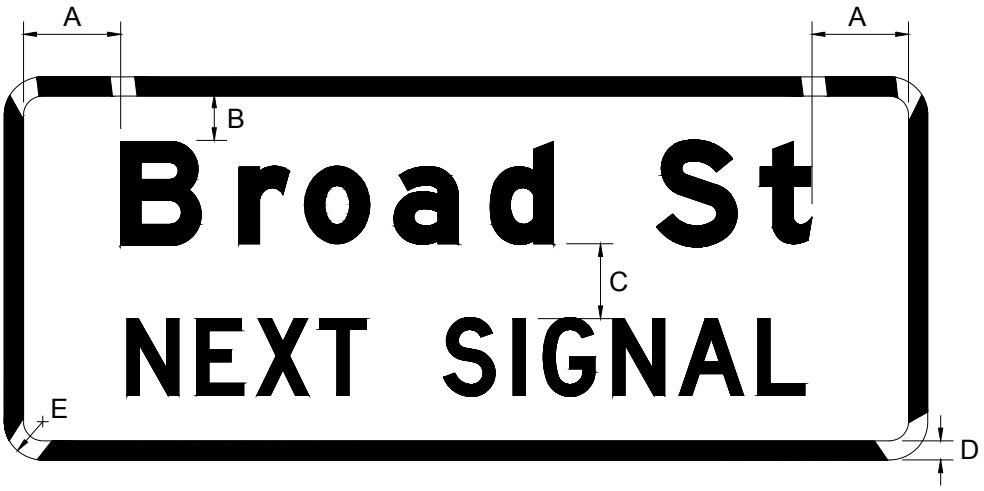
SIGN	DIMENSIONS (INCHES)								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
A	6 (Min)	5	4	9	5	9 (Min)	5	1½	3
B	4 (Min)	6	4	9	4	9 (Min)	4	1¼	2

Notes: Lines 1 and 3 shall be centered horizontally on the sign. Arrow tips shall be aligned with the left and right edges of the text except when text length is insufficient. Series B numerals may be used on Line 2 when the text length is insufficient provided such use allows for a better design. Arrows shall be the same as shown on Page 3-38 of the Standard Highway Signs book. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.

This sign is intended to be used on traffic signal structures to display the street name.

SHAPE		Horizontal Rectangle
COLOR	Message and Border: Field:	White (Reflectorized) Green (Reflectorized)
SIZE	Horizontal: Vertical:	Variable 18"
MESSAGE	Line 1 Upper/Lower Case:	8"/6" E(M)
BORDER WIDTH		1½"
CORNER RADIUS		2"

Notes: Line 1 shall be centered horizontally on the sign. 6"/4½" E(M) characters may be used on new structures if sufficient space will not exist for the larger sign installation, and on existing structures if the same is true or if the structure cannot support the additional loading of the larger sign but can support the reduced sign size loading. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.

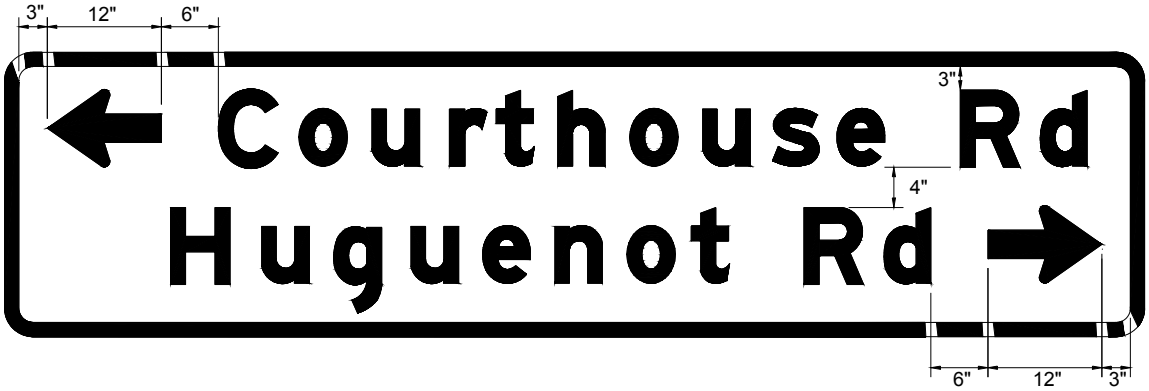


This sign is intended to be ground mounted in advance of a traffic signalized intersection to display the street name. Sign size B shall only be used where right-of-way or geometrics do not allow the installation of the larger sign.

SHAPE			Horizontal Rectangle	
COLOR		Message and Border:	White (Reflectorized)	
		Field:	Green (Reflectorized)	
			A	**B**
SIZE		Horizontal:	Variable	Variable
		Vertical:	30"	24"
MESSAGE	Line 1	Upper/Lower Case:	8"/6" E(M)	6"/4½" E(M)
	Line 2	Capitals:	6" D	4" D

SIGN	DIMENSIONS (INCHES)				
	A	**B**	**C**	**D**	**E**
A	6 (Min)	4	6	1½	3
B	4 (Min)	4	4	1¼	2

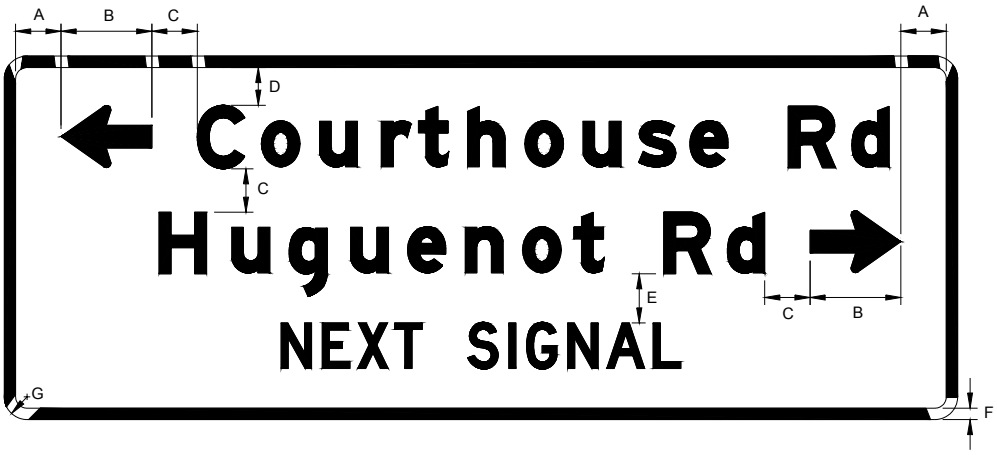
Notes: Lines 1 and 2 shall be centered horizontally on the sign. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.



This sign is intended to be used on traffic signal structures to display two street names for an intersecting street.

SHAPE			Horizontal Rectangle
COLOR		Message and Border:	White (Reflectorized)
		Field:	Green (Reflectorized)
SIZE		Horizontal:	Variable
		Vertical:	30"
MESSAGE	Line 1	Upper/Lower Case:	8"/6" E(M)
	Line 2	Upper/Lower Case:	8"/6" E(M)
BORDER WIDTH			1½"
CORNER RADIUS			3"

Notes: The name of the street to the left shall be displayed at the top with the name of the street to the right displayed on the bottom. Arrows shall be the same as shown on Page 3-38 of the Standard Highway Signs book except scaled to have a length of twelve (12) inches. 6"/4½" E(M) characters may be used on new structures if sufficient space will not exist for the larger sign installation, and on existing structures if the same is true or if the structure cannot support the additional loading of the larger sign but can support the reduced sign size loading. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.

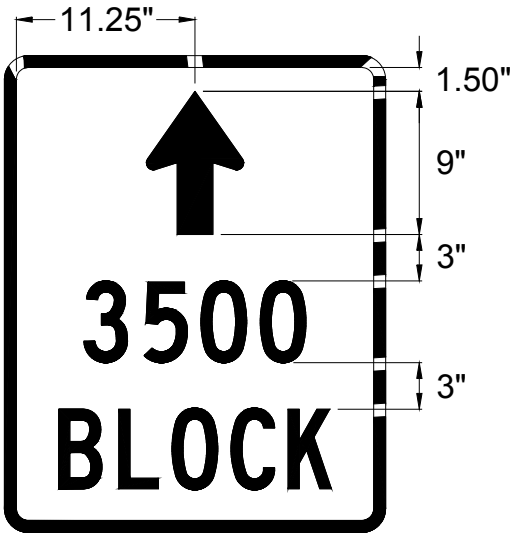


This sign is intended to be ground mounted in advance of a traffic signalized intersection where there are two names for the intersecting street. Sign size B shall only be used where right-of-way or geometrics do not allow the installation of the larger sign.

SHAPE			Horizontal Rectangle	
COLOR		Message and Border:	White (Reflectorized)	
		Field:	Green (Reflectorized)	
			A	**B**
SIZE		Horizontal:	Variable	Variable
		Vertical:	48"	36"
MESSAGE	Line 1	Upper/Lower Case:	8"/6" E(M)	6"/4½" E(M)
	Line 2	Upper/Lower Case:	8"/6" E(M)	6"/4½" E(M)
	Line 3	Capitals:	6" D	4" D

SIGN	DIMENSIONS (INCHES)						
	A	**B**	**C**	**D**	**E**	**F**	**G**
A	6	12	6	5	7	1½	3
B	4	9	4	4¼	5	1¼	3

Notes: Line 3 shall be centered horizontally on the sign. Arrows shall be the same as shown on Page 3-38 of the Standard Highway Signs book except those on Sign A shall be scaled to have a length of twelve (12) inches. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.



This sign is intended to be used on traffic signal structures to display the block number following the signalized intersection.

SHAPE			Vertical Rectangle
COLOR		Message and Border:	White (Reflectorized)
		Field:	Green (Reflectorized)
SIZE		Horizontal:	24"
		Vertical:	30"
MESSAGE	Line 1	Arrow:	9"
	Line 2	Numerals:	5" C
	Line 3	Capitals:	5" C
BORDER WIDTH			¾"
CORNER RADIUS			1½"

Notes: Lines 1, 2 & 3 shall be centered horizontally on the sign. Arrow shall be the same as shown on Page 3-38 of the Standard Highway Signs book. Sign colors other than white on green may be used if those colors are already established and displayed for a specific section of counties/towns.

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Grounding	NUMBER: MM-312
	DATE: September 27, 2002
SPECIFIC SUBJECT: Inspection and testing of grounding systems	SUPERSEDES: TE-302
DIRECTED TO: District Administrators	SIGNATURE: *Ilona O. Kastenhofer*

This memorandum implements a revised policy for the inspection and testing of Department maintained grounding systems for traffic control devices.

Inspections and tests shall be accomplished in accordance with the attached requirements. Testing shall be completed within 1 year of issuance of this memorandum for all existing traffic control devices that have not been tested in accordance with the previous memorandum.

The District Administrator should develop a recurring schedule to inspect and test grounding systems for conformance to the requirements herein. The frequency of inspection shall be three (3) years except two (2) years shall be used in areas having a high sand content or where chemically enhanced grounding electrode systems have been used.

It is anticipated that the inspections and tests required herein will result in the determination of systems having inadequate equipment grounding systems (inadequately sized equipment grounding conductors, non-existent equipment grounding conductors, non-existent bonded metal conduit systems or failed equipment grounding systems). Decisions should be made on whether it is more feasible to correct the problem with the inadequate equipment grounding systems within the time constraints of this memorandum or whether to test the grounding electrode system and accomplish corrections to that system (if needed) to conform to the requirements herein. Locations, where corrections are not made to the equipment grounding conductor system to conform to the requirements of the latest edition of the *National Electrical Code (NEC)* during this inspection, shall be programmed for future correction unless the system is planned for removal and a determination is made that it would not be cost effective to make such corrections considering the amount of time until removal. The District Administrator shall develop a cost estimate and shall develop a plan for implementation based on current and future funding sources.

The testing and documentation requirements herein are only applicable for maintenance purposes; testing and documentation for new installations or for maintenance replacement of equipment shall be in accordance with the Road and Bridge Specifications.

DCF/MEM: dcf
cc: Mr. Philip A. Shucet
Mr. Claude D. Garver, Jr.
Dr. Gary R. Allen
Mr. C. Frank. Gee
Mr. Malcolm. T. Kerley, PE
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
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Division Administrators
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District Structure and Bridge Engineers
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Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis

Testing, Documentation and Corrective Action Requirements

1. Testing shall be accomplished with equipment specifically designed for such use and when the soil appears dry to ensure the accuracy of the readings.

2. Testing shall be accomplished by personnel experienced and/or trained to perform the work.

3. Testing to determine resistance to ground for the grounding electrode system shall be accomplished at the connection point of the grounding electrode conductor to the equipment while the conductor is connected to the grounding electrode(s). The grounding electrode conductor shall be disconnected from the equipment unless the testing equipment is specifically designed to provide test results for the grounding electrode system while not being affected by the conductor connection. Grounding electrode conductors shall be disconnected from grounding bushings during the test. When the grounding electrode conductor remains connected to the equipment during testing as allowed above, the equipment grounding conductor shall be disconnected to eliminate a parallel path to ground.

4. When new equipment grounding conductors are installed, they shall conform to the size requirements of the attached memorandum dated July 27, 2001 with the following exceptions and clarification:

    a. For existing signalized intersections, spare conductors may be used as the equipment grounding conductors provided they conform and are installed in accordance with the requirements of the *NEC*.
    b. For existing signalized intersections, equipment grounding conductors, sized in accordance with the requirements of the *NEC*, shall be used if such use eliminates the need to replace the conduit with a larger size due to conduit fill.
    c. For all existing installations, continuous metal conduit may be used as the equipment grounding conductor provided grounding bushings are installed and bonded.
    d. At span wire installations, the span wire may be used as the equipment grounding conductor provided electrical continuity exists as determined by a continuity test. If electrical continuity does not exist, a #8 equipment grounding conductor shall be attached to the span wire (prior to the connecting hardware at each pole) and the poles to ensure continuity of the equipment grounding path. Where glass strain insulators and/or saddle clamps exist, a #8 jumper shall be used to connect the separate span wires. Appropriate connectors shall be used to connect the #8 to the span wire. A continuity test shall be accomplished for verification.

5. Documentation of the testing shall be accomplished using the attached form for all new and recurring tests. Electronic versions of this form will be available on the Mobility Management Division's intranet. Modification of the form is allowed as long as the data shown as a minimum is being recorded. Documentation shall be maintained for the previous and current tests and a copy of the completed forms shall be sent to the State Mobility Manager.

6. Corrective action needed at each site to conform to the requirements of this memorandum shall be completed within ten (10) working days after determination of inadequacy unless otherwise approved by the District Administrator.

7. Corrective work shall be accomplished in accordance with the applicable sections of the latest versions of the *Road and Bridge Specifications, Road and Bridge Standards* and *NEC* Article 250.

Inspection and Testing at Service Entrance Equipment

Test the grounding electrode system to determine if the resistance to ground is 25 ohms or less:

1. If 25 ohms or less, an augmentation grounding electrode having at least 8 feet contact with the soil shall be installed (if not already existing) at least 8 feet from all other grounding electrodes and connected in parallel with the primary grounding electrode.
2. If more than 25 ohms, then additional grounding steps or methods, including but not limited to, deep earth grounding and a chemically enhanced grounding electrode system shall be taken to achieve 25 ohms or less. Upon achieving 25 ohms or less, the requirements of 1. above shall be accomplished. When considering the use of chemically enhanced grounding electrode systems, environmental approval from the District Environmental Engineer shall be obtained for the specific system prior to its use.
3. If the test is being accomplished under the recurring schedule as required herein, then the test result shall be reviewed against the previous completed test to determine if any action, such as checking connections for problems, etc. is needed.

Inspection and Testing at Control Cabinets Housing Electrical/Electronic Equipment (e.g., controller cabinets, lighting control centers for roadway, parking lot and sign lighting, etc.), Structures (other than the service entrance structure), Junction Boxes, Manholes, Etc.

Determine if an equipment grounding conductor exists between the service entrance equipment and the control cabinet and at the structures, junction boxes and manholes:

1. If an equipment grounding conductor exists, then the following shall be accomplished:
   - **a.** If not electrically connected, necessary corrections shall be performed.
   - **b.** Determine if the conductor is sized properly in accordance with the requirements of the *NEC*:
     - **i.** If sized properly, no action is needed.
     - **ii.** If not sized properly, document the information for future correction unless replaced with the proper size conductor.
   - **c.** Determine if a grounding electrode system exists at the cabinets, structures, junction boxes and manholes:
     - **i.** If not existing but required by the NEC or the Virginia Road and Bridge Standards for that location, one shall be installed. Since these are supplementary grounding electrodes, only one grounding electrode need be installed and connected to the equipment grounding conductor to form a system. There shall be no testing required since there is no requirement in the *NEC* for the maximum resistance to ground for supplementary grounding electrodes.
     - **ii.** If existing, no action is needed.

2. If an equipment grounding conductor does not exist, but is required by the *NEC*, the following shall be accomplished unless an equipment grounding conductor is installed. If an equipment grounding conductor is installed, the requirements of 1c. shall then apply:
   - **a.** Test the grounding electrode system to determine if the resistance to ground is 25 ohms or less:
     - **i.** If 25 ohms or less, an augmentation grounding electrode having at least 8 feet contact with the soil shall be installed (if not already existing) at least 8 feet from all other grounding electrodes and connected in parallel with the primary grounding electrode.
     - **ii.** If more than 25 ohms, then additional grounding steps or methods, including but not limited to, deep earth grounding and a chemically enhanced grounding electrode system shall be taken to achieve 25 ohms or less. Upon achieving 25 ohms or less, the requirements of 2.a.i. above shall be accomplished. When considering the use of chemically enhanced grounding electrode systems, environmental approval from the District Environmental Engineer shall be obtained for the specific system prior to its use.
     - **iii.** If the grounding electrode and grounding electrode conductor do not exist, such shall be installed and the test accomplished except for non-metallic junction boxes (polymer concrete, etc.) where the insulation rating of all power cables within the box is 600 volts or greater and no splicing is being accomplished for those power cables.

COMMONWEALTH OF VIRGINIA
VIRGINIA DEPARTMENT OF TRANSPORTATION
GROUNDING SYSTEM INSPECTION REPORT

DISTRICT _____ **DATE** _____ **TEST PERFORMED BY** _____ _____
(Print Name) **(Print VDOT or Company Name As Applicable)**

_____
(Print Name of VDOT Representative Present During Testing If Tests Conducted By Contractor)

COUNTY _____ **ROUTE** _____ **GENERAL DESCRIPTION/LOCATION** _____

EQUIPMENT USED _____ **EQUIPMENT CALIBRATION DATE** _____

ITEM	SPECIFIC LOCATION OF EQUIPMENT	EQUIPMENT GROUNDING CONDUCTOR		FINAL OHMS READING OF GROUNDING SYSTEM	AUGMENTATION ELECTRODE INSTALLED (Y/N)	PRIMARY GROUNDING ELECTRODE TOTAL LENGTH (REQUIRED ONLY WHEN NEW) (FEET)	COMMENTS
		EXISTING (Y/N)	ADEQUATELY SIZED (Y/N)				

9/27/02

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, 23219-2000

CHARLES D. NOTTINGHAM
COMMISSIONER

ILONA O. KASTENHOFER
STATE TRAFFIC ENGINEER

July 27, 2001

Equipment Grounding Conductors For
Grounding Raceway and Equipment

MEMORANDUM

TO – District Traffic Engineers

The intent of this memorandum is to provide the latest information concerning equipment grounding conductors for grounding raceways and equipment and replaces all such information previously indicated in Mr. J. L. Butner's memorandum dated April 21, 1992. It should be noted that in the previous memorandum that the terminology "system bond wire" was used; however, to be consistent with the terminology used in the National Electrical Code (NEC), the terminology "equipment grounding conductors" will be used in this memorandum.

Since 1992, the equipment grounding conductor sizes have been determined by the plan designers and shown on the plans. This prevented the Department from relying on the Contractor to assure the correct equipment grounding conductor size was selected and allowed the field personnel responsible for inspections to know the exact size requirements at each location. We still believe this to be the best method and have no plans to change that at this time. However, based on the NEC, we have determined that we need to change the calculation method for sizing of the equipment grounding conductors used for lighting applications and other applications where the power conductor size has been adjusted to compensate for voltage drop. This change in the calculation method will cause an increase in the size of the equipment grounding conductor in most installations. While the NEC provides the calculation method concerning this, it has been determined by working through multiple examples of typical installations that the equipment grounding conductor will be increased to be the same size as the power conductor. Therefore, to eliminate the expense of accomplishing the calculations, it has been decided to require the equipment grounding conductor to be the same size as the power conductor for lighting applications and other applications where the power conductor size has been adjusted to compensate for voltage drop.

In order for everyone to know what is required, we have attached a sheet entitled Equipment Grounding Conductor Sizes for Grounding Raceways and Equipment. This attachment will provide the direction to the plan designers so they will know what is required on the plans along with the proper equipment grounding conductor size.

As it has been in the past, the cost of the equipment grounding conductor is included in the cost of the conduit, therefore no pay item will be needed. The only exception to this would be if you are installing equipment grounding conductors in existing conduits; in those instances, you will need to have a separate pay item for the equipment grounding conductor or you will need to indicate that the cost is included in other appropriate pay items.

This revised method shall be used on all projects that bids have not been received provided you can obtain approval to make the changes from Construction Division for those already advertised. This method will in most instances increase the equipment grounding conductor size so it will also be necessary to verify that the conduit size is capable of handling this increase.

In existing installations, the equipment grounding conductor should be adjusted to conform to these requirements for those conduits where conductor cables are being replaced or additional cables are being installed within such conduits. As indicated before, you will need to ensure that the conduit size is capable of handling the increase. When not, replacement of the conduit will be required.

If there are any questions, please contact Mr. Mansour Mahanoozadeh at (804) 786-7983 or via email at mahban_me@vdot.state.va.us.

Ilona O Kastenhofer

I. O. Kastenhofer
State Traffic Engineer

DCF/df
Attachment
Cc: Ms. K. D. Jefferson
Ms. C. A. Clayton
Mr. R. W. Alexander
Mr. T. F. Chu
Mr. M. D. Hagan
Mr. S. D. Hanshaw
Ms. K. R. Rusak
Mr. S. A. Smith

EQUIPMENT GROUNDING CONDUCTOR SIZES FOR GROUNDING RACEWAYS AND EQUIPMENT

BACKGROUND

The method of determining the equipment grounding conductor size for grounding raceways and equipment as shown herein will provide a size of equipment grounding conductor that equals or exceeds Article 250 of the NEC.

WHEN ARE EQUIPMENT GROUNDING CONDUCTORS REQUIRED

Equipment grounding conductors are only required in non-metallic conduits in accordance with Article 250 of the NEC. The NEC **does not require** that equipment grounding conductors be installed in non-metallic conduits when the line voltage of conductors is less than fifty (50) volts. (See latest version of the NEC for details)

Conductors such as loop lead-ins, pedestrian push button cable, DC interconnect cable, video detection coaxial cable, TMS communication cable, etc. have a line voltage of all conductors of less than fifty volts and therefore will not require a equipment grounding conductor.

EQUIPMENT GROUNDING CONDUCTOR SIZE

Determination of the equipment grounding conductor size shall be in accordance with the following:

- Traffic Signals – All traffic signals will require 1#8 AWG conductor in non-metallic conduits for grounding raceways and equipment.

- Lighting Systems (Or Other Systems Where The Power Conductor Size Has Been Adjusted To Compensate For Voltage Drop) – Equipment grounding conductor shall be the same size as the largest power conductor within the non-metallic conduit.

EXAMPLE PLAN NOTE

Since the contractor normally has the option of providing metal conduits where we do not specifically state non-metallic conduits, the following note is recommended for installation on the plans:

> Equipment grounding conductor shown on plans is required only if the conduit is non-metallic.

EXAMPLE PLAN LABELING FOR CONDUITS

- Traffic Signals

  2" Conduit
  4-7c
  2-2c(s)
  1#8 AWG Equipment Grounding Conductor

- Lighting Systems

  2"-3#2 & 1#2 Equipment Grounding Conductor

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Signing	**NUMBER:** MM-313
	DATE: February 24, 2003
SPECIFIC SUBJECT: Signing for Weight Restrictions of Structures	**SUPERSEDES:** TE-244
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

In order to promote safety, and uniformity in the posting of weight restrictions for structures, the following criteria has been developed based on the requirements of Section 46.2-1130 of the *Code of Virginia*, and the federal *Manual on Uniform Traffic Control Devices*.

Structures that require weight restrictions and the actual weights to be posted will be determined by the District Structure and Bridge Engineer in accordance with Structure and Bridge Division's memorandum S&B 02-27, latest revision.

Signs for structure weight restrictions shall be erected at the structure and in advance of the last alternate route. Table 2C-4 of the *MUTCD* shall be used as a guide in determining the placement distance of the signs in advance of the last alternate route. Additionally, one sign should be installed a maximum of 150 feet past the alternate route to alert traffic approaching from either direction on the alternate route. Discretion should be used in determining the effective placement of this sign. It may be desirable in some instances to place signs on the intersecting route approaches in lieu of past the alternate route to assure the signs are effective in alerting drivers to the restriction. On highways where the intersection of the last alternate route is via an interchange, signs should be installed on the alternate route for both directions.

Restricted structures on interstate and primary routes, and secondary routes that generally carry trucks with semi-trailers shall be signed using the modified R12-5 sign (copy attached). Advance signing should consist of two signs. The top sign should be similar to the M3-1 cardinal direction sign with the message BRIDGE in place of the cardinal direction, and the bottom sign should be the modified R12-5 sign. When the advance signs are installed on the alternate routes, a third sign consisting of the appropriate M6 directional arrow panel to indicate the direction of the structure shall be installed below the other two signs.

Restricted structures on secondary routes that do not generally carry trucks with semi-trailers shall be signed using the R12-1 sign. Advance signing should consist of the same signing as required above except the R12-1 sign shall be used in lieu of the modified R12-5 sign. At the District Traffic Engineer's discretion, modified R12-5 signs may be used in lieu of R12-1 signs.

When other roadways exist between the last alternate route and the restricted structure, which may generate traffic that may exceed the weight restriction, consideration should be given to posting additional signs at those intersecting locations.

All structures not signed in accordance with this memorandum shall be corrected by no later than December 31, 2003. At those locations where a modified R12-5 sign is required by this memorandum and a R12-1 sign exists, and that is the only non-conforming issue for that location, the correction date may be extended until December 31, 2005.

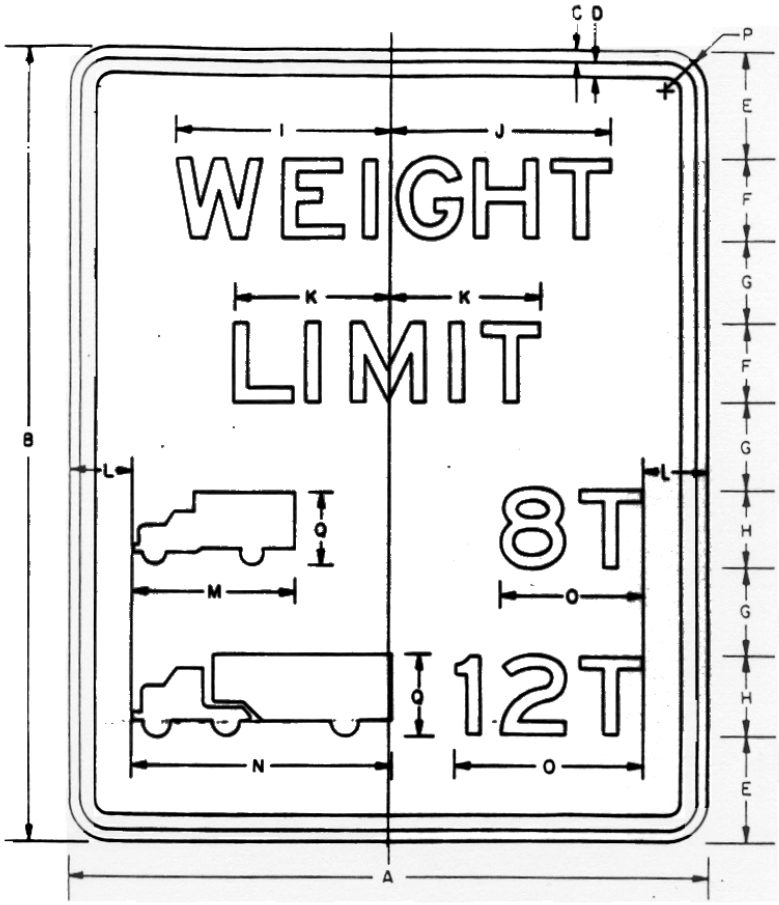
DCF/df

cc: Mr. Philip A. Shucet
Mr. Claude D. Garver, Jr., P.E.
Dr. Gary R. Allen
Mr. C. Frank. Gee, P.E.
Mr. Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca
District Structure and Bridge Engineers
District Traffic Engineers
Division Administrators
Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis

R12-5 Modified

COLORS

Message and Border.....Black (non-reflectorized)
Field.....White (reflectorized)



SIGN	DIMENSIONS (INCHES)																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
A	24	30	$\frac{3}{8}$	$\frac{5}{8}$	$4\frac{1}{8}$	3E	$3\frac{1}{4}$	3D	$7\frac{7}{8}$	$8\frac{3}{8}$	$5\frac{3}{4}$	$2\frac{1}{2}$	6	$9\frac{1}{2}$	Var.	$1\frac{1}{2}$	3
B	30	36	$\frac{1}{2}$	$\frac{3}{4}$	$4\frac{3}{4}$	4E	$3\frac{1}{2}$	4D	$10\frac{1}{2}$	$11\frac{1}{8}$	$7\frac{3}{8}$	$2\frac{3}{4}$	8	12	Var.	$1\frac{7}{8}$	4
C	36	48	$\frac{5}{8}$	$\frac{7}{8}$	$6\frac{7}{8}$	5E	$4\frac{3}{4}$	5D	$13\frac{1}{8}$	14	$9\frac{1}{8}$	3	10	15	Var.	$2\frac{1}{4}$	5
E	48	60	$\frac{3}{4}$	$1\frac{1}{4}$	$8\frac{1}{4}$	6E	$6\frac{1}{2}$	6D	$15\frac{3}{4}$	$16\frac{3}{4}$	$11\frac{1}{2}$	5	12	18	Var.	3	6

NOTES: If the weight restriction for a single unit truck is over 20 tons, the truck symbol should show tandem axles on the rear.

If the weight restriction for a tractor-trailer combination is over 30 tons, the trailer symbol should show tandem axles.

April 28, 2003

MEMORANDUM

TO: District Traffic Engineers

FROM: Raymond J. Khoury, P.E.

SUBJECT: Engine Braking and Other Noise Restriction Signs

Over the last few years, there have been several requests for engine braking restriction signs. In response, various signing initiatives have been pursued including a pilot project on Route 17 in Culpeper County. The pilot project was inconclusive in establishing whether the signs had any positive impact on noise reduction and has since been discontinued with the implementation of other truck restriction measures. Past guidance and instructions have not effectively addressed the issues from a highway safety and operations perspective and has created confusion regarding any appropriate application of such signs.

Attached is MMD Memorandum (No. MM-316) addressing Engine Braking and Other Noise Restriction Signs, which is now in effect. We have added "Other Noise Restriction Signs" in order to capture all such signs, both currently permitted and potentially coming.

Thank you in advance for your cooperation in implementing this memorandum.

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	NUMBER: MM-316
SPECIFIC SUBJECT: Engine Braking and Other Noise Restriction Signs	DATE: April 28, 2003
	SUPERSEDES:
DIRECTED TO: District Administrators	SIGNATURE: *Raymond J. Khoury, P.E.*

Continuing expansion of business and residential development along highway corridors is generating unsolicited requests for signs to counter noise problems. In response, various regulatory and warning (advisory) signs directed at eliminating or limiting certain vehicle operation practices have been installed.

The following has been considered regarding this issue:

- Properly installed and maintained engine braking and other vehicular equipment does not produce offensive or obnoxious noise levels when used responsibly
- There are no state statutes restricting the use of engine brakes
- Effectiveness of these signs at reducing noise levels has not been demonstrated
- Existing motor vehicle statutes addressing noise emitted by improperly maintained vehicles should be effective if properly enforced. Highway statutes do not address improperly maintained vehicles.

Therefore, since this issue is relative to motor vehicle regulations, and not related to traffic control or safety, the following actions shall be taken:

- Effective immediately, engine braking and other noise restriction signs are not to be installed or permitted
- Existing engine braking and other noise restriction <u>regulatory</u> signs shall be removed immediately. This may require rescinding permits and having such signs removed.
- Existing engine braking and other noise restriction <u>warning</u> signs shall be removed, as time, opportunity and other conditions deem appropriate, but no later than July 1, 2003. This may require rescinding permits and having such signs removed.

If future requests for engine braking or other motor vehicle related noise restriction measures are received, the requestor should be referred to the Department of Motor Vehicles or the applicable police agency to identify measures at their disposal to address the problem.

This issue has been discussed with the State Environmental Engineer, Mr. Earl T. Robb, the Director of Public Relations for the Department of Motor Vehicles, and the Director of the Bureau of Administrative and Support Services for the Department of State Police and each agrees with the direction that this document is setting.

cc: Mr. Philip A. Shucet
Mr. Claude D. Garver, Jr., P.E.
Dr. Gary R. Allen
Mr. C. Frank. Gee, P.E.
Mr. Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
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Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Signing	**NUMBER:** MM-314
	DATE: February 24, 2003
SPECIFIC SUBJECT: Signing for Vertical Clearances of Structures	**SUPERSEDES:** TE-244
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

In order to promote safety, and uniformity in the posting of structure vertical clearances, the following criteria has been developed based on the requirements of Section 46.2-1110 of the *Code of Virginia*, and the federal *Manual on Uniform Traffic Control Devices (MUTCD)*.

Signs shall be installed in accordance with the following chart:

SIGNING FOR VERTICAL CLEARANCES OF STRUCTURES				
ACTUAL VERTICAL CLEARANCE[1]	**SIGN LOCATIONS[2]**			
	SIGN AT STRUCTURE[3]	**SIGN AT LEAST 1500 FEET IN ADVANCE OF STRUCTURE**	**SIGN IN ADVANCE OF LAST ALTERNATE ROUTE[4, 5, 6, 7, 8]**	**SIGN 150 FEET (MAX) PAST THE LAST ALTERNATE ROUTE[8, 9]**
14'-4" to 14'-5"	✓			
13'-6" to 14'-3"	✓	✓	O	O
< 13'-6"	✓	✓	✓	S

✓– Denotes signs **shall** be installed at that location
S – Denotes signs **should** be installed at that location
O – Denotes signs **may** be installed at that location

Footnotes:
[1]As measured to the nearest inch not exceeding the actual clearance.
[2]Dual indication of signs may be needed on multi-lane roadways.
[3]At arched structures or structures under which the clearance varies greatly, two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway.

[4]Placement distance of the signs in advance of the last alternate route shall be in accordance with Table 2C-4 of the *MUTCD*.

[5]When signing in advance of the last alternate route is at least 1500 feet in advance of the structure, this signing may suffice for the sign required 1500 feet in advance of the structure.

[6]Where the advance alternate route is between the structure and the sign placed at least 1500 feet in advance of the structure, engineering judgment should be used to determine if signs at the last alternate route are needed. Decision to not install signs at the last alternate route for this situation shall be approved by the District Traffic Engineer.

[7]When other roadways exist between the last alternate route and the restricted structure, which may generate traffic that may exceed the height restrictions, consideration should be given to posting additional signs at those intersection locations.

[8]For those structures having actual vertical clearances of 13'-6" to 14'-3", sign installations at these locations may be considered depending upon the amount of truck traffic.

[9]Discretion should be used in determining the effective placement of this sign. It may be desirable in some instances to place signs on the intersecting route approaches in lieu of past the alternate route to assure the signs are effective in alerting drivers to the restriction. On highways where the intersection of the last alternate route is via an interchange, signs should be installed on the alternate route for both directions.

The vertical clearance posted on the signs shall be 3 inches less than the actual vertical clearance. W12-2 signs shall be utilized for indicating the structure vertical clearance except W12-2P signs (rectangular shape) may be used when the signs are mounted on the structure. Advance signs located on the alternate routes shall include the appropriate M6 directional arrow panel (black legend on a yellow background) mounted below the W12-2 sign to indicate the direction of the structure.

All structures not signed in accordance with this memorandum shall be corrected by no later than December 31, 2003 with the following exceptions. Existing signs that are no longer required based on the requirements of this new policy and rectangular warning signs not conforming to the requirements of a W12-2P may remain in place until maintenance replacement time.

DCF/df

cc: Mr. Philip A. Shucet
Mr. Claude D. Garver, Jr., P.E.
Dr. Gary R. Allen
Mr. C. Frank. Gee, P.E.
Mr. Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley

Mr. Roberto Fonseca
District Structure and Bridge Engineers
District Traffic Engineers
Division Administrators
Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: ROADWAY LIGHTING	NUMBER: IIM-LD-231 MM-319
SPECIFIC SUBJECT: PROCUREMENT, DESIGN AND MAINTENANCE OF LIGHTING SYSTEMS	DATE: JULY 15, 2003
	SUPERSEDES:
LOCATION AND DESIGN DIVISION APPROVAL: *Mohammad Mirshahi, PE*	
MOBILITY MANAGEMENT DIVISION APPROVAL: *Raymond J. Khoury, PE*	ASSET MANAGEMENT DIVISION APPROVAL: *James R. Smith, Jr.* Acting Director

BACKGROUND

- The 2003 General Assembly enacted legislation that amended Section 2.2-1111 of the Code of Virginia relating to procurement and design of lighting systems. This legislation requires that the Department design all lighting systems in accordance with the current Illuminating Engineering Society of North America (IESNA) standards and recommended practices. It further requires that all lighting systems utilize fixtures that minimize glare, light trespass and skyglow as defined by IESNA.

EFFECTIVE DATE

- This legislation is effective July 1, 2003; however, the Central Office Location and Design Division's Traffic Engineering Design Section has been designing lighting systems in accordance with IESNA since earlier in 2002, when it was recognized this issue needed to be addressed.

POLICY

- Any roadway lighting designed, installed or funded under the auspices of the Department must be in accordance with this legislation. This includes, but is not limited to, construction projects, lighting installed by permit, intersection lighting (including that installed by Regional Signal Contracts), etc. Typically the Central Office Traffic Engineering Design Section designs or reviews designs of others to ensure the lighting designs are appropriate.

- Because of the potential magnitude of signal projects with intersection lighting, this office is having some standard intersection lighting designs developed that may be used by the districts when including intersection lighting with their signal designs. Until these standard designs are completed and/or if a standard design does not apply to a specific intersection configuration, this office needs to review or provide designs for those locations to ensure compliance.

- Additionally, any maintenance or maintenance replacement of the lighting system must be done in a manner not to alter the integrity of the original design. Any luminaire replacement must be identical to those originally installed or a new design or design review will need to take place.

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** MM-324
	DATE: October 1, 2003
SPECIFIC SUBJECT: W16-5P, W16-6P and W16-7P Supplemental Arrow Plaques	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

The Millennium Edition of the Federal *Manual on Uniform Traffic Control Devices (MUTCD)* implemented new supplemental arrow plaques (W16-5P, W16-6P and W16-7P) to be used with warning signs.

To reduce costs while still providing adequate identification of the specific warning, the Department has decided that M5-1, M6-1 and M6-2 supplemental arrow plaques may be used in lieu of those arrow plaques. The M6-2 supplemental arrow plaque will be installed so the arrow is sloped downwards. The background color of the signs shall be either yellow or fluorescent yellow-green, as applicable, and shall match the background color of the warning sign it is supplementing.

This will allow the Department to utilize its existing inventory of screens while reducing the total square footage usage of aluminum and retroreflective sheeting. This has been discussed with the Federal Highway Administration and they have expressed an interpretation that Section 2C.43 of the *MUTCD* permits this use of the M5 and M6 series signs in lieu of the W16 series of signing.

cc: Mr. Philip A. Shucet
Don R. Askew, P.E.
Dr. Gary R. Allen
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Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca
District Traffic Engineers
Division Administrators
Mr. Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

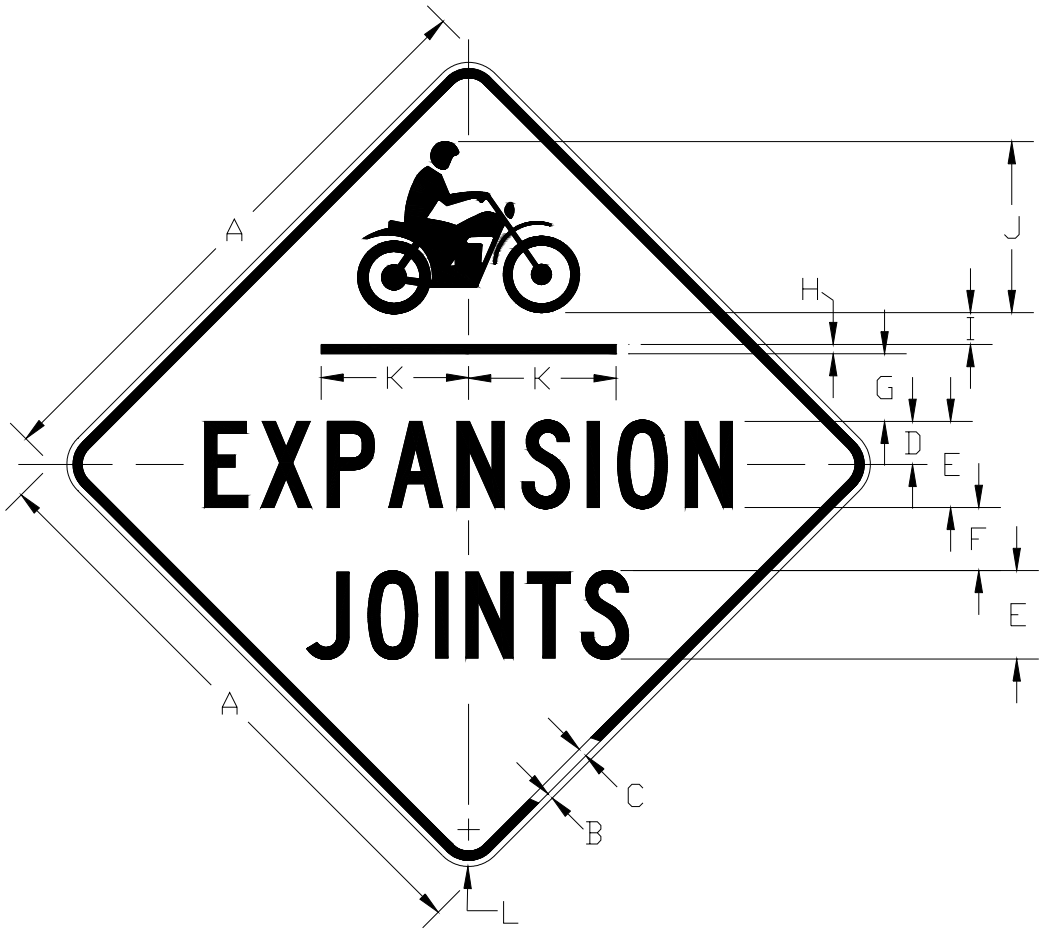
MEMORANDUM

GENERAL SUBJECT: Signs	**NUMBER:** MM-326
	DATE: January 20, 2004
SPECIFIC SUBJECT: Expansion (Across Lane) Joints on Bridge Sign	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

The Department has developed a sign to be installed in advance of a bridge to warn motorcyclists of certain expansion joints that run across the travel lane. These signs may be installed where engineering review and judgment deem it necessary, taking into consideration the joints placement, condition, or size, or the curvature of the bridge where the joint is placed.

Signs shall be fabricated in accordance with the attached design and shall be installed as the need arises.

cc: Mr. Philip A. Shucet
Don R. Askew, P.E.
Dr. Gary R. Allen
Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca
District Traffic Engineers
Division Administrators
Mr. Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis



This sign is intended for use in advance of bridges to warn motorcyclists of certain expansion joints that run across the travel lane. This sign may be installed where engineering review and judgment deem it necessary, taking into consideration the joints placement, condition, or size, or the curvature of the bridge where the joint is placed. Sign size 3 should be erected on limited access roadways, sign size 2 on primary roadways and sign size 1 on ramps, secondary roadways, or primary roadways where sufficient right-of-way does not exist for the installation of the larger sign.

SIGN SIZE	DIMENSIONS (INCHES)											
	A	B	C	D	E	F	G	H	I	J[1]	K	L
1	36	⅝	⅞	2½	5C	3¾	4	⅞	2	10½	9	2
2	48	½	¾	3½	7C	5¼	5½	¾	2½	14	12	3
3	60	¾	1⅛	4	8C	6	5½	1⅛	3	17½	15	3¾

[1] RL-150 symbol from the *Standard Highway Signs* book

COLORS

LEGEND – BLACK (NON-REFLECTIVE)
BACKGROUND – YELLOW (REFLECTIVE)

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Signs	**NUMBER:** MM-328
	DATE: December 9, 2003
SPECIFIC SUBJECT: Open Joints on Bridge Sign	**SUPERSEDES:** TE-308
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

The Department has developed a sign to warn motorcyclists of open longitudinal joints in the travel lanes on bridges for both temporary (construction) and permanent situations regardless of the roadway type/class or the posted speed. Signs shall be installed for longitudinal joints that meet both of the following criteria:

- Joint is parallel or no more than 30 degrees from parallel to the traffic lane
- Joint width is 1½ inches or greater

Sign installations should also be considered for locations where the longitudinal joints are less than 1½ inches in width.

Cold weather contraction shall be considered in the determination of the joint's width. Joints that contain joint filler are not excluded from the provisions of this memorandum since cold weather contraction may create a less than level riding surface.

These requirements are based upon recommendations provided by the Virginia Coalition of Motorcyclists.

Signs shall be fabricated in accordance with the attached design. Additional signing identifying the location of the joints (exit number, distance ahead, etc.) shall be installed beneath these signs when needed. New signs needed due to the modification of the policy by this memorandum shall be installed at known locations of open longitudinal joints no later than May 1, 2004.

cc: Mr. Philip A. Shucet
Don R. Askew, P.E.
Dr. Gary R. Allen
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Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca

District Traffic Engineers
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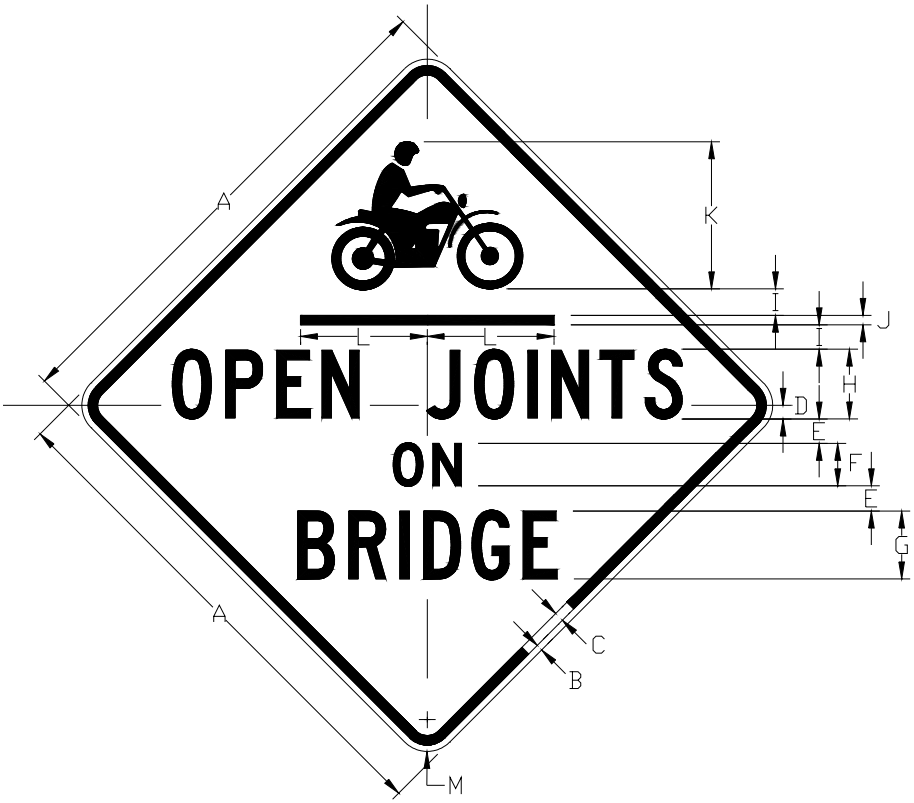
Mr. Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis



This sign is intended for use in advance of open longitudinal joints of sufficient size on bridges that may cause motorcyclists to lose control. Sign size 3 should be erected on limited access roadways, sign size 2 on primary roadways and sign size 1 on ramps, secondary roadways, or primary roadways where sufficient right-of-way does not exist for the installation of the larger sign.

SIGN SIZE	DIMENSIONS (INCHES)												
	A	B	C	D	E	F	G[1]	H[2]	I	J	K[3]	L	M
1	36	5/8	7/8	0	1¾	3D	5C	5C	2	7/8	10½	9	2
2	48	½	¾	½	2½	5D	7C	7C	2½	¾	14	12	3
3	60	¾	1⅛	1½	3	5D	8C	8C	3	1⅛	17½	15	3¾

[1] Horizontal spacing between letters is at 70% of the normal spacing for Sign Size 2.
[2] Horizontal spacing between letters is at 70% of the normal spacing for Sign Sizes 1 and 2. Horizontal spacing between words is reduced to 4½" for Sign Size 1 and 6" for Sign Size 2.
[3] RL-150 symbol from the *Standard Highway Signs* book

COLORS

LEGEND – BLACK (NON-REFLECTIVE)
BACKGROUND – YELLOW OR FLUORESCENT ORANGE (REFLECTIVE)

VIRGINIA DEPARTMENT OF TRANSPORTATION

MOBILITY MANAGEMENT DIVISION

MEMORANDUM

GENERAL SUBJECT: Signs	**NUMBER:** MM-330
	DATE: June 17, 2004
SPECIFIC SUBJECT: Commercial Vehicle Restriction Signing	**SUPERSEDES:** TE-297
DIRECTED TO: District Administrators	**SIGNATURE:** *R. J. Khoury*

The 2004 General Assembly enacted legislation amending and reenacting Section 46.2-803.1 of the Code of Virginia relating to lane restrictions for certain commercial motor vehicles on certain highways to be effective July 1, 2004. The amendments are shown in italics and strikethroughs on the attached legislation.

The specific requirements of this legislation are as follows:

- Prohibits commercial vehicles, except buses, from using the left-most lane of interstate highways having more than two lanes in each direction, regardless of the speed limit in the Eighth Planning District (equates to VDOT's Northern Virginia District) and on Interstate Route 81, except when necessary to exit the highway via a left exit.

- Prohibits commercial vehicles, except buses, from using the left-most lane of interstate highways, except Interstate Rte. 81, having more than two lanes in each direction and the speed limit is not less than sixty-five miles per hour in all districts other than the Eighth Planning District, except when necessary to exit the highway via a left exit.

- Requires commercial vehicles, except buses, to keep to the right-most lane when operating at a speed of 15 mph or more below the posted speed limit on an interstate highway with no more than two lanes in each direction.

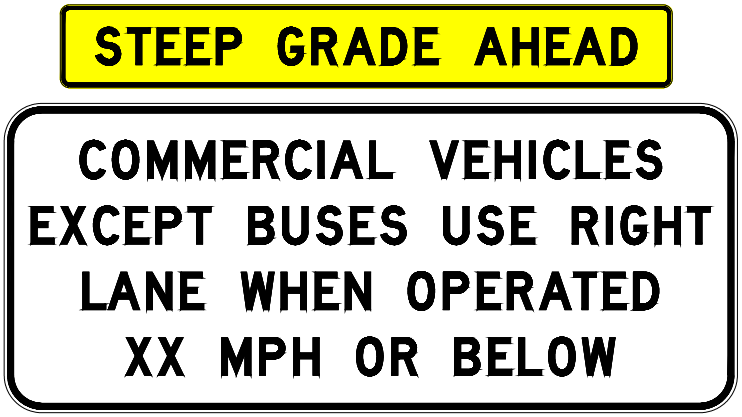
While the legislation requiring operators of commercial vehicles to keep to the right-most lane when operating at a speed of 15 mph or more below the posted speed is a statewide statutory requirement not requiring posting of signs, signs have been developed to be installed at specific uphill areas where problems might exist. The District Traffic Engineer shall determine the location of problem areas with input from the Virginia State Police.

Ground mounted sign designs are attached for use with this legislation. If there is a need to install this signing overhead, the letter series/height, and sign height/width shall be modified appropriately utilizing the same messages.

Installation of signs to comply with the modified legislation prohibiting the use of the left-most lane on sections of Interstate Route 81 having more than two lanes in each direction, regardless of the speed limit, should be accomplished as soon as possible on or after July 1, 2004. Installation of signs to comply with the modified legislation that requires keeping to the right-most lane when operating at a speed of 15 mph or more below the posted speed limit shall be installed as soon as possible after determination of problem areas.

Attachments

cc: Mr. Philip A. Shucet
Don R. Askew, P.E.
Dr. Gary R. Allen
Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca
District Traffic Engineers
Division Administrators
Mr. Kamal S. Suliman
Resident Engineers
Mr. T. F. Chu
Mr. M. D. Hagan
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis



This sign is intended to be installed in advance of select uphill grades on interstate highways having two lanes in each direction to prohibit commercial vehicles, except buses, from using the left lane when traveling at 15 mph or more below the posted speed limit. Uphill grade locations shall be those where problems exist and shall be determined by the District Traffic Engineer with input from the Virginia State Police. Signing indicating the end of this commercial vehicle restriction is not required. However, if there is an uphill left exit, signs shall be installed allowing the commercial vehicles to use the left lane to exit. In that interstate speed limits are typically posted at 55 mph, 60 mph or 65 mph, the xx mph shown above would read 40 mph, 45 mph or 50 mph, respectively.

SHAPE		**Top Sign**	**Bottom Sign**
		Horizontal Rectangle	Horizontal Rectangle
COLOR		**Top Sign**	**Bottom Sign**
	Message and Border:	Black (Non-Reflectorized)	Black (Non-Reflectorized)
	Field:	Yellow (Reflectorized)	White (Reflectorized)
SIZE		**Top Sign**	**Bottom Sign**
	Horizontal:	132"	156"
	Vertical:	18"	66"
MESSAGE		**Top Sign**	**Bottom Sign**
	Line 1:	8" D	8" D
	Line 2:	-----	8" D
	Line 3:	-----	8" D
	Line 4:	-----	8" D
MARGIN WIDTH		**Top Sign**	**Bottom Sign**
		⅜"	¾"
BORDER WIDTH		**Top Sign**	**Bottom Sign**
		⅝"	1¼"
CORNER RADIUS		**Top Sign**	**Bottom Sign**
		2"	8"

Notes: Vertical spacing between Line 1 and the border is 4" for the top sign and 6" for the bottom sign. Vertical spacing between lines of text on the bottom sign is 6".

This sign is intended to be installed to prohibit commercial vehicles, except buses, from using the left lane on interstate highways having more than two lanes in each direction and conforming to speed limit requirements as established in accordance with Section 46.2-803.1 of the Code of Virginia. Signing should be installed at the point of the restriction and at every entrance point onto the interstate highway. Signing at the point of restriction should be dual indicated unless median geometrics prevent such; e.g., median barrier with narrow shoulders. When two entrance points are in close proximity of each other (e.g., cloverleaf interchange), a single sign may be installed just beyond the last entrance acceleration lane for each direction. Sign B is intended to be used in all locations unless conditions prevent the installation of that sign at the entrance points onto the interstate highway. In those situations, Sign A has been designed for use on the ramps only to convey the message to motorists.

SHAPE		Horizontal Rectangle	
COLOR	Message and Border:	Black (Non-Reflectorized)	
	Field:	White (Reflectorized)	
SIZE		A	B
	Horizontal:	60"	108"
	Vertical:	48"	84"
MESSAGE	Line 1 Capitals:	5" D	8" D
	Line 2 Capitals:	5" D	8" D
	Line 3 Capitals:	5" D	8" D
	Line 4 Capitals:	5" D	8" D
	Line 5 Capitals:	5" D	8" D
MARGIN WIDTH		½"	¾"
BORDER WIDTH		¾"	1¼"
CORNER RADIUS		7"	9"

Notes: Vertical spacing between the message and the border is 4.25" for Sign A and 8” for Sign B. Vertical spacing between the lines of message is 3" for Sign A and 6” for Sign B.

This sign is intended to be installed at the point of the end of the commercial vehicle restriction that prevents commercial vehicles, except buses, from using the left lane on interstate highways having more than two lanes in each direction and conforming to speed limit requirements established in accordance with Section 46.2-803.1 of the Code of Virginia. This sign should not be used to follow signs restricting commercial vehicles traveling 15 mph or more below the posted speed to the right lane on interstate highways having two lanes in each direction.

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	Black (Non-Reflectorized)
	Field:	White (Reflectorized)
SIZE	Horizontal:	108”
	Vertical:	48”
MESSAGE	Line 1 Capitals:	8” D
	Line 2 Capitals:	8” D
	Line 3 Capitals:	8” D
MARGIN WIDTH		¾”
BORDER WIDTH		1¼”
CORNER RADIUS		6”

Notes: Vertical spacing between the message and the border is 5". Vertical spacing between the lines of message is 5".

This sign is intended to be installed in advance of a left exit on interstate highways where commercial vehicle restrictions have been established in accordance with Section 46.2-803.1 of the Code of Virginia. This sign should be installed as directed by the District Traffic Engineer based on the distance needed for commercial vehicles to safely merge into the left lane(s) to exit. Typically, this signing would be approximately two miles in advance of the left exit or near the point of the advance left exit signing, whichever is greatest.

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	Black (Non-reflectorized)
	Field:	White (Reflectorized)
SIZE	Horizontal:	108"
	Vertical:	66"
MESSAGE	Line 1 Capitals:	8"D
	Line 2 Capitals:	8"D
	Line 3 Capitals:	8"D
	Line 3 Capitals:	8"D
MARGIN WIDTH		¾"
BORDER WIDTH		1¼"
CORNER RADIUS		8"

Notes: Vertical spacing between the message and the border is 6". Vertical spacing between the lines of message is 6". The message 295 SOUTH on Line 3 is used as an example; the correct message shall be utilized on the sign when fabricated. Line 4 shall be modified to state the exact number of lanes that may be used to exit, e.g. USE TWO LEFT LANES. Sign width shall be adjusted as needed.

CHAPTER 809

An Act to amend and reenact § 46.2-803.1 of the Code of Virginia, relating to lane restrictions for certain commercial motor vehicles on certain highways.

[H 1346]

Approved April 14, 2004

Be it enacted by the General Assembly of Virginia:

1. That § 46.2-803.1 of the Code of Virginia is amended and reenacted as follows:

§ 46.2-803.1. Commercial motor vehicles limited to use of certain lanes of certain interstate highways.

Except where the posted speed limit is less than ~~sixty-five~~ *65* miles per hour, no person shall drive any commercial motor vehicle, as defined in § 46.2-341.4, on the left-most lane of any interstate highway having more than two lanes in each direction.

Furthermore, within the Eighth Planning District *and on Interstate Route 81*, no person shall drive any commercial motor vehicle, as defined in § 46.2-341.4, on the left-most lane of any interstate highway having more than two lanes in each direction, regardless of the posted speed limit. *Every commercial motor vehicle shall keep to the right-most lane when operating at a speed of 15 miles per hour or more below the posted speed limit on an interstate highway with no more than two lanes in each direction.*

The provisions of this section shall not apply to (i) buses or school buses or (ii) other commercial vehicles when (a) preparing to exit a highway via a left exit or (b) being used to perform maintenance or construction work on an interstate highway.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-333
	DATE: June 8, 2005
SPECIFIC SUBJECT: Warning Sign for Steel Plates	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

When steel plates are used on a roadway open to vehicular traffic, they must be marked as shown in the current Virginia Work Area Protection Manual. A warning sign shall be installed in combination with the marked plates to alert the approaching motorists in advance of the location. For rural locations, the sign should be placed 500 feet in advance of the steel plates to provide adequate warning. In urban locations, the sign should be placed a minimum of 100 feet in advance of the steel plates. Signs shall be fabricated in accordance with the attached design.

cc: Mr. Philip A. Shucet
Don R. Askew, P.E.
Dr. Gary R. Allen
Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Jeffrey C. Southard
Mr. Greg Whirley
Mr. Roberto Fonseca
District Traffic Engineers
Division Administrators
Resident Engineers
Ms. Ling Li, P.E.
Ms. K. D. Jefferson
Mr. S. D. Hanshaw
Mr. Dan Dennis

Sign A should be used whenever possible. However, if right of way or other constraints typical in urban areas prohibit the safe placement of this sign, then Sign B may be used.

SHAPE		Diamond	
COLOR	Message and Border:	Black (Non-reflectorized)	
	Field:	Yellow (Reflectorized)	
		A	**B**
SIZE	Each Side:	48"	36”
MESSAGE	Line 1 Capitals:	7" D	5" D
	Line 2 Capitals:	7" D	5" D
	Line 3 Capitals:	7" D	5" D
VERTICAL SPACING	Top and Bottom:	16.6"	13.1"
	Between Lines:	5.25"	3.75"
MARGIN WIDTH		¾"	½"
BORDER WIDTH		1¼"	¾"
CORNER RADIUS		3"	2"

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Pavement Markings	**NUMBER:** TE-334
	DATE: August 26, 2005
SPECIFIC SUBJECT: Use of Six Inch Traffic Line Markings	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury, P.E.*

The Department has developed policy statements (provided herein) regarding the use of Six Inch Wide Traffic Line Markings on certain roadways. The purpose of this policy is to establish statewide, uniform use of six inch wide traffic line markings. It is not intended to alter the interpretation of other policies or best practice statements regarding pavement markings or pavement markers.

Effective immediately, the Virginia Department of Transportation has adopted the following positions regarding the use of six inch line markings on highways:

1) When using six inch line markings on any section of highway, all line markings within that section of highway including lane lines, centerlines, and edge lines shall be six inch width.

2) The mainline of all Interstate Highways shall be marked with six inch lines. All new contracts shall include provisions to accomplish this. Existing contracts should be altered if funds are available.

3) The mainline of other high design highways should be marked with six inch lines except those short segments (approximately three miles and less) of limited access primary routes designed to take traffic around communities and built-up areas, unless the connecting non-limited access portions of that route are also marked with six inch traffic lines.

4) Any street or highway including ramps and loops to Interstates and other high design highways may be marked with six-inch traffic line markings provided that the travel lanes are a minimum of 12 feet in width.

cc: Mr. Greg Whirley
Dr. Gary R. Allen
Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Roberto Fonseca
Mr. R. W. Steeg
District Traffic Engineers
Resident Administrators
Mr. D. K. Cook

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Pavement Markings	**NUMBER:** TE-336
	DATE: November 17, 2005
SPECIFIC SUBJECT: Use of Horizontal Pavement Markings (M1-1 Rte. Shield)	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:**

On January 20, 2004 The Traffic Engineering Division, formerly Mobility Management requested an official interpretation pertaining to the use of a Horizontal Pavement Symbol Marking depicting the M1-1 Route Shield (photo example attached) from the Federal Highway Administration (FHWA). The aforementioned symbol markings are generally referred to as "Horizontal Signs". After its review, the FHWA determined that the use of the Interstate Shield (M1-1) as a "Horizontal Sign" is in compliance with Section 3B.19 of the Manual on Uniform Traffic Control Devices (MUTCD). An official interpretation number and title: "3—162 Section 3B.19 Interstate Shield Pavement Marking" was issued to VDOT, thus allowing the use of the M1-1 Interstate Route Shield as a "Horizontal Sign".

In accordance with the **Standard statement in Section 3B.19 of the 2003 MUTCD, Word and symbol markings shall be white, except as otherwise noted.** However, the official FHWA interpretation allows for the use of the colors (red & blue) on the Interstate Shield Pavement Marking Symbol. Thus, the Department's position regarding the use of the M1-1 Horizontal Sign on VDOT maintained roadways is that "Horizontal Signs" shall be the approximate shape and color (Red, White & Blue) to correctly depict the highly recognizable Interstate Shield to road users. They may be used at the District Traffic Engineer's discretion. When used, the M1-1, horizontal sign must be a minimum of 20 feet long and 5 feet 6 inches wide. Larger signs may be used, but caution must be exercised so that the width never takes up more that 70% of the lane width so that two wheeled vehicles may pass around these markings. This position statement is to establish statewide, uniform use of the M1-1 Horizontal Sign. It is not intended to alter the interpretation of other policies or best practice statements regarding pavement markings symbols in general.

Please note that the FHWA plans to develop a detailed design layout for the Interstate Shield Pavement Marking Symbol and add it to the Standard Highway Signs book in the near future so that agencies will have a fully uniform design for this symbol marking.

Effective immediately, the Virginia Department of Transportation has adopted the above position with respect to the use of the M1-l Horizontal Sign on VDOT maintained roadways.

Cc: Division Administrators
District Traffic Engineers
Regional Operation Directors
Resident Administrators
Ms. Constance. S. Sorrell
Mr. Greg Whirley
Dr. Gary R. Allen
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Ms. Barbara W. Reese
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Photo Example of a M1-1 Pavement Symbol Marking

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-337
	DATE: September 1, 2005
SPECIFIC SUBJECT: Clearview Highway Font	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *R. J. Khoury*

The Clearview Highway font was developed to provide increased visibility and reduced halation (over glow) on highway signs. The Federal Highway Administration (FHWA) has issued an Interim Approval for the optional use of this font, if a jurisdiction submits a written request. VDOT has requested and received a conditional usage statement that will allow us to transition to using Clearview font for positive contrast (white type) legends on guide signs.

Designs for positive contrast guide signs shall now be accomplished using Clearview font, if it is practical to achieve. The legend shall be spaced according to Clearview spacing tables and not E-Modified. Action word messages and cardinal directions shall remain in all upper case letters as specified in the MUTCD. A guide for converting the Standard Highway Signs (SHS) Alphabet to the Clearview font is shown below:

SHS Standard Alphabet	**Clearview "W" Series**
Series B	Clearview 1-W
Series C	Clearview 2-W
Series D	Clearview 3-W
Series E	Clearview 4-W
Series E-Modified	Clearview 5-W & 5-W-R*
Series F	Clearview 1-W

* Clearview 5-W-R has tighter letter space than 5-W and is designed for replacement of overhead guide signs in which the 5-W is too wide for the specific application.

Clearview font shall be fabricated using prismatic sheeting for the legend and permanent Type III (high intensity) or prismatic sheeting for the background. This applies to overhead and ground mounted guide signs. Clearview font may also be used on guide sign overlayments, in accordance with the same specifications and if there is adequate space on the panel.

This does not apply to signs with unique designs using non-highway fonts.

cc: Mr. Greg Whirley
Dr. Gary R. Allen
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Ms. Barbara W. Reese
Ms. Constance. S. Sorrell
Mr. Roberto Fonseca
Mr. R. W. Steeg
Division Administrators
District Traffic Engineers
Resident Administrators

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING MEMORANDUM

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-339
	DATE: January 12, 2006
SPECIFIC SUBJECT: Restricted Width Route Sign	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury*

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.

Construction/maintenance activities may 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 may 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.

The design for these signs is attached. Signs shall be installed on roadways where construction/maintenance activities exist with physical barriers on both sides of a single lane and the clear distance between edge lines is less than 14 feet.

Signs shall be installed in advance of the location where the clear width is less than 14 feet as indicated above and also in advance of the last alternate route. Table 2C-4 of the MUTCD shall be used as a guide in determining the advance placement distance of the signs. Additionally, signs should be installed on the approaches of the alternate route to alert traffic intending to turn onto the restricted route. Engineering judgment should be used in determining the effective placement of this sign. On highways where the intersection of the last alternate route is via an interchange, signs should be installed on the alternate route for both directions. When the advance signs are installed on the alternate routes, a third sign consisting of the appropriate M6 directional arrow panel to indicate the direction of the restriction shall be installed below the main sign.

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

This memorandum is effective immediately. Any existing work operations where signing is required based on this memorandum should have signs installed as soon as possible.

cc: Division Administrators
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This sign is intended to be installed on all routes where construction/maintenance operations exist with physical barriers on both sides of a single lane and the clear distance between edge lines is less than 14 feet. Sign C shall be used on limited access highways and Sign B on non-limited access highways. Sign A may be used where right-of-way is inadequate for Sign B.

SHAPE			Horizontal Rectangle		
COLOR		Message and Border:	Black (Non-Reflectorized)		
		Field:	White (Reflectorized)		
			A	**B**	**C**
SIZE		Horizontal:	42"	66"	108"
		Vertical:	30"	36"	60"
MESSAGE	Line 1	Capitals:	4" D	6" D	10" D
	Line 2	Capitals:	4" D	6" D	10" D
		Solid Bar:	⅝"	⅞"	1¼"
	Line 3	Numerals:	6" D	8" D	12" D
	Line 3	Capitals:	4" D	5" D	8" D
MARGIN WIDTH			⅜"	⅝"	¾"
BORDER WIDTH			⅝"	⅞"	1¼"
CORNER RADIUS			2"	2"	3"

Notes: Width indicated on Line 3 of the sign shall be shown in multiples of 6 inches, rounded downward; i.e., 13 feet 11 inches would be displayed as 13 FT 6 IN; 13 feet 5 inches would be displayed as 13 FT 0 IN. Vertical spacing between Line 1 and the border is 2.8" for Sign A, 2" for Sign B and 3.8" for Sign C. Vertical spacing between Lines 1 and 2 is 3" for Sign A, 4" for Sign B and 7" for Sign C. Vertical spacing between the solid bar and both Lines 2 and 3 is 2.5" for Sign A, 2.1" for Sign B and 4.1" for Sign C. Length of the solid bar is 36" for Sign A, 54" for Sign B and 90" for Sign C.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Traffic Signs	**NUMBER:** TE-340
	DATE: January 12, 2006
SPECIFIC SUBJECT: Speed Limit and Fine Signs in Work Zones	**SUPERSEDES:** MM-317
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury*

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.

Selection of work zones for this initiative is at the District Traffic Engineer's discretion. 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.

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 District Traffic Engineer

Signing for this initiative shall conform to the attached drawings. In addition, a WORK ZONE sign is required to be installed above the speed limit signs in work zones where either increased fines apply or where speed limits are being reduced.

This memorandum is effective immediately for work zones being established. Existing work zones, where the construction signing is already in place, do not need to be modified to conform to this memorandum.

cc:

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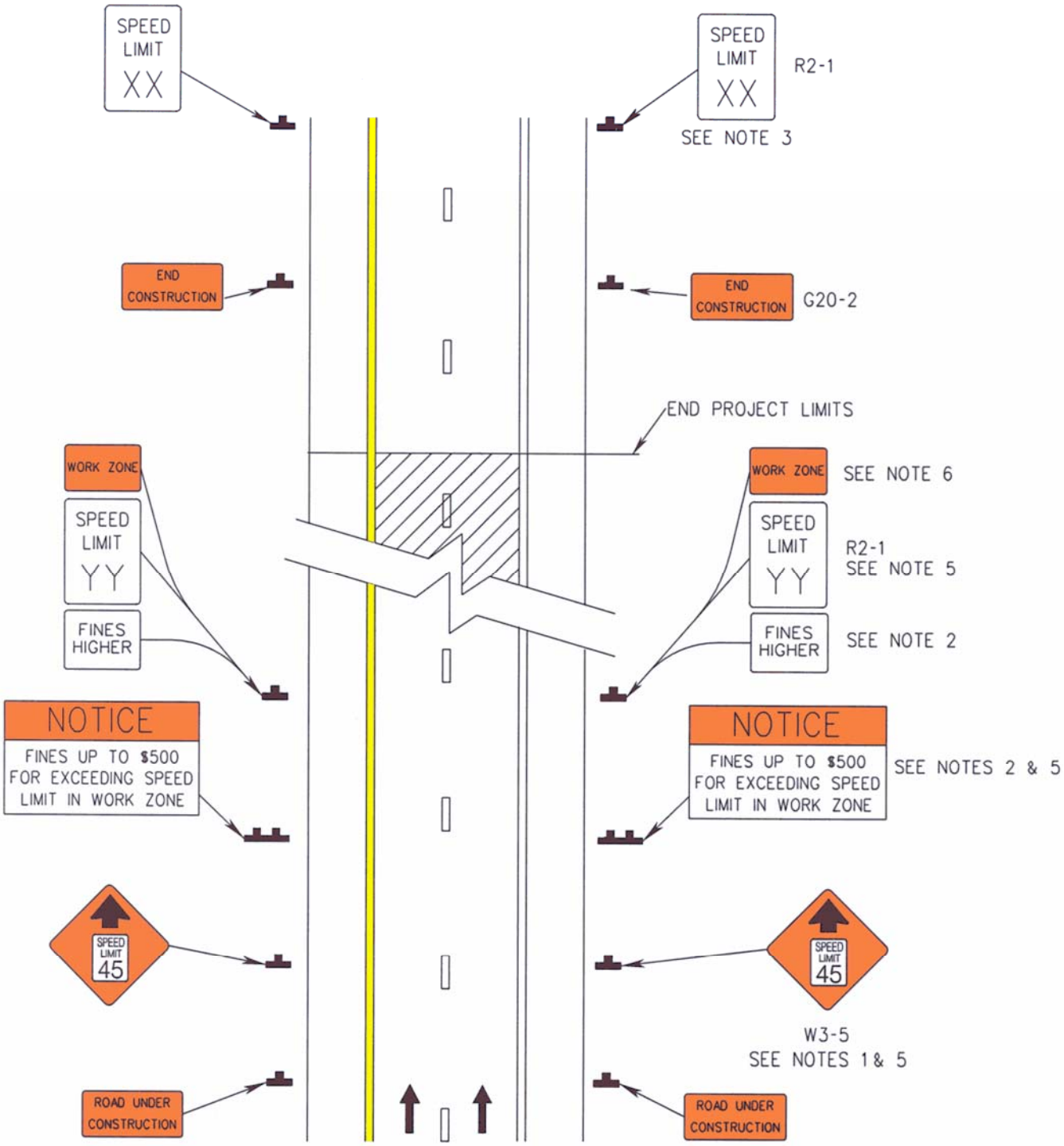
Ms. Barbara W. Reese
Mr. Roberto Fonseca



SPEED LIMIT AND FINE SIGNS IN WORK ZONES

NOTES
(Speed Limit and Fine Signs in Work Zones)

1. W3-5 signs only required if speed limit is being reduced in the work zone. An existing REDUCED SPEED AHEAD sign (R2-5a) may be used in lieu of this sign in order to utilize the existing stock but not beyond December 31, 2008. Mixing of the signs shall not occur on an approach.

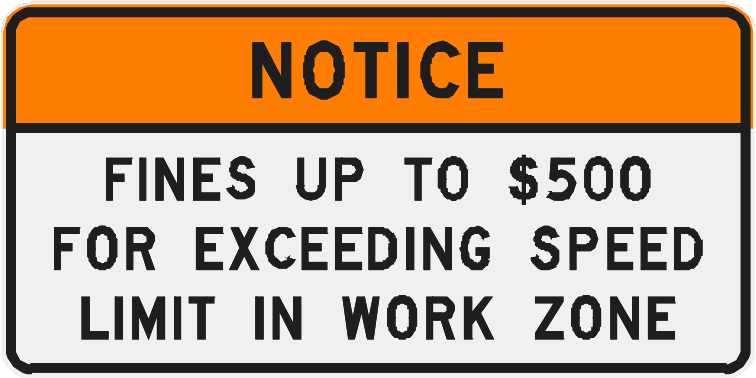
2. NOTICE - FINES UP TO $500 FOR EXCEEDING SPEED LIMIT IN WORK ZONE and FINES HIGHER signs are only required when the work zone has been selected for increased fines. An existing NOTICE – $500 MAXIMUM FINE FOR EXCEEDING SPEED LIMIT IN WORK ZONE sign may be used in order to utilize the existing stock; however, mixing of the signs shall not occur on an approach.

3. If the entire project is signed for a reduced speed and an original speed limit sign is not within 1000 linear feet of the END CONSTRUCTION sign, signs depicting the original speed limit shall be erected 500 feet (plus or minus) past the END CONSTRUCTION sign. On secondary route highways with unposted speed limits, an END XX SPEED LIMIT (VR-5) sign shall be used in place of erecting an R2-1 sign. If only part of the project is signed for a reduced speed, then the original speed limit shall be posted 500 feet (plus or minus) past the end point of the reduced speed.

4. Sign spacing shall be in accordance with the established distances as prescribed in the *Virginia Work Area Protection Manual* based on the type of facility and speed limit. In addition, on divided facilities, the signs should be double indicated.

5. Experience has shown that compliance to work zone speed limits is greater if the Reduced Speed Limit (W3-5) (if used), NOTICE – FINES UP TO $500 FOR EXCEEDING SPEED LIMIT IN WORK ZONE and the Speed Limit (R2-1) signs are placed as close to the work as possible, as opposed to placement prior to the advance warning signs (ROAD WORK AHEAD, etc.).

6. The use of the WORK ZONE sign with the Speed Limit (R2-1) sign installed on portable sign stands is not required. This is due to the increased potential for the sign stand to tip over and/or skate along the roadway.



This sign is intended to be used in work zones where the $500 maximum fine regulation is in effect. Sign A shall be used on Secondary and Minor Primary road systems and Sign B on Major Primary and Interstate road systems.

SHAPE		Horizontal Rectangle	
COLOR	Line 1		
	Message and Border:	Black (Non-Reflectorized)	
	Field:	Fluorescent Orange (Reflectorized)	
	Lines 2 through 4		
	Message and Border:	Black (Non-Reflectorized)	
	Field:	White (Reflectorized)	
		A	**B**
SIZE	Horizontal:	66"	108"
	Vertical:	42"	54"
		A	**B**
MESSAGE	Line 1 Capitals:	6" E	6" E
	Solid Bar:	1"	1"
	Line 2 Capitals:	4" C	6" D
	Line 3 Capitals:	4" C	6" D
	Line 4 Capitals:	4" C	6" D
		A	**B**
MARGIN WIDTH		½"	½"
BORDER WIDTH		1"	1"
CORNER RADIUS		3"	4"

NOTES: Vertical spacing between Line 1 and the top border/solid bar is 2¼" for Sign A and Sign B. Vertical spacing between Line 2 and the solid bar is 4¼" for Sign A and 5¾" for Sign B. Vertical spacing between Lines 2, 3, and 4 is 3½" for Sign A and 5" for Sign B. Vertical spacing between Line 4 and the bottom border is 4¼" for Sign A and 5¾" for Sign B.

This sign is intended to be installed above all speed limit signs used in work zones. Sign A shall be used with 24" width speed limit signs, Sign B with 36" width speed limit signs and Sign C with 48" width speed limit signs.

SHAPE		Horizontal Rectangle		
COLOR	Message and Border:	Black (Non-Reflectorized)		
	Field:	Fluorescent Orange (Reflectorized)		
		A	**B**	**C**
SIZE	Horizontal:	24"	36"	48"
	Vertical:	9"	12"	12"
MESSAGE	Line 1 Capitals:	3" C	5" C	6" C
MARGIN WIDTH		⅜"	½"	½"
BORDER WIDTH		⅜"	½"	½"
CORNER RADIUS		1½"	1½"	1½"

NOTE: Spacing of the message for Sign B shall be 70% of the normal spacing.

R2-6

The standard R2-6 sign is intended to be used below the speed limit signs in work zones where the $500 maximum fine regulation is in effect. These signs shall not be used unless a separate sign is in place in the work zone indicating the $500 maximum fine is in effect. The 2004 Standard Highway Sign book provides dimensions for 24", 36" and 48" signs to be used with the same standard width speed limit signs.

CODE OF VIRGINIA

§ 46.2-878.1. Maximum speed limits in highway work zones; penalty.

Operation of any motor vehicle in excess of a maximum speed limit established specifically for a highway work zone, when workers are present and when such highway work zone is indicated by appropriately placed signs displaying the maximum speed limit and the penalty for violations, shall be unlawful and constitute a traffic infraction punishable by a fine of not more than $500.

For the purposes of this section, "highway work zone" means a construction or maintenance area that is located on or beside a highway and marked by appropriate warning signs or other traffic control devices indicating that work is in progress.

Nothing in this section shall preclude the prosecution or conviction for reckless driving of any motor vehicle operator whose operation of any motor vehicle in a highway work zone, apart from speed, demonstrates a reckless disregard for life, limb, or property.

(1992, c. 462; 1995, c. 54; 2003, c. 839.)

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Pedestrian Signals	**NUMBER:** TE-341
	DATE: March 6, 2006
SPECIFIC SUBJECT: Accessible Pedestrian Signals	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *Raymond J. Khoury*

The Department has developed "*Guidelines for the Retrofit Installation of Accessible Pedestrian Signals".* The purpose of this guideline is to establish a statewide, uniform methodology for retrofitting existing pedestrian signals with accessible pedestrian signals for the visually impaired in accordance the latest MUTCD. It is not intended to alter the interpretation of other policies or best practice statements regarding the accessible pedestrian signals.

The guideline was studied and prepared by the Virginia Transportation Research Council and was requested to be made into this memoranda by the Traffic and Safety Research Advisory Committee (TASRAC).

A copy of the "*Guidelines for the Retrofit Installation of Accessible Pedestrian Signals"* is available at the following web site:

http://www.virginiadot.org/business/trafficeng-default.asp

cc: Division Administrators
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Resident Administrators
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Mr. Malcolm T. Kerley, P.E.
Ms. Barbara W. Reese
Mr. Robert Fonseca
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GUIDELINES FOR THE RETROFIT INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS

Virginia Department of Transportation
Traffic Engineering Division

I. INTRODUCTION

An accessible pedestrian signal (APS), which is used in conjunction with standard pedestrian signals, makes signal information accessible to blind, visually impaired, and other disabled persons by providing information in a non-visual format, typically audible tones, verbal messages, and/or vibrotactile surfaces.

These guidelines provide the Virginia Department of Transportation (VDOT) a process with which to assess and evaluate the need to install (retrofit) an APS at an existing intersection. The goal is that all requests for APS installation receive a fair and equal assessment, that funds are expended in the most effective manner, and that all installations are undertaken as quickly as possible. The guidelines also provide information on the type of APS equipment to deploy and procedures for installing it. The goal is to install the most suitable equipment uniformly throughout the state and to ensure that the required and best installation procedures are followed.

The guidelines describe a process in which an intersection must first meet particular basic requirements in order to be considered for an APS. Then, if an APS is justified, an intersection must be evaluated to determine first hand the needs of the requesting blind or visually impaired individual, the estimated cost of installation, and the intersection's need for an APS relative to other intersections for which an APS has been requested. The scores received in the evaluation determine this relative need and, if needed because of limited funding, can be used to develop a prioritized list of intersections to be funded. Once the installation is scheduled, guidance is provided on the type of equipment to deploy and on procedures for installing it.

It should be noted that different guidelines that are not yet developed might be applicable at new intersections or at intersections undergoing major improvements.

II. BASIC REQUIREMENTS

1. There must be a formal request and a demonstrated need for an APS (as evidenced by Requirement 2).

2. The attached "Request for the Installation of Accessible Pedestrian Signals Form" must be completed and submitted to the appropriate VDOT District Traffic Engineer. Anyone having difficulty completing the form will be given the appropriate assistance needed either to complete it or to submit the required information. The requestor should be a blind or visually impaired individual or a person or agency filing on his or her behalf.
3. The intersection must be signalized and equipped with pedestrian signals on the crossing for which APS is being requested. The following procedure should be followed in implementing this basic requirement:

    a. If the intersection is signalized and the crossing for which APS is being requested is equipped with pedestrian signals, proceed with its evaluation.

    b. If there are plans for the installation of pedestrian signals on the crossing for which APS is being requested, revise them (unless shown to be an undue hardship) to include APS. In this case, the intersection need not be evaluated. If there is undue hardship, install the pedestrian signals without APS as planned and proceed with its evaluation.

c. If there are no pedestrian signals on the crossing for which APS is being requested and no plans for them, conduct a traffic engineering study at the intersection to determine if pedestrian signals are warranted. If warranted, include the appropriate APS when the pedestrian signals are installed. The intersection need not be evaluated.

4. The attached "Accessible Pedestrian Signal Evaluation Form" must be completed as instructed for intersections requiring an evaluation. The form can be used by any office by writing in the appropriate contact information or revised electronically with the contact information.

III. FUNDING PROCESS

Generally, intersections approved for APS retrofit are funded on a "first come, first served" basis unless the funds are depleted. If the funds are depleted, the approved intersections are put on hold or carried over to the next funding cycle (typically a fiscal year). The new funds are distributed first to the carried over intersections based on a priority established by an evaluation score and then to any new intersections for which requests are received and approved. This basic process is repeated year after year. There is an exception involving intersections carried over into a third funding cycle that is explained in the following comprehensive explanation of the process.

More specifically, when a request for an APS retrofit installation is received, it is checked against the basic requirements. If the intersection is approved and requires an evaluation, a team is assembled to visit the intersection to conduct the evaluation. (The evaluation process is described later.) Funds are then allocated to the intersection based on an estimated cost, and the retrofit is scheduled for design and installation. This first come, first served process is repeated until the funding is depleted. At that point, further requests are evaluated and then put on hold or carried over until funding becomes available from the next funding cycle (typically at the beginning of the next fiscal year). Once the new funds are received, they are allocated to the carried over intersections based on a prioritized list established by the evaluation scores. If funds still remain after being distributed to the prioritized list, further requests for APS retrofit installations are once again funded, designed, and scheduled for implementation on a first come, first served basis until the funds are depleted. Again, further requests are evaluated and then put on hold or carried over until new funding becomes available.

The exception to this process is when intersections are carried over into a third funding cycle (typically the third fiscal year). Any such intersections will receive first priority for the funds, with their existing evaluation scores used if need be. They will not be combined with intersections that received approval during the second funding cycle (typically fiscal year), that is, were over only one cycle.

For the first year of the program only, an initial period of three months will be allowed to publicize and promote the APS program, assemble existing APS requests, collect an initial round of requests, and conduct intersection evaluations. After the three-month period, an initial prioritized list of intersections to receive APS retrofit installations should be developed, and then the procedures described in these guidelines should be followed.

IV. INTERSECTION EVALUATION

A. Overview of Procedure

Once a request is received for an APS and it is determined that the intersection meets the basic requirements and needs to be evaluated, an evaluation team should be assembled to visit the

intersection and conduct the evaluation described later in order to derive a priority score. This evaluation should be conducted within one month of the date the written request was received.

Team members should include the requesting blind or visually impaired person, an orientation and mobility specialist (possibly from the Virginia Department of Blind and Visually Impaired, and the VDOT District Traffic Engineer or designated representative. Both the local VDOT Resident Engineer and a representative from the local city, town, or county should be invited to be a member of the evaluation team and included if they accept. Finally, the requesting blind or visually impaired individual may, at his or her discretion, invite others to participate in the evaluation as a member of the evaluation team.

During the intersection visit, members of the evaluation team should thoroughly discuss all possible solutions to address the crossing needs of the requesting blind or visually impaired person. These discussions should include, but not be limited to, minor intersection improvements, installation of new crosswalks, installation of pedestrian signals with APS on crossings for which APS are not being requested, consideration of the needs of other potential blind or visually impaired individuals, and consideration of the intersection's characteristics after improvements are made.

At any point deemed appropriate and at the discretion of the VDOT District Traffic Engineer, an intersection may be reevaluated to account for changes that would influence the evaluation score and hence the ranking on the prioritized list. Similarly, if a significant amount of time elapses between the intersection's evaluation and the design or installation of the APS system, the VDOT District Traffic Engineer should ensure that there is a continued need for the APS. For example, the requesting blind or visually impaired person may have relocated since submitting the request.

B. Background on Evaluation Methodology

If the specified basic requirements are met, an APS should be installed at the requested intersection after an evaluation is undertaken. The evaluation will determine first hand the needs of the requesting blind or visually impaired person, the estimated cost of installation, and the intersection's need for an APS relative to other intersections for which an APS has been requested. Should funding be limited, the evaluation process will be used to prioritize multiple requests for installations to determine an appropriate order of the expenditure of funds and the design/installation of the retrofit APS. When this happens, new funds will be distributed and installations scheduled at intersections based on the scores received in the evaluation process.

A logical process to compare intersections should include an evaluation of factors that impact the ability of a blind or visually impaired pedestrian to cross an intersection and that specifically address the needs of the requesting party. Some factors are more important than others, and the evaluation process should allow the evaluation team to distinguish and account for this distinction through the use of the point system. The following factors will be used to establish a prioritized list of intersections to receive funding and to be scheduled for an APS installation in the case of limited funding. More details on the factors and the rating methodology to be used are provided in the next section.

Accessible Pedestrian Signal Evaluation Factors	
Evaluation Factor	**Brief Description**
1. Configuration of Intersection	Skewed, offset, lacking particular straight through movements
2. Width of Crossing	Width of approach used by requesting party
3. Maximum Posted Speed Limit on Street to Be Crossed	Maximum posted speed limit on street to be used by requesting party
4. Special Traffic Conditions I	Heavy right-turn volumes and right-turn signals or arrows
5. Special Traffic Conditions II	Free flow right-turn lane (with or without a right-turn island)
6. Special Pedestrian Signal Conditions	Lead or exclusive pedestrian phases, mid-block exclusive pedestrian signals
7. Proximity of Intersection to Key Facilities	Distance to pedestrian generators or attractors
8. Need to Cross by Visually Impaired	Work- or school-related trip purpose by requesting party
9. Time in Queue	Length of time intersection has been waiting for funding based on time since request
10. Other Special Traffic and Mobility Conditions	Catchall to account for other concerns, especially if low volumes are a problem

C. Details on Evaluation Factors and Rating Methodology

The following factors and rating methodology should be used to evaluate intersections for which an APS installation has been requested and that have met the basic requirements. The evaluation team should review this methodology, employ it when conducting an intersection evaluation, and complete the attached "Accessible Pedestrian Signal Evaluation Form." If needed due to limited funding, the total score tallied should be used to rank the intersection on a prioritized list of intersections that have been approved for APS installation.

It is very important to re-emphasize that the application of these factors and this rating methodology, and thus the scoring and point systems contained therein, are applied equally to all intersections. The final score is used only to establish a relative ranking of intersections that have already been approved for an APS; that is, the absolute value of the score has no bearing on the earlier justification process.

1. Configuration of Intersection

The number of approaches to an intersection and the geometric design (offset, skewed, etc.) can affect the ability of the blind or visually impaired pedestrian to cross the roadway safely. The blind or visually impaired pedestrian listens for the traffic going straight through the intersection that is close and parallel with the crosswalk being traversed to guide his or her passage across the roadway. Accordingly, when an intersection's configuration is skewed, offset, or does not have particular straight through movements (as is the case in a three-leg tee intersection), a crossing can become unsafe for the blind or visually impaired pedestrian. Points are assigned if there is no straight through traffic parallel with the crossing to be used by the requesting party or if the traffic is not close enough to be heard.

Configuration of Intersection	Points
No straight through traffic flow parallel with crosswalk to be used by requesting party or traffic not close enough to be heard	15

2. Width of Crossing

Wider streets are more difficult for the blind/visually impaired pedestrian to safely cross. Points are assigned on the basis of the width of the crossing to be used by the requesting party. Crossing width is measured from the curb at the embarkation point to the curb at the destination point. Islands and medians should be included in the total crossing distance even if they are equipped with separate pedestrian actuators. Efforts should be made to permit blind/visually impaired pedestrians to cross in one continuous movement. Traffic signal timings should be extended to accommodate a full crossing. Divided streets with or without a pedestrian actuator in the median should be handled as a single crossing, with the width measured across the entire street.

Width of Crossing to Be Used by Requesting Party (feet)	**Points**
40 or less	2
41 to 52	4
53 to 68	6
69 to 78	8
79 or more	10

3. Posted Speed Limit on Street to Be Crossed

The speed of approaching traffic reflects the capability of approaching drivers to stop for pedestrians clearing the intersection as the traffic signals and pedestrian signals change. Points are assigned on the basis of the maximum posted speed limit on the street to be used by the requesting party. More points are assigned for higher speeds.

Maximum Posted Speed Limit on Street to Be Used by Requesting Party (mph)	**Points**
0 to 25	1
26 to 30	2
31 to 35	3
36 to 40	4
41 or more	5

4. Special Traffic Conditions I

There are special conditions found at intersections that are related to traffic flow and signals and signal timings that may hinder the capability of a blind/visually impaired pedestrian to cross the street. These conditions include heavy right-turn volumes (≥ 40 vehicles in the peak hour or the existence of a right turn lane) from the street parallel to the crossing and right-turn signals or arrows. Accordingly, points are assigned if these conditions impact the crossing to be used by the requesting party.

Special Traffic Conditions I	**Points**
Heavy right-turn volumes (≥ 40 vehicles in peak hour) from street parallel with crossing or right-turn signals or arrows that impact crossing to used by requesting party	15

5. Special Traffic Conditions II

Particular special conditions at intersections are related to geometric features that may hinder the capability of a blind or visually impaired pedestrian to cross the street. One of the most critical is a free flow right-turn lane (with or without a right-turn island). Special care must be taken when installing an APS to mitigate the problems associated with this

condition. Accordingly, points are assigned if this condition impacts the crossing to be used by the requesting party.

Special Traffic Conditions II	Points
Free flow right-turn lane (with or without a right-turn island) that impacts crossing to used by requesting party	15

6. Special Pedestrian Signal Conditions

Particular special conditions at intersections are related to pedestrian signals that may hinder the capability of a blind or visually impaired pedestrian to cross the street. These conditions include the presence of a lead pedestrian phase, an exclusive pedestrian phase, or a mid-block exclusive pedestrian signal. Accordingly, points are assigned if any of these conditions impacts the crossing to be used by the requesting party.

Special Pedestrian Signal Conditions	Points
Lead pedestrian phases, exclusive pedestrian phases, or mid-block exclusive pedestrian signals that impact crossing to be used by requesting party	15

7. Proximity of Intersection to Key Facilities

An APS system should be considered at intersections that are close to facilities that attract or generate significant amounts of pedestrian traffic. An APS would improve the safety and mobility of the blind or visually impaired pedestrian and make these facilities more accessible. Examples are medical, educational, social, recreational, commercial, shopping, public, governmental facilities, and transit stops. Pedestrian demand is based in part on how close the intersection is to these facilities; i.e., the closer a facility, the more the demand. Likewise, points are assigned based on the closeness of these facilities to the intersection; i.e., the closer a facility, the more the points. In the case of multiple facilities, points should be assigned using the closest facility to the proposed APS deployment site. An estimate of 400 ft can be used an average block length.

Proximity of Intersection to Key Facilities	Points
4 to 6 blocks	2
3 blocks	4
2 blocks	6
1 block	8
At subject facility	10

8. Need to Cross by Visually Impaired

A blind or visually impaired pedestrian has a trip purpose or reason for every crossing needed. Although all trips are important, those related to work/employment or school are considered much more important. Accordingly, points are assigned if the need to cross is related to work/employment or school.

Need to Cross by Visually Impaired	Points
Need to cross is related to work/employment or school	15

9. Time in Queue

APS retrofit installations should be undertaken as soon as possible, and this factor enhances the score of intersections that have been waiting the longest to be funded. Points are assigned based on when during the fiscal year the request for an APS retrofit installation was received. More points are assigned as the wait time increases. As noted previously, once an intersection is carried over the second year (into the third year),

however, it is automatically placed on a priority list to receive funding regardless of how its score compares with the scores of intersections requested during the second fiscal year.

Time in Queue	**Points**
Month in fiscal year request received	
July	24
August	22
September	20
October	18
November	16
December	14
January	12
February	10
March	8
April	6
May	4
June	2

11. Other Special Traffic and Mobility Conditions

This factor is intended to provide the orientation and mobility specialist on the evaluation team an opportunity to add 15 points based on special conditions not adequately covered by previous factors or based on special needs of the requesting party. In particular, the orientation and mobility specialist should consider adding the points if traffic volumes are so low as to result in crossing conditions that are a problem for the requesting party.

Other Special Traffic and Mobility Conditions	**Points**
Special traffic and mobility conditions	15
Comments:	

V. EQUIPMENT

Unless site-specific factors dictate otherwise, the APS equipment installed at the intersection should have the characteristics described in this section of the guidelines. Any exceptions should be left to engineering judgment, and the VDOT District Traffic Engineer should most likely be the one to make the decision for an exception.

A. Description of Main APS Unit

The basic APS unit should be a pushbutton integrated unit with a raised (tactile) arrow that vibrates when the walk signal is on. The unit should have a locator tone, a walk tone, and the capability of providing a voice message, with all sounds typically coming directly from a speaker in the unit. The pushbutton should be a minimum of 2 in (51 mm) across in one dimension and should contrast visually with its housing or mounting[2]. The following are specific details of its operation.

Pushbutton Locator Tone

The APS unit should have a locator tone at the pushbutton to alert the visually impaired user of its presence and location. The locator tone should be similar to the walk tone if one is used for the walk indication; however, it should repeat at a slower rate. The locator tone can best be defined as a tick or percussive tone; a buzz, cuckoo, beep, or chirp is not considered acceptable for the walk interval. It should have a duration of 0.15 sec or less and should repeat at 1-sec intervals[1]. The locator tone should always operate during the "Don't Walk" interval of the pedestrian signal and during the flashing "Don't Walk" interval[2] if the countdown feature is not being used. See the later section that describes this additional feature. The locator tone should be deactivated if the traffic signal is in a flashing operation[1] or if the pedestrian signal system is otherwise inoperative[2]. The locator tone should have the following characteristics:

1. Tones should consist of multiple frequencies with a dominant component at 880 Hz.[2]

2. The volume measured at 36 in (915 mm) from the pedestrian signal device should be 2 dB minimum and 5 dB maximum above ambient noise level[2] with a maximum of 89 dB[1] and should be responsive to ambient noise level changes.

3. Tones should be audible 6 to 12 ft (1.8 to 3.7 m) from the pushbutton or to the building line, whichever is less[1].

Confirmation of Pedestrian Signal Timing Activation

Once a pedestrian locates and engages the pushbutton, a confirmation light should come on to confirm that a request has been received and that pedestrian signal timing has been activated. In order to provide this confirmation to a visually impaired pedestrian, some form of immediate audible indication should be emitted, e.g., a beep, tick, or other percussive tone. A pushbutton information message may also serve as this confirmation if it starts immediately upon engaging the pushbutton. See the later section that describes this additional feature.

Walk Interval Tone

The walk tone of the APS unit should be similar to the locator tone except that it should repeat at a faster rate. The tone is best defined as a tick or percussive tone; a buzz, cuckoo, beep, or chirp is not considered acceptable for the walk interval. The duration of the tone should be 0.15 sec and should repeat at intervals of 0.15 sec[2]. The unit should have the capability of emitting the selected sound for as long as the walk signal is on at the pedestrian signal head. The walk interval tone should have the following characteristics:

1. Tones should consist of multiple frequencies with a dominant component at 880 Hz.[2]

2. The volume measured at 36 in (915 mm) from the pedestrian signal device should be 2 dB minimum and 5 dB maximum above ambient noise level[2] with a maximum of 89 dB[1] and should be responsive to ambient noise level changes.

Walk Interval Voice Message

The APS unit should have the capability of emitting a voice message during the walk interval for as long as the walk signal is on at the pedestrian signal head. The words and their meanings must be clear and concise and correctly understood by the visually impaired user. The basic model to be used for the message is[3]:

- "Howard. Walk sign is on to cross Howard" walk message for Howard Street).

- "Walk sign is on for all crossings" (walk message for intersections with exclusive pedestrian phase).

The voice message should normally be used for the walk interval. Its volume measured at 36 in (915 mm) from the pedestrian signal device should be 2 dB minimum and 5 dB maximum above ambient noise level[2] with a maximum of 89 dB[1] and should be responsive to ambient noise level changes.

Vibrating Tactile Arrow

The APS unit should have a raised (tactile) arrow that is installed to point parallel with the direction of travel on the crosswalk. It should vibrate during the walk interval. The arrow can be part of or above the pushbutton or located on top of the unit.

The arrow should be raised at least 1/32 in (0.8 mm) and should be at least 1½ in (38 mm) in length. The arrowhead should be open at 45 degrees to the shaft and should be 33 percent of the length of the shaft. Stroke width should be from 10 to 15 percent of the length of the arrow. The arrow should contrast with the background[2].

B. Additional Features

The APS unit should provide the following optional features.

Pushbutton Information Message

A pushbutton informational speech message should advise the visually impaired user of the need to wait for a walk signal. The message can also provide information about other features at the intersection. The message should be activated immediately upon engaging the pushbutton or upon pushing and holding it up to but not more than 0.5 sec. The volume of the message measured at 36 in (915 mm) from the pedestrian signal device should be 2 dB minimum and 5 dB maximum above ambient noise level[3] with a maximum of 89 dB[2] and should be responsive to ambient noise level changes. Once activated, the information message should repeat itself until being immediately truncated by the initiation of the walk interval tone or message. The term "wait" should always be used[2]. Examples of messages are the following[3]:

- Model pushbutton message: *Wait to cross Howard at Grand.*

- Model pushbutton message for intersections having an exclusive pedestrian phase with right turns-on-red prohibited: *Wait to cross Howard at Grand. Wait for red light for all vehicles.*

- Model pushbutton message for intersections having an exclusive pedestrian phase with right turns-on-red permitted: *Wait to cross Howard at Grand. Wait for red light for all vehicles. Right turn on red permitted.*

- Model pushbutton message for angled crosswalks: *Wait to cross Howard at Grand. Crosswalk angles right.*

- Model pushbutton message for crosswalks to medians where a second button push is required: *Wait to cross Howard at Grand. Short WALK phase. Raised (or cut-through) median with second pushbutton.*

- Model pushbutton message for signalized crosswalks to splitter islands: *Wait to cross right turn lane to island for Howard and Grand crosswalks.*

If the information message is activated immediately upon engaging the pushbutton, this message may serve as confirmation to the visually impaired pedestrian that his or her request was received and that pedestrian signal timing was activated.

Pedestrian Countdown

The APS unit should be capable of providing a voice message countdown for the visually impaired pedestrian. The pedestrian signal head may have a pedestrian interval countdown display to inform sighted pedestrians of the number of seconds remaining until the termination of the pedestrian change or clearance interval. This display typically accompanies the flashing raised stop hand in the pedestrian head. The intent is simply to inform pedestrians of the timing of the clearance interval so they can make practical decisions regarding either entering the crossing or speeding up their walk rate to ensure clearing the crosswalk prior to the onset of traffic flow. The APS unit provides this capability via a voice message.

Audible Beaconing

The APS unit should be capable of providing beaconing. *Beaconing* is defined as providing directional orientation (homing) to a visually impaired pedestrian through the use of an audible sound or signal. The volume of the walk message or tone and the subsequent sound that occurs during the flashing or change interval (either the locator tone or the countdown message) may be increased. The system could also be set such that the sounds alternate back and forth from one end of the crosswalk to the other. The system may also have a separate speaker oriented in line with the appropriate crosswalk to focus the sound.[3]

Beaconing may be needed at intersections having skewed crosswalks or irregular geometry such as multiple legs, at crosswalks longer than 70 ft (unless another APS is installed in an existing median), and at crosswalks used by a visually impaired pedestrian with a severe veering problem. It is not appropriate at locations with free right turns or split phasing[3].

VI. INSTALLATION PROCEDURES

A. Manual on Uniform Traffic Control Devices for Streets and Highways

Sections 4E.06 and 4E.09 of the MUTCD provide guidance on accessible pedestrian signals[1].

B. Miscellaneous Practices

The following practices should be followed to ensure successful installation of APS at an existing intersection.

Coordination with Requesting Citizen

Meeting with the visually impaired citizen who requested the APS to determine his or her specific needs and concerns is a critical first step to a successful installation. (Note that this is required in Section IV.) Likewise, it is critical to meet with him or her after the APS

is first installed to provide instruction on how to use the APS and, if needed, to fine-tune its operation.

Location of APS Pushbuttons

Successful operation of the APS is highly dependent on the pushbutton being installed at the appropriate specific location. Information on proper location is provided in both the MUTCD[1] and the NCHRP synthesis and guide to best practices regarding APS[4].

Removal of APS Units Not Being Used

Once VDOT district staff learns that an APS unit is no longer needed at a location (e.g., the user has moved), immediate steps should be taken to disengage the unit and remove it for use at another site. Since there is no practical way that VDOT can routinely monitor usage, non-usage will typically be reported by adjacent residents or business owners (primarily via complaints) or possibly by social service agencies. In addition, VDOT maintenance crews responding to equipment problems might determine that an APS is not being used.

Rest in Walk Operation

At intersections where the pedestrian signal on certain crossings (primarily on the side or minor street) "rests" in the "Walk" interval, the APS walk interval indications should operate for only one timing cycle when the pushbutton is activated; i.e., the APS pushbutton should normally "rest" in locator tone operation unless a pedestrian actually pushes the button and calls for the APS walk interval.

REFERENCES

1. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways,* Part 4: Highway Traffic Signals, Chapter 4L: Pedestrian Control Features, Section 4E.06: Accessible Pedestrian Signals, Section 4E.09: Accessible Pedestrian Signal Detectors. Washington, D.C., 2003.

2. The Access Board. *Draft Guidelines for Accessible Public Rights-of-Way*, June 17, 2002. http://www.access-board.gov/rowdraft.htm#1106. Accessed December 10, 2004.

3. Barlow, J.M., Bentzen, B.L., and Tabor, L.S. *Accessible Pedestrian Signals: Synthesis and Guide to Best Practice*. An Interim Product Prepared for National Cooperative Highway Research Program Project 3-62 Guidelines for Accessible Pedestrian Signals. Transportation Research Board, Washington, D.C., 2003.

ATTACHMENT A

ACCESSIBLE PEDESTRIAN SIGNAL EVALUATION

ACCESSIBLE PEDESTRIAN SIGNAL EVALUATION FORM		
Location:		
Date:	Day:	Time of Day:
Weather Conditions:		
Evaluation Team Members:		
Specific Needs of Requesting Party:		

EVALUATION FACTOR	**POINTS**
1. Configuration of Intersection	

Points are assigned if the intersection's configuration causes there to be an absence of straight through traffic that is parallel to the crossing to be used by the requesting party or that is close enough to be heard. For example, the intersection may be skewed, offset, or does not have certain straight through movements (as is the case in a 3-leg tee intersection). Accordingly, if there is *no* straight through traffic flow that is parallel with the crosswalk to be used by the requesting party or close enough to be heard, assign 15 points.

Comments:

2. Width of Crossing to Be Used by Requesting Party		
Width (feet)	Points	Comments:
40 or less	2	
41 to 52	4	
53 to 68	6	
69 to 78	8	
79 or more	10	

3. Maximum Posted Speed Limit on Street to be Used by Requesting Party		
Speed (mph)	Points	Comments:
0 to 25	1	
26 to 30	2	
31 to 35	3	
36 to 40	4	
41 or more	5	

4. Special Traffic Conditions I	
If there *are* heavy right-turn volumes (≥ 40 vehicles in the peak hour or the existence of a right-turn lane) from the street parallel with the crossing or right-turn signals or arrows that impact the crossing to used by the requesting party, assign 15 points. Comments:	
5. Special Traffic Conditions II	
If there *is* a free flow right-turn lane (with or without a right-turn island) that impacts the crossing to be used by the requesting party, assign 15 points. Comments:	
6. Special Pedestrian Signal Conditions	
If there *are* lead pedestrian phases, exclusive pedestrian phases, or mid-block exclusive pedestrian signals that impact the crossing to be used by the requesting party, assign 15 points. Comments:	
7. Proximity of Intersection to Key Facilities	
Proximity to Facility / Points / Comments: 4 to 6 blocks — 2 3 blocks — 4 2 blocks — 6 1 block — 8 At the Facility — 10 (Use 400 feet as an estimate of an average block length.)	
8. Need to Cross by Visually Impaired	
If the requesting party's need to cross *is* related to work/employment or school, assign 15 points. Comments:	

9. Time in Queue		
Month in fiscal year request received	Points	
July	24	
August	22	
September	20	
October	18	
November	16	
December	14	
January	12	
February	10	
March	8	
April	6	
May	4	
June	2	
10. Other Special Traffic and Mobility Conditions		
If special traffic and mobility conditions *do exist* as determined by the Orientation and Mobility Specialist (including intersections at which traffic volumes are so low as to result in crossing conditions that are a problems for the requesting party), assign 15 points. Comments:		
TOTAL POINTS		
Additional Comments by Evaluation Team:		

ATTACHMENT B

REQUEST FOR THE INSTALLATION OF ACCESSIBLE PEDESTRIAN SIGNALS FORM

Requesting Party's Name:
_____
(Blind or visually impaired pedestrian)

Address:
_____City:_____
_

State: _____Zip Code: _____

Telephone (Home): _____ Telephone (Work): _____

I request that the Virginia Department of Transportation install Accessible Pedestrian Signals (APS) to cross _____ (*route number/street name*) at the intersection of _____ and _____ in _____ *(city, town, or county).*

Please describe the difficulty you have in crossing:
_____
_____
_____
_____

Signature: _____ Date: _____

Please call _____ at _____ with questions and/or mail form to:

<u>For Office Use Only</u>

Date Received: _____ Received by: _____

a. If the intersection is signalized and the crossing for which APS is requested is equipped with pedestrian signals, evaluate the intersection.
b. If there are plans to install pedestrian signals on the crossing, revise them (unless shown to be undue hardship) to include APS and do not evaluate the intersection. If undue hardship, install pedestrian signals without APS as planned and evaluate the intersection.
c. If there are no pedestrian signals on the crossing and there are no plans for pedestrian signals, conduct a study to determine if pedestrian signals are warranted. If warranted, include appropriate APS when pedestrian signals are installed, and do not evaluate the intersection.

Evaluation Date: _____ Evaluation Team: _____
_____
_____
_____

Recommendations: _____

Signature (District Traffic Engineer): _____

Date: _____

Signature (District Civil Rights Manager): _____

Date: _____

Attach Evaluation Sheets and All Supporting Documentation.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zones	**NUMBER:** TE-342
	DATE: April 24, 2006
SPECIFIC SUBJECT: Lane Encroachment and Center Lane Closure Policy for Work Zones on Limited Access Highways	**SUPERSEDES:**
DIRECTED TO: District Administrators	**SIGNATURE:** *R. J. Khoury*

The following policy regarding acceptable lane encroachments and lane closures for limited access highways is effective immediately. This policy is meant to consider the critical operational flow of traffic through work zones and the related safety aspects of performing work operations.

1. **Lane encroachment for work activity shall not result in a travel lane width of less than 11 feet, except as follows:**

   a. **Operations less than three consecutive day/night periods at the same location -** Lane encroachment resulting in a travel lane width of at least 10 feet may be used for intermediate-term stationary operations such as milling/paving operations. The restriction should be limited to the areas where the work activities are occurring by moving the channelizing devices out as the work progresses.

   b. **Operations longer than three consecutive day/night periods at the same location –** For long-term stationary operations such as construction projects, a travel lane width no less than 10 feet may be allowed only when an assessment is made and documented by the District Traffic Engineer. This assessment must demonstrate that if not allowed, traffic delays and back-ups will create unacceptable safety factors and/or road network failure. Such assessment shall consider as a minimum, traffic volumes, vehicle mix, speed, capacity, and type of operation.

2. **When any center lane must be closed for work activity, an additional adjoining lane(s) on one side shall be closed also, such that through traffic is not split.** The center lane closure may encroach on the remaining lanes in accordance with the provisions of Item 1.

3. **A center lane shall not be closed when work is performed in an adjacent lane unless the provisions of Item 1 can not be met.**

cc: Division Administrators
District Traffic Engineers
Regional Operation Directors
Resident Administrators
Ms. Constance. S. Sorrell
Mr. Greg Whirley
Dr. Gary R. Allen
Malcolm. T. Kerley, P.E.
Ms. Barbara W. Reese
Mr. Roberto Fonseca

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zone Safety	**NUMBER:** TE-345
SPECIFIC SUBJECT: Work Zone Traffic Control Training Procedures	**DATE:** Sept. 21, 2007 **SUPERSEDES:**
LEARNING CENTER DIVISION APPROVAL: *Barbara Patterson*	**TRAFFIC ENGINEERING DIVISION APPROVAL:** *R. J. Khoury.*
DIRECTED TO: District Administrators Division Administrators	

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

To ensure compliance with this requirement of the Work Zone Safety and Mobility final rule, a multi-disciplined Work Zone Safety Training Committee (WZSTC) was established. Through their efforts, the attached Work Zone Traffic Control Training procedures were developed.

To assist in the implementation of these procedures, Work Zone Traffic Control Training Champions have been identified in each district and affected division, and will be working with the Learning Center Division and the WZSTC to plan and accomplish the initial training of personnel no later than July 1, 2009.

Enclosure:

Cc: Regional Operations Directors
Regional Traffic Engineers
Resident Administrators
District HR Managers
Ms. Constance S. Sorrell
Mr. Greg Whirley
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca
Mr. E. D. Arnold

WORK ZONE TRAFFIC CONTROL TRAINING PROCEDURES

PURPOSE:

The following procedures provide direction for training requirements for personnel involved in the planning, designing, supervising, implementation, inspection and maintenance of work zone traffic control. These procedures include 1) identifying responsibilities of the Department and Training Providers; 2) providing a method for submittal, review, and evaluation of training courses for qualification as an approved work zone traffic control training course and a process for periodic reevaluation of each course for continued approval or removal from the approved course list; 3) providing description of the different categories of training, the content requirements for each category course, and the category of training necessary for different responsibility duties; and 4) providing training instructor qualifications.

AUTHORITY:

Federal-Aid Policy Guide 23 CFR Parts 630J and 655F (Federal Regulations).

SCOPE:

Training courses approved in accordance with this procedure shall be the only training accepted as meeting the standards for qualifying persons to plan, design, implement, inspect, and/or supervise the selection, placement, or maintenance of work zone traffic control plans and devices in work zones on streets and highways within the Commonwealth of Virginia State Highway System right of way. Unless an earlier date is specified, persons possessing current valid and verifiable wallet cards and documented in the VDOT Virtual Campus from these approved courses on or after July 1, 2009 shall be the only personnel approved to plan, design, or oversee work on the maintenance of traffic activities for which they have been trained.

REFERENCES:

- The Virginia Work Area Protection Manual;
- Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD);
- VDOT Road and Bridge Standards;
- VDOT Road and Bridge Specifications;
- ATSSA Quality Standards for Temporary Traffic Control Devices.
- VDOT Material Division Instructions

BACKGROUND:

Work zone traffic control is an important function necessary in providing a safe environment in those areas where workers and transportation modes may compete for common or adjacent space. Every reasonable effort should be made to reduce the risk of injury to both the worker and the transportation system user in these areas of potential conflicting interests. In order to achieve this goal, proper training of personnel

involved in the planning, designing, supervising, implementations, inspections, enforcement and maintenance of work zone traffic control is necessary. These responsibilities generally fall into one of the four training areas of responsibilities: 1) the Roadway Design area; 2) the Roadway Construction area; 3) the Roadway Operations area; and Law Enforcement.

The State Traffic Engineer is responsible for implementing these program requirements. To that end, the State Traffic Engineer has established a ***Work Zone Safety Training Committee (WZSTC),*** consisting of representatives appointed by the State Traffic Engineer from the Department's Learning Center, Location and Design, Contract and Scheduling, Local Assistance, Asset Management, and Traffic Engineering Division, and from the Federal Highway Administration (FHWA), the Virginia Transportation Construction Alliance (VTCA) and others approved by the State Traffic Engineer. This committee shall be chaired by the Work Zone Safety Program Manager. This committee's functions include making recommendations on procedures, standards, and specifications involving work zone traffic control training issues, the review of training courses for approval that are submitted in compliance with this procedure, and the review and approval of Work Zone Safety Training instructor qualifications.

DEFINITIONS:

Department - The Commonwealth of Virginia Department of Transportation.

District - Any of the Department's administrative subdivisions that are headed by a District Administrator.

Region – Any of the Department's administrative subdivisions that are headed by a Regional Operation Director.

WZSTC - The Department's Work Zone Safety Training Committee as established by TE Memorandum 345.

May - This is a permissive condition. It is used to identify allowable alternatives.

Shall - This is a mandatory condition or requirement.

Should - This is an advisory condition. This refers to the recommended or preferred process to be followed.

Training Provider - One who assumes the responsibility of providing the financial support, training materials, and training for Department approved Work Zone Traffic Control Training course(s).

Closed Course – An approved course whose registration and attendance is restricted by the training provider.

Open Course – An approved course open for any to register and attend.

ATSSA – The American Traffic Safety Services Association

1. RESPONSIBILITIES

(A) Department:

The WZSTC shall:

(1) Have direct responsibility for the processing, evaluation and approval of the work zone traffic control training course material and instructors in accordance with this procedure submitted by training providers.

(2) Prescribe work zone traffic control training requirements for Department employees and any other persons performing work within the State Highway System right of way.

(3) Furnish training course information and requirements to District and Division WZTC Training Champions to coordinate delivery of training.

(4) Review and provide recommendations for approval of plans for implementation and resourcing.

(5) Document all students' course training in the VDOT Virtual Campus by: student name, course category, course date, course location, providers' name, instructors' name, pass/fail status, date when training is required and provide all students with a wallet size card after successful completion of the course.

(6) Ensure the implementation of approved training courses by monitoring classes as needed and perform periodic reviews of course evaluations and perform an annual evaluation of the program.

(B) Training Provider:

The Training Provider shall:

(1) Submit self developed Training Courses to the WZSTC for review and approval or utilize an existing VDOT developed course.

(2) Provide training in the appropriate category.

(3) Update course when notified and resubmit for approval.

(4) Provide documentation of instructor qualifications.

(5) Furnish course material for each student.
(6) Provide at least the minimum training that is required by this procedure for category approved.

(7) Submit a course roster of completed training courses to the Chairman of the WZSTC within 30 days of completion of the course as well as the original student evaluation form of the course and the instructor and a ***VDOT Training Form 7A***.

(8) Submit a class schedule listing date, time, location, and category of training a minimum of ninety days for VDOT personnel only, or four weeks prior for a closed class, and eight weeks prior for an open class to the WZSTC chairman. Other than classes for VDOT personnel, alterations to these submittal time frames must be made in writing and approved by the WZSTC chairman. **Any training courses may be monitored by WZSTC members or their representatives.**

2. COURSES REVIEW AND EVALUATION

2.1 Upon receipt of the training course the WZSTC or a review subcommittee chosen by the WZSTC shall review the course content, method of instruction, and conformance to Department standards and determine the appropriate category of the training course and determine its approval or disapproval. This review should be completed within 30 calendar days of receipt of the information.

2.2 The WZSTC shall forward to the course Training Provider all general comments regarding the approval or disapproval of the pending training course. The course shall be approved by the WZSTC before the Training Provider may schedule and implement any training of personnel that work within the State Highway System right of way.

2.3 Review and approval of course updates or revisions shall follow the same evaluation schedule.

3. APPROVED COURSES

3.1 The State Traffic Engineer's Office shall maintain a list of approved courses and Training Providers. The official list of approved courses, category descriptions, and addresses of course Training Providers and approved instructors are provided on the Department's Web site at:

External customers: http://www.vdot.virginia.gov/business/trafficeng-default.asp
VDOT personnel: http://www.vdot.virginia.gov/business/virtualcampus.asp

3.2 A minimum of one current copy of each approved course's materials and accompanying documentation shall be maintained by the chairperson of the WZSTC (or his/her designee) including approval dates for the original course and all subsequent revisions.

3.3 The Training Provider is responsible for submitting and monitoring courses to assure that course updates are performed every two years or as determined by the WZSTC. Failure to keep a course current and updated may result in the course Training Provider having it's course removed from the approved course list.

3.4 When courses are identified by the WZSTC as needing updating, the chairperson shall advise the Training Provider in writing of the pending removal of its course from the approved course list if the course is not made current. If the Training Provider does not update the course to meet the training requirements of this procedure and submit the update for review by the WZSTC within two months, the chairperson shall advise the State Traffic Engineer and/or the Chief Engineer's Office that the course shall be removed from the approved course list or to hold such action pending an ongoing review of a course revision.

3.5 Records and course materials for those courses removed from the approved course list shall be maintained by the WZSTC for a period of four years. Personnel trained utilizing such courses while they were in approved status shall be considered as having met the training requirements of this procedure.

4. TRAINING REQUIREMENTS

4.1 The objective of these training courses is to provide persons involved with Work Zone Traffic Control responsibilities with constant and consistent education based on their job function to ensure that Department standards are followed in planning, designing, supervising, implementing, evaluating, enforcing and maintaining work zone traffic control.

4.2 Work zone traffic control plans, Maintenance of Traffic, Sequence of Construction and/or temporary traffic control devices shall not be designed, implemented or installed in the field unless performed by or under the direct supervision of a person who has satisfactorily completed the training requirements prescribed herein.

4.3 All designated Department employees, contractors, consultants, permit, utility, or any other appropriate person responsible for work zone traffic control planning, design, implementation, inspection, and/or for supervising the selection, placement, or maintenance of traffic control schemes and devices in work zones on the State Highway System right of way shall satisfactorily complete the training requirements of this procedure in the appropriate category of

involvement in accordance with the authority identified in the Authority section and Traffic Engineering Division memorandum TE-345.

4.4 The Department shall require documentation in VDOT's Virtual Campus of successful completion of a Work Zone Traffic Control training course. This requirement is included in such documents as construction, maintenance, design or inspection contracts, specifications, special provisions, and permits.

4.5 This procedure does not apply to Law Enforcement Officers providing services on construction/maintenance projects. Specific work zone safety training requirements for law enforcement personnel are covered in Section 7 of these directions.

5. TRAINING CATEGORIES

5.1 To satisfy the Department's training requirements, the WZSTC identified three training categories for Work Zone Traffic Control training courses. Listed below for each of these three categories are the job descriptions that would necessitate training. However, regardless of whether an individual's job description is mentioned specifically, for each work site within the highway ROW in Virginia, the entity performing the work shall provide at least one trained person so that during work activities impacting traffic there is someone at each site who has received at least the Basic training class.

(A) Basic Work Zone Safety Training

(1) This one day course is required for all persons with duties that include any of the following **Maintenance** Type activities:

(a) Direct responsibility for placement of work zone traffic control devices;

(b) Direct responsibility for field maintenance of work zone traffic control devices;

(c) VDOT Maintenance Managers.

(B) Intermediate Work Zone Safety Training

(1) This two day course is required for all persons with the following **Construction** type duties:

(a) Inspection of the placement or operational function of work zone traffic control devices;

(b) Construction Supervisory responsibilities;

(c) Maintenance of Traffic Coordinators on construction projects;

(d) Regional Traffic Engineering Work Zone Safety Coordinators;

(e) Regional Safety Engineers (ES&H);

(f) Traffic Control Supervisors;

(g) Personnel with responsibility for the development of work zone safety policies and procedures.

(C) Advanced Work Zone Safety Training

(1) This two day course is required for personnel with responsibility or authority for the **Design and/or Review** of work zone traffic control requirements to be implemented. These positions include the following:

(a) The roadway design or bridge engineer responsible for the work zone traffic control plan development;

(b) The drafting or electronic generation of work zone traffic control plans;

(c) Residency permits personnel charged with reviewing and approving work zone traffic control.

5.2 Training for Basic, Intermediate, and Advance category levels, are required every 4 (four) years for all persons to continue to be qualified to perform their assigned duties. (See Table 5.1, WZ Traffic Control Training Requirements)

5.3 Upon successful completion of a training course, each individual shall receive a wallet size card, reflecting the student's name, the provider's name and ID #, the instructor's name, the course category, the date the course was successfully completed and the issuance date, and the date training, or a refresher course, is required. Certificates may also be issued at the option of the Training Provider.

Table 5.1, WZ Traffic Control Training Requirements

Area of Responsibilities	Training Required	ATSSA Certification Required	Minimum Required
Maintenance	Basic	No	One per work site
Contractor (non-supervisory)	Basic	No	One per work site

Utilities	Basic	No	One per work site
Maintenance Contract Monitors	Basic	No	All
Construction Inspection	Intermediate	No	At least one per project
Contractors (Supervisory)	Intermediate	No	At least one per project
Regional WZS Coordinator	Intermediate	Yes	All
ES&H Safety Engineer	Intermediate	Yes	All
Traffic Control Supervisor (Special Provision)	Intermediate	Yes	All
Contract Monitor	Intermediate	No	One per Residency
VDOT Land Development/Permit	Intermediate	No	One per Residency
Traffic Control Plan/MOT Designers	Advanced	No	One per design team

6. SUBMITTAL AND EVALUATION OF SPONSOR/ PROVIDER TRAINING COURSE CRITERIA AND INSTRUCTOR QUALIFICATIONS

6.1 The basic, intermediate, or advanced work zone safety training courses may be purchased from the Department, or a self developed training course meeting the following criteria and approval process may be used:

6.2 Submit Work Zone Traffic Control (WZTC) training courses (Basic, Intermediate, Advanced) to the Department's Work Zone Safety Training Committee for review and approval. The WZSTC (or review subcommittee) shall review the course content, method of instruction, and the appropriate category of course training prior to approving its use in training of personnel that work within the State Highway System right of way. The sponsor shall meet all training course requirements contained in this procedure and receive an approved trainer identification number before performing Work Zone Traffic Control training in the State of Virginia.

6.3 Training Providers requesting the WZSTC to evaluate a training course shall submit one copy of course material, lesson plan, instructor resume, workshop exercises, and accompanying documentation of their course to:

VDOT
WZS Program Manager
Room 208
1401 E. Broad Street
Richmond, VA 23219

6.4 Minimum qualification requirements for an instructor for:

(1) **Basic:** Successful completion of the Intermediate or Advanced Course with a current valid and verifiable wallet card as well as successful completion of VDOT's Flagger Certification Program or ATSSA's Flagger Instructor Training course with a current valid and verifiable wallet card and successful completion of the Department's Basic Instructor Course (BIC) or two years of documented experience in conducting training courses. In addition, an instructor shall possess two years of appropriate work zone experience for specific work zone activities in one or more of the following: Highway Design; Construction; Maintenance or Traffic Operations

(2) **Intermediate:** Successful completion of the ATSSA Traffic Control Supervisor (TCS) VDOT course with a current valid and verifiable wallet card as well as successful completion of VDOT's Flagger Certification Program with a current valid and verifiable wallet card or successful completion of the ATSSA Flagger Instructor Training course with a current valid and verifiable wallet card and successful completion of the Department's Basic Instructor Course (BIC) or two years of documented experience in conducting training courses. In addition, an instructor shall possess a minimum of two years of appropriate work zone experience for specific work zone activities in one or more of the following: Highway Design; Construction; Maintenance, Utilities or Traffic Operations.

(3) **Advanced:** Successful completion of the ATSSA Traffic Control for Design Specialist (TCDS) VDOT course with a current valid and verifiable wallet card as well as successful completion of the Department's Basic Instructor Course (BIC) or two years of documented experience in conducting training courses. Documentation describing the instructor's knowledge, skills, and abilities detailing his/her involvement in using the following State of Virginia documents: ***Design Standards, Plans Preparation Manual***, **current edition of the *Virginia Work Area Protection Manual***, and ***VDOT Standard Specifications*** for work zone applications. In addition, an instructor shall possess a minimum of two years of appropriate work zone experience for specific work zone activities in one or more of the following: Highway Design; Construction; Maintenance; Utilities or Traffic Operations

(4) Provide documentation of training experience, qualifications and a copy of the instructor's current valid wallet card or ATSSA certification number if required.

(5) The WZSTC has the authority to review and approve or reject specific courses and/or instructors not meeting the above minimum requirements. If the WZSTC determines the course/instructor provides valid, qualified

training, the WZSTC may waive this training requirement. This waiver will require a two-thirds vote by the full WZSTC membership.

6.4.1 The Department shall provide a copy of the course evaluation sheet and an examination to the Course Training Provider. The Training Provider shall provide course materials for the following courses:

Basic – Work Zone Safety Guidelines for Temporary Traffic Control pocket guide, a notebook containing a copy of the slides used in the PowerPoint presentation, written workshop exercises, a course/instructor evaluation sheet, and an examination.

Intermediate – VDOT Virginia Work Area Protection manual, a notebook containing a copy of the slides used in the PowerPoint presentation, written workshop exercises, a course/instructor evaluation sheet, and an examination.

Advanced – VDOT Virginia Work Area Protection manual, a notebook containing a copy of the slides used in the PowerPoint presentation, written workshop exercises and plan sheets, a course/instructor evaluation sheet, and an examination.

The instructor shall follow the VDOT lesson plan or one that was submitted to and approved by the WZSTC.

6.5 Training shall be offered in up to three (3) categories: Basic, Intermediate, or Advanced. In order to successfully complete Basic Training, the instructor shall determine that the trainee has demonstrated knowledge and proficiency in flagging operations. Successful completion of the Basic, Intermediate or Advanced training course by the student shall consist of classroom training, problem solving, and a written test with a score of 80% or greater. Higher course categories may be substituted for lower course categories.

A student failing to make a passing score on the test may take a makeup test after 24 hours. Sponsors/Providers must contact the WZSTC chairman to receive a copy of the makeup test. A second failure will require the student to attend the training course again prior to retesting.

6.6 Prerequisites:

(1) Basic Training
No experience necessary;

(2) Intermediate Training
No experience necessary;

(3) Advanced Training

Hands on experience (preferably two years) in work zone traffic control or responsible for work zone traffic control plan development;

(4) Refresher Training

Work Zone Traffic Control training shall be renewed every four years by attending and successfully passing an approved training course in a given category based on a person's work zone job responsibilities.

6.7.1 Course Content - The minimum requirements for each course shall be as follows:

6.7.2 Basic WZS Training – Approximately seven (7) hours of classroom instruction on the Virginia Work Area Protection Manual and part 6 of the MUTCD and students participating in a workshop exercise selecting and setting up a sample work zone. A written test shall consist of at least 10 questions on traffic control devices, and 30 questions on the minimum design standards for traffic control on the State Highway System for maintenance type operations. See Appendix A for a Basic WZS Training Course outline.

6.7.3 Intermediate WZS Training – Approximately fourteen (14) hours of classroom instruction on the VA WAPM and Part 6 of the MUTCD and students participating in workshop exercises selecting and setting up two sample work zones. Flagging operations shall be covered in enough detail that a person who successfully completes this course is capable of providing basic training as described above. A written test shall consist of at least 15 questions on traffic control devices, and 30 questions on the minimum design standards for traffic control on the State Highway System for construction type operations. See Appendix A for an Immediate WZS Training Course outline.

6.7.4 Advanced WZS Training – Approximately fourteen (14) hours of classroom instruction on the ***VA WAPM, MUTCD,*** and ***Virginia's Road and Bridge Standard Specifications***. The minimum advanced training classroom and field MOT review areas to be covered shall be an in-depth and comprehensive review of the ***VA WAPM,*** design exercises and problem solving of MOT on traffic control plans. Participating in design work samples of rural multilane, urban multi-lane, interstate, high volume multi-access urban multi-lane, and traffic control plan exercises that include the design of an MOT traffic plan (that requires special treatment not covered in the ***MUTCD*** or the ***Design Standards***) and plan exercises that contain dysfunctional elements that require problem solving is required. A written test shall consist of at least 20 questions on traffic control devices, and 30 questions on the minimum design standards for traffic control on the State Highway System. See Appendix A for an Advanced WZS Training Course outline.

6.8 Wallet Card for Completion for Basic, Intermediate, or Advanced Training.

6.8.1 Successful completion of a course is based on a passing score of 80% or greater and successful completion of class exercises. Upon successful completion of a training course, each individual shall receive from the Department a wallet size card, which shows the student's name, the provider's name and ID #, the instructor's name, the course category, the date the course was successfully completed, the issuance date, and the expiration date.

6.9 Periodic Evaluation and Course Update

6.9.1 The WZSTC may occasionally require all Training Providers to update their course content due to major changes in the Department's policy, such as the issuance of new ***Design Standards*** or work zone safety revisions/changes. Upon notification by the WZSTC chairman, the changes shall be incorporated into the course, but will not require resubmittal by the Training Provider unless requested by the WZSTC chairman.

6.10 Students' Training Documentation

6.10.1 Training Providers shall maintain a listing of all students' course training by: student name, course category, course date, course location, provider's name, instructor's name, pass/fail status and date when training or a refresher course is required and be able to provide the documentation to the WZSTC upon request.

6.10.2 Documentation of all students' course training for Basic, Intermediate, and Advanced courses shall be accomplished by the course instructor on VDOT **Training Form 7A**, and forwarded to the WZSTC chairman within one month after the date the course is taught for entry into the VDOT University Virtual Campus.

6.10.2.1 Listings for Work Zone Traffic Control Training are in the Department's Learning Management System: VDOT University Virtual Campus. Each class listed begins with Work Zone Traffic Control followed by the category Basic, Intermediate, or Advanced:

Example: Work Zone Traffic Control: Basic, etc.

6.11 Courses for training categories shall be stand alone. Any higher category may be substituted for a lower course category. (Example: Basic Training requirements can be met by completing the Intermediate or Advanced Training courses.)

7. TRAINING

7.1 This entire procedure addresses availability of training for work zone traffic control for both Department and non-Department personnel and can be found on the Department's Web site at:

http://www.vdot.virginia.gov/business/trafficeng-default.asp

7.2 Law Enforcement Officers shall successfully complete an approved on-line work zone safety training course on the Learning Management System developed especially for the type of duties and responsibilities required by them prior to working within a highway construction or maintenance work zone.

8. FORMS

8.1 Training Form 7A is available on the Department's web site at:

http://www.vdot.virginia.gov/business/virtualcampus.asp

WORK ZONE TRAFFIC CONTROL TRAINING
Appendix A

Work Zone Traffic Control: Basic Course Outline

Introduction – Module 1

Reference: VDOT WZ Statistics, Work Area Protection Manual, Introduction

- Welcome/Expectations/House Rules
- Course Overview/Agenda
- Work Zone Statistics
- WAPM Definitions
    - Standard
    - Guidance
    - Option
    - Support
    - Engineering judgment
    - Documentation

Liability and Risk – Module 2

Reference: Course Notebook, Pocket Guide

- Four elements of tort liability
- Tort Liability Awards
- Ten steps to minimize liability

Work Zones – Module 3

Reference: WAPM Chapter 6G and Chapter 6H, Pocket Guide

- Determining work zone types
    - Work duration
    - Work location
    - Work zone type
    - Highway type
- Five categories of work duration
    - Long-term stationary
    - Intermediate-term stationary
    - Short-term stationary
    - Short-duration
    - Mobile operation
- Five component parts of a work zone
    - Advance Warning Area
    - Transition Area
    - Buffer Area
    - Work Area
    - Buffer
    - Termination Area

PG exercises

- Tapers
- Warning Signs
- Channelizing Devices
    - Measuring tips

- Short-term stationary WZ
    - Layout
    - Setup
    - Review/Drive through
    - Remove
- Mobile operation

Traffic Control Devices – Module 4

Reference: Pocket Guide

- Signs
- Channelizing devices
- Removal and replacement of traffic control devices

Making adjustment to temporary traffic control – Module 5

Reference: WAPM, Chapter 6G, Chapter 6H and Chapter 6I, Pocket Guide

- Hills and curves
- Incident management
- Detours
- Night work zones
- Urban areas
- Pedestrians and Bicyclists
- Inclement weather

Roles and Responsibilities - Module 6

Reference: WAPM, Chapter 6E and 6H

- Group Exercise
- Define a Work Zone
- Roles and Responsibilities
    - Flagging Operations
        - Flagger Daily Responsibilities
        - Flagger Apparel
        - Flagger Devices
    - Truck Mounted Attenuator Operator
    - Portable Changeable Message Sign Operator
    - Arrow Board Operator
    - Work Zone Inspector
- Review of Course Material and evaluation
- Top 10 problems in work zones

Course Exam (one hour)

Work Zone Traffic Control: Intermediate Course Outline

First Day

Introduction – Module 1

Reference: Course Notebook

- Welcome/Expectations/House Rules
- Course Overview/Agenda
- Accreditation

Liability and Risk – Module 2

Reference: Course Notebook

- Four Elements
- Ten Best Practices to Avoid a Suit
- Documentation

Human Factors – Module 3

Reference: Course Notebook

- WZ Hazards
- Driver Expectations
- Perception/Reaction Considerations

Manuals and References – Module 4

Reference: Course Notebook

- MUTCD
    - TTC Standards
    - TTC Guidance
    - TTC Options
- VA WAPM
- VDOT Pocket Guide, Specifications, and other references

Components Parts of Temporary Traffic Control – Module 5

Reference: Work Area Protection Manual, Chapter 6C

- Definition
- Advance Warning Area
- Transition Area
- Buffer Area
- Activity/Work/Traffic Area
- Termination Area

Temporary Traffic Control Devices – Module 6

Reference: WAPM, Chapter 6F and Appendix A & D

- General Requirements
- Device Categories
- Signs
    - Regulatory
    - Warning
    - Guide

- Advance Warning Signs
    - Sheeting Requirements
    - Substrate Types
    - Placement & Spacing
    - Installation
    - Portable Sign Stands
- Portable Changeable Message Signs
    - Application
    - Displays
- Arrow Panels
    - Modes
    - Sizes
    - Placement
- Tapers
    - Types
    - Spacing & Placement

Taper & Buffer Exercise

- Channelizing Devices
    - Cones
    - Drums
    - Type III Barricades
    - Spacing
- Barriers
    - Application
    - Delineation
    - End Treatments

Barrier Exercise

- Pavement Marking Eradication, Marking, & Markers
    - Eradication Requirements
    - Construction Markings Requirements
    - Marker Requirements
- Truck Mounted Attenuators
    - Application
    - Placement

Lane Closure Evaluation Exercise

Flagging Operations – Module 7

Reference: WAPM, Chapter 6E and 6H

- Flagger Daily Responsibilities
- Flagger Apparel
- Flagger Devices

Flagger Operation Evaluation Exercise

Work Zone Traffic Control: Intermediate Course Outline

Second Day

Roles and Responsibilities – Module 8

Reference: Course Notebook

- Contractor's
- Inspector's
- Maintenance of Traffic (MOT) Coordinator

Laying out, Installing and Removing Temporary Traffic Control – Module 9

Reference: Course Notebook, Pocket Guide

- Steps in Laying Out Temporary Traffic Control (TTC)
- Steps in Installing TTC
- Installation Review and Adjustments
- Steps in Properly Removing TTC

Types of Temporary Traffic Control Activities – Module 10

Reference: Work Area Protection Manual, Chapter 6G and Chapter 6H

- Duration of Work
- Location of Work
- Work Activities
- Constructability
- Types of Work Zones

Review of TTC Typical Applications – Module 11

Reference: Course Notebook, WAPM Chapter 6G

- Activities Beyond the Shoulder (TTC-1.0)
- Shoulder Closure Activities (TTC-3.0, 4.0)
- Standard Lane Closure on a Multi-lane Roadway (TTC-12.0, 13.0)
- Lane Closure with Concrete Barrier Service (TTC-16.0)
- Flagging Operation on a Two-lane Roadway (TTC-18.0)
- Work Activities Near a Highway Rail Crossing (TTC-39.0)

Making Adjustments to Temporary Traffic Control – Module 12

Reference: Work Area Protection Manual, Chapter 6G and Chapter 6H

- Hills and Curves
- Night Operations
- Weather Conditions
- Urban Areas
- Pedestrians and Bicyclists

Use of Virginia State Police in Work Zones – Module 13

Reference: Work Area Protection Manual, Appendix C

- Review Guidelines in Appendix C
- Slow Roll Traffic Control

Team WZ Layout Exercises
Reference: Work Area Protection Manual, Training Kits.

Review of Course Material

Course Exam (ninety minutes)

Work Zone Traffic Control: Advanced Course Outline

First Day

Introduction – Module 1

Reference: Course Notebook

- Welcome/Expectations/House Rules
- Course Overview/Agenda
- Certification

Temporary Traffic Control Standards, Manuals and References – Module 2

Reference: Course Notebook

- Defining Temporary Traffic Control
- TTC Standards
- TTC Requirements
- TTC Guidelines

Fundamental Principles – Module 3

Reference: Work Area Protection Manual, Chapter 6B, Chapter 6D

- 7 Principles
- Safety and Accessibility
- Mobility
- Guidance
- Inspection
- Maintenance
- Training
- Public Relations

Human Factors – Module 4

Reference: Course Notebook

- Designing for the Driver
- Perceptual Ability
- Driver Expectations
- Perception/Reaction Considerations
- Capacity & Congestion Factors

Components Parts of Temporary Traffic Control – Module 5

Reference: Work Area Protection Manual, Chapter 6C

- Definition
- Advance Warning Area
- Transition Area
- Buffer Area
- Activity/Work/Traffic Area
- Termination Area
- Tapers
- Flagging Methods
- Diversions & Detours

TTC Exercise

Types of Temporary Traffic Control Activities – Module 6

Reference: Work Area Protection Manual, Chapter 6G and Chapter 6H

- Duration of Work
- Location of Work
- Work Activities
- Constructability
- Types of Work Zones

Design Considerations – Module 7

Reference: Work Area Protection Manual, Chapter 6G and Appendix C, Course Notebook

- Planning
- Designing
    - Issues
    - Special Needs
- Enforcement
    - Application
    - Procedures

Second Day

Temporary Traffic Control Devices – Module 8

Reference: Work Area Protection Manual, Chapter 6F and Appendix A & D

- General Requirements
- Device Categories
- Signs
    - Regulatory
    - Warning
    - Guide
    - Placement
    - Portable
    - Retroreflectivity
    - Spacing
- Channelizing Devices
    - Cones
    - Drums
    - Type III Barricades
    - Spacing
- Warning Lights
    - Types A, B and C
    - Vehicle
- Arrow Panels
    - Modes
    - Sizes
    - Placement
- Portable Changeable Message Signs
    - Application
    - Displays

    - Placement
- Truck Mounted Attenuators
    - Application
    - Placement
- Barriers
    - Application
    - Delineation
    - End Treatments

Barrier Exercise

Temporary Traffic Control Plans – Module 9

Reference: IIM-LD-241/TED-343

- TTC Requirements

TTC Exercise

Night-time Work Zones – Module 10

Reference: Course Notebook

- Night-time Temporary Traffic Control Considerations
- Illumination
    - Levels
    - Glare
- TTC Typicals

TTC Exercise

Urban and Other Considerations – Module 11

Reference: Course Notebook, Work Area Protection Manual, Chapters 6D, 6G and 6H

- Urban Considerations
- Pedestrian/ADA Considerations
- Accommodating Motorcycles

Review of Course Material

Course Exam (ninety minutes)

VIRGINIA DEPARTMENT OF TRANSPORTATION

STRUCTURE AND BRIDGE DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

SUBJECT: High Mast Light Poles: Inspection and Maintenance	**NUMBER:** SB-73 TED-346 **Date:** March 9, 2007
SIGNATURES: Kendal R. Walus, P.E./ Original Signed State Structure and Bridge Engineer R. J. Khoury, P.E./ Original Signed State Traffic Engineer	**SUPERCEDES: n/a**

Introduction: This memorandum addresses the following two issues concerning high mast light poles (HMLP): section loss at the base and cracking at the slip joints. Historically, weathering steel poles have experienced problems with both of these issues. As a result of this, we are the modifying the VDOT *Road and Bridge Specifications* to ensure that no additional weathering steel high mast poles are built. Though weathering steel poles are the foremost concern, the issue of section loss at the base of the poles may become an issue with galvanized HMLP as the galvanization deteriorates.

Discussion on Loss of Section at the Pole Base:

Two weathering steel materials were mainly used for HMLP: ASTM A588 and ASTM A595 Grade C. Shop plans from the late 1970's detail a backup ring and full penetration welds at the base. With moisture due to condensation collecting between the inside of the pole and the backup ring, pack rust will form over a period of time as corrosion of the pole continues.

Shop plans from one fabricator detail an additional stiffening tube on the inside between the outer pole and the back up ring and extending about 5 to 6 feet above the base plate. The fabricator refers to this as a two-ply pole (as opposed to a monotube section) and indicates that this was done in lieu of additional stiffening required in the vicinity of the hand hole area. The pole in this case was designed based on the section modulus of the outer pole section only.

In lieu of a more sophisticated analysis and to simplify the decisions involved with section loss of high mast light poles, the basic assumption is that the section loss is directly correlated to loss of thickness in the pole section. Since stress is proportional to the applied moment and section modulus is proportional to thickness, it can be shown that stress is inversely proportional to thickness.

The following chart indicates the increase in stress due to an incremental loss of section:

Percentage Loss of Section	Percentage Increase in Stress
10 %	11 %
15 %	18 %
20 %	25 %

Suggested Procedure for Determining Section Loss for Poles:

1. Remove hand hole cover and visually inspect the inside of the pole.

2. If visible corrosion is observed, especially in the vicinity of the lower end of pole toward the base plate, tap on the exterior of the pole to loosen any lensing or loosen corrosion particles.

3. At an approximate distance of 3 feet above the base plate, use an electronic thickness device to obtain three random readings around the circumference of the pole. The average of these three numbers may be assumed to be the thickness of the pole and should be recorded. The reading obtained is also valid for a two-ply pole as the device measures only the outermost thickness. To obtain accurate readings using the device, the inspector will need to grind the irregular weathered surface at measurement locations.

4. At an approximate distance of 1 1/2 inches above the base plate, obtain eight readings, one at each quarter point and one between each of these points on the circumference of the pole using an electronic thickness device and record the value.

5. If the inspector during the initial visual inspection observes other locations that should be checked for section loss, then additional thickness measurements should then be taken.

6. The smallest value of the readings from step 4 and 5 shall then be compared to the baseline thickness reading obtained in step 3.

7. % Section loss = $\left[\dfrac{1-(t\ \text{min.}\ \textit{from step}\ 4/5)}{(t\ \text{min.}\ \textit{from step}\ 3}\right] x\,100$

8. The course of action that should be taken based on the % section loss is indicated in the table given below.

Loss of Section at Base:

The following table shows the recommended guidelines to be followed due to the results of the inspection concerning the amount of corrosion in a HMLP:

Amount of Corrosion (Percentage Loss of Section)	**Action Required**
1 % to 15%	Increase Inspection Cycle from 60 months to every 24 months or less
15% to 20%	Pole should be removed from service within 6 months*
>20%	Pole should be removed from service immediately*

*Consideration of lowering the light assembly to reduce the loading on the pole should be made depending on the severity of the corrosion and forecasted weather conditions.

The required actions listed above have been correlated with the amount of resultant overstress felt to be prudent. While this is a simplification of the issue, it is felt that in general a more rigorous analysis is not warranted. The method for evaluating percent (%) section loss does not take into account other issues such as cracking induced by overstress, fatigue, and other visible adverse situations.

Cracking at Slip Joints:

HMLP fabricated with weathering steel with slip joints may experience wicking action that over a period of time that will result in cracking at the joints. In the past, the majority of the joints were sealed and stainless steel banding was applied to help extend the service life of these structures. However, recent inspections have revealed that some of the HMLP may have not been banded or sealed.

If cracks exist at the slip joint of the pole, whether banded or not, plans to remove the structure from service should be started immediately.

The general guidelines given above shall not take the place of sound engineering judgment in the evaluation of these structures.

CC:
Chief Engineer
Chief of Systems Operations
Traffic Engineering Division Director
Asset Management Division Director
District Construction Engineers
District PE Managers
District Maintenance Engineers
District Structure and Bridge Engineers
Regional Traffic Engineer
Residency Administrators
Smart Traffic Center Managers

VIRGINIA DEPARTMENT OF TRANSPORTATION

STRUCTURE AND BRIDGE DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

SUBJECT: Moratorium on the Use of Cantilever Sign Structure(s) with Variable Message Sign(s) (VMS) or Changeable Message Signs (CMS)	**NUMBER: SB-74** **TED-347** **DATE:** February 27, 2007
SIGNATURE: Kendal R. Walus/ Original Signed State Structure and Bridge Engineer R. J. Khoury/ Original Signed State Traffic Engineer	**SUPERCEDES:** Chief Engineer Memo dated January 4, 1994

This I&IM replaces Mr. J. S. Hodge, Chief Engineer, memorandum dated January 4, 1994 and recommendation by Structure and Bridge Division, dated December 17, 1993.

The purpose of this memorandum is to reiterate that there is a moratorium on erecting any cantilever sign structures with variable message sign(s) (VMS) or changeable message sign(s) (CMS). The original decision was based on a failure that occurred near the I-81 weigh station near Troutville.

These cantilever structures were subject to other wind phenomena which were not adequately addressed by the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* at that time. Although now addressed in the current specifications, it is felt that a span type structure or butterfly is more suitable for the design if VMS/CMS is/are included.

CC:
Chief Engineer
Chief of Systems Operations
Traffic Engineering Division Director
Asset Management Division Director
District Construction Engineers
District PE Managers
District Maintenance Engineers
District Structure and Bridge Engineers
Regional Traffic Engineer
Residency Administrators
Smart Traffic Center Managers

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

NUMBER: TE – 350.1	**DATE:** November 3, 2009	COMMONWEALTH OF VIRGINIA RAYMOND J. KHOURY Lic. No. 032146 PROFESSIONAL ENGINEER
SUPERSEDED: TE - 350	**SUNSET DATE:** N/A	
GENERAL SUBJECT: Work Zone Safety		
SPECIFIC SUBJECT: Work Zone Speed Analysis		
DISTRIBUTION TO: Regional Operations Directors Regional Traffic Engineers		VDOT - Traffic Engineering Richmond, Virginia Traffic Engineer

The Virginia Work Area Protection Manual, in section 6C.01, states the following regarding reducing speeds in work zones:

"Speeds shall only be reduced within construction/maintenance work zones by the Regional Traffic Engineer upon completion of an engineering and traffic investigation warranting the reduction. Documentation of the change shall be performed and maintained."

To facilitate the documentation of these "engineering and traffic investigations" in a manner that will be similar throughout the state, the attached *Engineering and Traffic Investigation -Work Zone Speed Analysis* form shall be used. A printed copy of each completed and approved (PE Signed and Sealed) form shall be retained by the Regional Traffic Engineer and in the project's contract file. In addition and at the direction of the Code of Virginia, § 46.2-878, if the analysis results in an reduced speed limit posting for the work zone, a copy of the form shall be provided to the State Traffic Engineer.

CC: Mr. Greg Whirley
Ms. Constance S. Sorrell
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca

Division Administrators
District Administrators
Regional Operations Maint. Mgrs.
Resident Administrators
Mr. B. H. Cottrell

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: WORK ZONE SAFETY AND MOBILITY	NUMBER: IIM-LD-241.4 TED-351.2
SPECIFIC SUBJECT: TRANSPORTATION MANAGEMENT PLAN REQUIREMENTS	DATE: January 23, 2009
	SUPERSEDES: IIM-LD-241.3 TED-351.1
LOCATION AND DESIGN DIVISION APPROVAL: Mohammad Mirshahi, P.E. State Location and Design Engineer Approved January 23, 2009	TRAFFIC ENGINEERING DIVISION APPROVAL: Raymond J. Khoury, P.E. State Traffic Engineer Approved January 13, 2009

Changes are shaded.

CURRENT REVISION

- Added work area access considerations to the Plan Requirements section.

EFFECTIVE DATE

- These instructions are effective upon receipt.

POLICY

- The Virginia Department of Transportation is committed in providing safe and efficient movement of motorized and non-motorized traffic through or around roadway work zones as well as providing protection for workers and equipment located within work zones. VDOT will focus on roadway visibility and functionality of temporary traffic control in work zones and traffic flow through the work zone. Emphasis will begin with the preliminary engineering stages and carried through to the completion of all work, including post construction reviews.

- Compliance with this guidance is consistent with the Department's goal of reducing work zone crashes and improving travel time thereby benefiting all citizens of the Commonwealth. This guidance outlines recommended procedures to be followed and identifies responsibilities to achieve safer work zones with minimal impact on the traveling public.

- **VDOT, through this directive, is extending this requirement to all work zone activities within state right of way and on all streets and highways that have been accepted into the State Highway System regardless of the funding source as well as all other projects receiving State and/or Federal funding.**

BACKGROUND

- In September 2004, the Federal Highway Administration (FHWA) published the Final Rule on Work Zone Safety and Mobility, 23 CFR 630 Subpart J. This rule, referred to as Work Zone Safety and Mobility, applies to State and local governments that receive Federal-aid highway funding. Transportation agencies are required to comply with the provisions of the Rule by October 12, 2007. This rule updates and broadens the former regulation, "Traffic Safety in Highway and Street Work Zones," to address present and future work zone issues.

- The policy provisions in the Final Rule on Work Zone Safety and Mobility:
    - Require agencies to implement a policy for the systematic consideration and management of work zone impacts on all Federal-aid highway projects. Furthermore, it encourages agencies to implement the policy for non-Federal-aid projects and programs.
    - Require the policy to address work zone impacts throughout the various stages of the project's development and construction. The agency must consider work zone impacts during project development, management of work zone impacts during construction, and assessment of work zone performance after implementation. The agency must also consider communication with the public before and during the project.
    - Recognize the state policy may vary based on the characteristics and expected work zone impacts of individual projects or classes of projects.
    - Require transportation management plans.

For additional information on the Final Rule on Work Zone Safety and Mobility, follow these links:
http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm (Regulation, Guidance and Examples);

http://www.ops.fhwa.dot.gov/wz/practices/factsheets/factsheets.htm (Best Practices).

NCHRP Synthesis 208, Development and Implementation of Traffic Control Plans for Highway Work Zones: http://www.trb.org/news/blurb_detail.asp?id=3349

TYPICAL WORK ZONE MANAGEMENT STRATEGIES

Various work zone management strategies may be employed to minimize traffic delays, thereby improving mobility as well as traveler and worker safety, completing the construction work in a timely manner while maintaining access for businesses and residents. The following set of strategies is not meant to be all-inclusive, but to present a number of suggestions for consideration while developing transportation management plans. For a more extensive listing and general information on work zone management strategies may be accessed at the following web sites:

http://www.ops.fhwa.dot.gov/wz/rule_guide/sec6.htm#tab62 and http://www.ops.fhwa.dot.gov/wz/resources/publications/trans_mgmt_plans/trans_mgmt_plans.pdf

The strategies are divided into three broad groups which are captioned as: 1) Temporary Traffic Control, 2) Public Information; and 3) Transportation Operations. Each of these groups is further defined by the specific items listed below.

- **Temporary Traffic Control Strategies:**
  - Control strategies
  - Traffic control devices
  - Project coordination, contracting and innovative construction strategies

- **Public Communication Strategies:**
  - Public awareness strategies
  - Motorist information strategies

- **Transportation Operations Strategies:**
  - Demand management strategies
  - Corridor/network management strategies
  - Work zone management strategies
  - Traffic/incident management strategies

GENERAL GUIDELINES

This section provides guidelines to be used by Project Managers, Roadway Designers, Traffic Engineers, Work Zone Safety Coordinators and Public Affairs Managers pertaining to acquiring the information to develop Transportation Management Plans (TMP). The FHWA Area Engineer shall be involved in each of the project's milestones on federal oversight projects. These guidelines require the evaluation of work zone traffic control and communication strategies

beginning at the Pre-Scoping Activities and continued throughout the CEP and during all phases of construction. For additional information on the Concurrent Engineering Process, follow this link: http://www.virginiadot.org/business/resources/Project_Management_Online_Guide.pdf. Also see LD-436 Quality Control Check List, available at: http://www.extranet.vdot.state.va.us/forms/

Specific work requirements are noted in the CEP Project Management Procedure for each milestone as well as Project Management forms that are be submitted at the milestones. All Temporary Traffic Control Plans shall be in compliance with the information published in the Virginia Work Area Protection Manual. Any deviations from the Virginia Work Area Protection Manual must be approved by the Regional Traffic Engineer and noted in the plans.

- **Scoping Meeting** – The Project team shall use field observations, review available crash data, and other relevant operational information to discuss preliminary work zone management strategies in conjunction with alternative project options and design schemes. Relevant operational information should include but is not limited to, project definition (scope, project's complexity level, roadway and traffic characteristics, and TMP type), construction phasing/staging of equipment and materials, as well as temporary traffic control, public communications and transportation operations strategies. The Regional Traffic Engineer shall begin acquiring traffic and crash data and explore possible alternate/detour routes. A preliminary cost estimate for the project's traffic management plan shall be developed by the Project Manager at this milestone. A preliminary Public Communications Plan shall be drafted by the District Public Affairs Manager.

    - For all projects <u>not</u> following the Concurrent Engineering Process (CEP), a TMP preliminary engineering review process shall be defined at the project scoping meeting.

- **Preliminary Field Inspection** – The Project Team shall utilize traffic and crash data and the preliminary Sequence of Construction (SOC) plans to identify safety and mobility issues during the proposed construction and begin developing the project's preliminary TMP. The Regional Traffic Engineer, working with the Project Team, shall propose the project's TMP that consists of temporary traffic control, public information, and transportation operations strategies, as appropriate. The Roadway Designer shall incorporate the recommended TMP into the projects initial roadway plans.

- **Public Hearing Meeting** – Review of the preliminary TMP as incorporated by the Roadway Designer (includes the Temporary Traffic Control Plan as well as the Public Communications Plan and Transportation Operations Plan if required) must be completed by the Regional Traffic Engineer and Regional Operations Director as applicable. Recommendations/corrections submitted by the Regional Traffic Engineer/Regional Operations Director that are accepted by the Roadway Designer in collaboration with the project team are to be incorporated into the preliminary TMP by the Roadway Designer prior to the Public Hearing.

- **Field Inspection Meeting** – The Roadway Designer shall complete the project's TMP for review by the project team during the Constructability Review stage for the Detail Roadway Design and Roadway Design phases of the CEP. All accepted recommendations/corrections submitted by the project team are to be incorporated into the TMP by the Roadway Designer prior to proceeding to the next phase of the project's development. The Project Team shall review the TMP to ensure that all comments and concerns have been addressed. The Regional Traffic Engineer shall verify that all safety information and crash data has been reviewed and incorporated into the TMP.

- **Pre-Advertisement Conference** – The Roadway Designer shall complete the project's final TMP for review by the Constructability Review Team during the Constructability and Bidability Review stage of the CEP. All recommendations/corrections submitted by the project team shall be incorporated into the final TMP by the Roadway Designer prior to proceeding to the next phase of the project's development. The Project Team shall review the TMP to ensure that all comments and concerns have been addressed. The TMP cost shall be finalized for the constructability review held prior to the Pre-Advertisement Conference milestone.

- **Implementing the Transportation Management Plan** – During the first day of the new work zone traffic pattern, the project's Manager and project's Maintenance of Traffic Coordinator shall inspect the work zone to ensure compliance with the TMP. On the third to fifth day of implementation of the TMP's new work zone traffic pattern, the Regional Work Zone Safety Coordinator and the project's Maintenance of Traffic Coordinator shall conduct an on-site review of the work zone's performance and recommend to the contractor any required changes to the TMP to enhance the work zone's safety and mobility. All such changes shall be documented and, if the project is a federal oversight project, it should be reviewed with an FHWA Area Engineer. An on-site review of the project's work zone traffic control by the Regional Work Zone Safety Coordinator, Project's Manager/Maintenance of Traffic Coordinator, District Safety Engineer, and the Contractor shall be conducted within 48 hours of any fatal incident/crash within the work zone.

- **Evaluation of the Transportation Management Plan** – A performance assessment of the TMP including area–wide impacts on adjacent roadways shall be performed by the Regional Traffic Engineering and Operations sections during construction as circumstances dictate. A review of the overall effectiveness of the project's TMP shall be completed during the Post Construction Meeting and included with the Post Construction Report. A copy of the specific information on the effectiveness of the TMP will be forwarded to the State Traffic Engineer for review. A copy of the TMP Interim/Post Construction Report Form can be obtained from the Regional Traffic Engineer.

The following guidance is provided to ensure the Project Team understands their role and responsibilities in the development of the project's TMP. Team members from the design disciplines/work group noted below shall have direct responsibilities for the proper development of the TMP during each stage of the CEP. The Project Manager

shall solicit comments from other design disciplines such as Structure and Bridge, Environmental, Materials, etc, as appropriate, to confirm that all safety and mobility concerns are addressed. All team members shall be provided an opportunity to review the TMP prior to each milestone team meeting.

For projects that do not follow the CEP, the Designer, Project Manager or the Contract Administrator will ensure the TMP and the component plans (Temporary Traffic Control, Public Communication and Transportation Operations Plans) are included in the project and contract documents. The development process should be established at scoping with the plans developed based on consultation with, and guidance from, the applicable discipline.

- **Project Team:**

  The Project Manager, with the project team, will review the project at each milestone to ensure appropriate action is taken to reduce work zone impacts on the public. Responsibilities of the project team include a TMP Design Checklist Review Form that can be obtained from the Regional Traffic Engineer.

- **Regional Traffic Engineering:**

  Shall ensure the safety of workers and the safe and efficient movement of traffic through the project's work zone by considering various temporary traffic management strategies and providing the project team with the following recommendations as well as verifying that the applicable information is included in the project's TMP:

  - Temporary traffic management strategies
  - Lane width(s) and the number of travel lane(s) and turn lane(s) to be maintained
  - Traffic impact assessments/analysis on the temporary traffic control plan
  - Identify all signal phases within the work zone and on all detour/alternate routes
  - Allowable work activity hours
  - On-site and off-site detour routes
  - Information on the use and placement of all temporary traffic control devices including barrier and channelization devices
  - Type and placement of all signs, message boards, arrow boards, and TMA's
  - Type and location of temporary pavement markings and markers
  - Access to all businesses and private dwellings
  - Post construction assessment of the Work Zone Traffic Impact
  - Verify quantities for all temporary traffic control devices

- **Regional Operations:**

  Shall ensure the safe and efficient movement of traffic through the project's work zone by considering various transportation management strategies and providing the Roadway Designer and the project team with the following recommendations as well as verifying that the applicable information is included in the project's TMP:

  - Temporary traffic management strategies
  - Incident/emergency management plan
  - Use of ITS for traffic monitoring
  - Surveillance of work zone traffic using CCTV, loop detectors, etc.
  - Use of safety service patrols
  - Contact information for Transportation Operations Centers (TOC) and incident management
  - Traffic impact assessments/analysis on the temporary traffic control plan
  - Identify all signal phases within the work zone and on all detour/alternate routes
  - Allowable work activity hours

  Location and Design (or Contract Administrator as appropriate):

  Shall ensure the proper design and presentation of all aspects of the TMP by providing the following detailed information in the plan assembly:

  - Profile, alignment, superelevation and lane widths for all traffic lanes, turning lanes, lane shifts and detours not identified on existing roadways
  - Earthwork/grading that must be completed prior to the next construction phase
  - Utility work that can be completed within the project's guidelines for the TMP
  - Ensure that all utilities will not conflict with temporary traffic control and other safety devices for all phases of construction.
  - Identify all temporary pavement locations and temporary drainage items
  - Illustrate the placement of all temporary signs, message boards, arrow boards, TMA's, barriers, attenuators, temporary pavement markings and markers, existing pavement marking eradication, and placement of Group I and II devices in the temporary traffic control plans for all construction phases (excluding temporary lane and shoulder closings)
  - Identify and note all signal phases within the work zone and all detour routes
  - Complete TMP typical sections
  - Complete special design details, special cross section and insertable sheets if applicable
  - Provide quantities for all temporary traffic control devices

- **Structure and Bridge:**

  Shall ensure the proper design and presentation of all aspects of the TMP by providing the following:

  - Movement, staging and use of cranes, other large equipment and materials
  - Need and placement of temporary bridge parapet and traffic barrier service
  - Need for the setting of beams over traffic
  - Use of temporary bridges
  - Need for demolition over traffic
  - Placing the above information in the plan assembly in narrative or illustrated format

- **Public Relations**

  Shall ensure that the transportation management plan is communicated to appropriate key audiences (motorists, police, businesses, residents, elected officials and media). Strategies will include:

  - Developing a project-specific communications plan to keep key audiences informed about construction-related impacts before and during the construction;
  - Communicating and promoting ways commuters can avoid construction-related delays , i.e. ridesharing, telework, riding the bus;
  - Developing a crisis communications plan which outlines steps to be taken during a major incident and includes emergency contact information; and,
  - Determines the need and types of community meetings needed to inform the public on the various aspects of the construction project

- **Right of Way:**

  Shall ensure the proper design and presentation of all aspects of the TMP by providing the following:

  - All temporary/permanent easements' needed for construction are included in the plans

- **Project Constructability Work Group:**

  Shall ensure that the project can be constructed according to the Plan Assembly, the Sequence of Construction and the TMP by reviewing the project documents ensuring that:

  - If right of way permits that an area for the placement of construction equipment and materials is provided
  - Access to the work area(s) for construction equipment and materials is provided

- Adequate time is provided to complete the construction
- Adequate drainage is maintained during construction
- Appropriate traffic control and an information campaign is provided for the setting of bridge beams or other operations requiring total roadway closures and detours
- All safety and mobility issues have been addressed for any unusual construction methods
- The project can be physically built as designed with only minimal road closures and detours with no major recurring traffic impacts
- Utility plans are coordinated with all phases of construction
- Consideration of construction methods for deep utilities and large diameter pipes

PLAN REQUIREMENTS

This section provides guidance to Project Managers for establishing a project's TMP requirements based on the project's level of complexity. These guidelines categorize a project into one of three types of transportation management. The project's type identifies the **minimum** TMP requirements and recommendations to be used by Project Managers, Roadway Designers, Regional Traffic Engineers, Regional Operation Directors and Public Affairs Managers for developing TMP. In general, the TMP shall consist of a traffic control plan and, as required, a public information and a transportation operations plan. The specific project level requirements for plan content are listed by project type. Any deviation from the requirements noted below will require the review and approval of the State Traffic Engineer.

- **Work Area Access Considerations:**

The Temporary Traffic Control Plan (TTCP) should address the need for access to the work area. This is a constructability issue in which the designer addresses the question of how the contractor will move materials and equipment into the work area safety with a minimum of disruption to traffic. This is a particularly critical issue on high speed roadways such as Limited Access highways, especially if traffic barrier service concrete (barrier wall) is used to protect work areas. Consideration may be given to the design and construction of temporary acceleration and deceleration lanes for the construction equipment. The following should be considered in the planning, design and operation of work zones.

- Anticipate types of work zones that typically create ingress/egress problems. Examples are work spaces requiring work vehicles to merge in/out of high-speed traffic and work activities that will generate frequent delivery of materials such as paving projects, bridge projects, and the delivery/movement of fill materials.

- Access into/out of the work space shall be included in the Temporary Traffic Control Plan.
- Adequate acceleration/deceleration space for work vehicles should be provided.
- The location of access openings should meet the sight distance requirements listed in Appendix A of the Virginia Work Area Protection Manual. In extreme conditions, lane closures may need to be considered.
- Construction access openings in traffic barrier service concrete (barrier wall) should be planned per Appendix A of the Virginia Work Area Protection Manual to ensure that the blunt ends of barrier walls are properly protected. The barrier or channelization devices should be planned in a manner as to not create a sight distance problem for equipment operator or motorists.
- Ingress/egress condition may justify a lowering of the speed limit during this activity. Any reduction in the posted speed limit must be authorized by the Regional Traffic Engineer and based on an engineering study per Traffic Engineering Memorandum TED-350.
- Warning signs ("Trucks Entering Highway") are available for ingress/egress conditions at work area accesses and should be used when appropriate. Special warning signs may be necessary. All warning sign(s) noting work zone access activities shall be covered/removed when the daily work activity ceases.

- **Type A Projects (Project Management Project Category I & II)**

  - Typical Projects: No-Plan, Minimum Plan, Single Phase Construction, Maintenance Projects, Utility and Permitted Work
  - Project Type: Simple project – widening of pavement or adding turn lanes or entrances. Sequence consists of temporary lane closures and flagging operations with no shifting of traffic onto temporary pavement and with two-way traffic operation maintained at all times or at new construction locations with no existing traffic.
  - Impact on Traffic: Lane closures and time restrictions should comply with the Regional Operation's lane closure policies. If the proposed work cannot be completed within the Regional Operation's allowable lane closure time periods an assessment of the Work Zone Traffic Impact will be completed using a sketch planning traffic analysis tool such as Quick Zone, QUEWZ and/or an operational-level traffic analysis software program as appropriate. Lane closures, the use of traffic control devices and their placement, Public Information and Traffic Operations Plans will be implemented based on this evaluation.

Major Components:

- Temporary Traffic Control Plan

  Major components will consist of General Notes, Typical Sections, and if needed Special Details. Each component shall provide the following information (this information may be presented in a narrative format with illustrations/sketches as necessary):

  - General Notes which:

    - Identify the project's TMP Type
    - Identify the work zone location.
    - Identify the length and width of the work zone.
    - Identify the lanes affected by the project work.
    - Note the hours the work zone will be active.
    - Identify potential location(s), within the R/W, for construction equipment and material storage.
    - Define the proposed traffic control by referencing the specific Typical Traffic Control Standard(s) listed in Virginia's Work Area Protection Manual and/or by referencing a Special Detail(s).
    - Note any entrances, intersections or pedestrian access points that will be affected by the work zone or by the traffic control devices.
    - Identify the major types of travelers (such as truckers, commuters, residents, etc.)

  - Typical Sections which:

    - Illustrate lane configuration(s) in the work zone.

  - Special Details which:

    - Show schematically the placement of all traffic control devices and locations of safe access into/out of the work space by work vehicles.
    - Place all traffic control devices in accordance with the standards contained in Virginia's Work Area Protection Manual and the Manual on Uniform Traffic Control Devices. Detail for any traffic control device not illustrated in the Virginia Work Area Protection Manual will be included in the plan.
    - Follow symbol conventions for identifying traffic control devices per Virginia's Work Area Protection Manual and the Manual on Uniform Traffic Control Devices.
    - Show all details, dimensions and explanatory notes required to execute the traffic control plan.

- Public Communications Plan

  A Public Communications Plan is recommended for roadways when traffic volumes exceed the minimum number of vehicles/hour/lane or delay times established by the Regional Traffic Engineer for lane closure periods. The Public Communications Plan shall provide the following information (this information may be presented in a narrative format):

  - A process to notify the Project Manager/Residency Administrator of scheduled work plans and traffic delays.
  - A process to notify the Project Manager/Residency Administrator, Regional Operations Manager and the Public Affairs staff of any unscheduled traffic delays.

- Transportation Operations Plan

  A Transportation Operations Plan is recommended for roadways when the work zone is greater than ½ mile in length and/or with reduced-width travel lanes. The Transportation Operations Plan shall provide the following information (this information may be presented in a narrative format as part of the Temporary Traffic Control Plan):

  - A process to notify the Regional Transportation Operations Center (TOC) to place lane closure information on the 511 system and VA-Traffic.
  - A contact list of local emergency response agencies.
  - Procedures to respond to traffic incidents that may occur in the work zone.
  - A process to notify the Project Maintenance of Traffic Coordinator/Project Manager/Resident Administrator, District Work Zone Safety Coordinator/Regional Traffic Engineer, the Regional Operations Manager and Public Affairs Manager of any incidents and expected traffic delays.
  - Procedures to clear the incident and restore normal project traffic operations.
  - Details of the process to review incidents for the purpose of modifying the Temporary Traffic Control Plan to reduce the frequency and severity of such incidents.

- **Type B Projects (Project Management Project Categories III & IV)**

  - Typical Projects: Moderate level of construction activity with the primary traffic impact limited to the roadway containing the work zone.
  - Project Type: Moderately complex project – pavement widening or bridges for additional thru lanes and pavement rehabilitation. Sequence consists of lane closures to one or both directions with shifting traffic that may include temporary pavement or detours for the duration of the work. If detour routes are used they typically will remain in place 24 hours per day

for the duration of the work. Several phases of construction – bridge replacements or new bridges, new interchanges, modifying existing interchanges or a new construction location with existing traffic crossing the construction area.

- Impact on Traffic: An assessment of the Work Zone Traffic Impact will be completed using sketch planning traffic analysis tool such as Quick Zone, QUEWZ and/or an operational-level traffic analysis software simulation program such as CORSIM, Synchro or other applicable programs. Lane closures and detour routes will be implemented based on this evaluation. All lane closures and time restrictions should comply with the Regional Operation's lane closure policies.

- Major Components:

  - Temporary Traffic Control Plan

    Major components shall consist of Detail Plans, Typical Sections, and as required Special Details/Cross Sections/Profiles. Each component shall provide the following information per construction phase. This information shall be placed on a plan sheet.

      - Detail Plans which include all the information listed for Type A Projects plus:

    - Detail drawing(s) containing the following information:

      - Identify the project's TMP Type
      - Narrative describing the sequence of construction
      - Type and location of all temporary signs for the work zone and all detour routes
      - Type and location of all temporary pavement markings
      - Type and location of all temporary pavement
      - Type and location of all temporary barriers
      - Type and location of all impact attenuator/end treatments/Fixed-Object-Attachments (FOA)
      - Locations of safe access into/out of the work space by work vehicles.

    - Document/detail how all entrances, intersections or pedestrian access points/routes that will be affected by the work zone or by the traffic control devices will be maintained or by providing acceptable alternate routes.
    - Identify all road(s) to be used as a detour route.
    - Notes regarding all traffic control changes such as temporary signals or signal timing changes required within the work zone or the detour route.

- Typical Sections shall contain all the information listed for Type A Projects.
- Special Details/Cross Sections/Profiles shall contain all the information listed for Type A Projects.

▪ Public Communications Plan

A Public Communications Plan is required for roadways when traffic volumes exceed the minimum number of vehicles/hour/lane or delay times established by the Regional Traffic Engineer for lane closure periods. The Public Communications Plan shall provide the following information (this information may be presented in a narrative format as part of the Traffic Control Plan or as a separate Special Provision Copied Note):

- All the information listed for Type A Projects.
- A process for notifying Public Safety, Emergency Management and mass transit organizations of detour route(s) and available alternate routes during construction.

▪ Transportation Operations Plan

A Transportation Operations Plan is required for roadways when the work zone is greater than ½ mile in length and/or with reduced width travel lanes. The Transportation Operations Plan shall provide the following information (this information may be presented in a narrative format as part of the Traffic Control Plan or as a separate Special Provision Copied Note):

- All the information listed for Type A Projects.

- **Type C Projects (Significant Projects – Project Management Category V)**

These types of projects are anticipated to cause sustained work zone impacts greater than what is considered tolerable based on policy or engineering judgment. They should be identified early in the design process in cooperation with the FHWA.

o Typical Projects: Long duration construction or maintenance projects on Interstate and freeway projects that occupy a location for more than three days with intermittent or continuous lane closures within the following Transportation Management Areas; Northern Virginia (including the counties of Arlington, Fairfax, Loudoun, Prince William, Spotsylvania and Stafford), Richmond (including the City of Richmond, Chesterfield and Henrico Counties), and Hampton Roads (including the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth and Virginia

Beach as well as James City and York Counties). Also includes Interstate and Principle Arterial Roadways with complex multi-phase construction, high accident rates, full closures, or multiple work zones (two or more) within two miles of each other.

- Project Type: Complex project – adding additional thru lanes, bridge rehabilitation, interchange construction and reconstruction. Sequence consists of lane closures with shifting traffic several times that may include temporary pavement or detours for the duration of the work. Impact of work zone on traffic operations extends beyond the work zone and affects alternate and/or detour routes. Multi phase construction – bridge replacements or new bridges. Rebuilding interchanges with additional ramps or extensive modification to existing ramps.
- Impact on Traffic: An assessment of the Work Zone Traffic Impact shall be completed using an operational-level traffic analysis software simulation program such as CORSIM, Synchro or other applicable programs. Lane closures and detour routes shall be implemented based on this evaluation.

- Major Components:

  - Temporary Traffic Control Plan
    Major components shall consist of Detailed Plans, Typical Sections, and as required Special Details/Cross Sections/Profiles. Each component shall provide the following information per construction phase. This information will be placed on a coordinate plan sheet.
    - Detail Plans which include all the information listed for Type B Projects including the project's TMP Type plus a list identifying the location of reduced width lane(s) specifying the reduced lane width.
    - Typical Sections which include all the information listed for Type B Projects.
    - Special Details/Cross Sections/Profiles which include all the information listed for Type B Projects.
  - Public Communications Plan
    The Public Communications Plan is required and shall provide all the information required for Type A and B Projects. This information may be presented in a narrative format as part of the Traffic Control Plan or as a separate Special Provision Copied Note.
  - Transportation Operations Plan
    The Transportation Operations Plan is required and shall provide all the information required for Type B Projects. (This information may be presented in a narrative format as part of the Traffic Control Plan or as a separate Special Provision Copied Note.)

EXAMPLES

The following link will open folders containing examples of TMP recommendations and Temporary Traffic Control Plans for previously developed projects. These examples are for illustrative purposes only and may not totally reflect current policy.

- **Examples of Temporary Traffic Control Plans**

RESPONSIBILITIES

The following guidance is provided to ensure that all individuals involved in the planning and construction of all work activities within state right of way and on all streets and highways that have been accepted into the State Highway System. understand their role and responsibilities in the development, implementation and review of the project's TMP. VDOT personnel, contractors and permittees from the design and construction disciplines/work groups noted below shall have direct responsibilities for the proper development and implementation of the TMP during each preliminary engineering and construction stage of the project.

- **Project Manager**

  The Project Manager is responsible for following the current Project Management Procedures established by the Project Management Office. In accordance with the Project Management Procedures, the Project Manager will be responsible for ensuring that the project's Transportation Management Plan (TMP) Type for the project is defined at the scoping meeting.

- **Traffic Engineering Division**

  The Traffic Engineering Division is responsible for providing temporary traffic control standards and work zone guidance and recommendations, identifying and communicating issues related to the design and usage of temporary traffic control devices, as well as the implementation, maintenance, general appearance and functionality of work zones. Specific responsibilities of this office include:

  - Conducting annual process reviews of two regions each year.
  - Evaluating work zone safety by tracking the number of fatalities and injuries in work zones annually.
  - Reviewing post-construction reports to ascertain the effectiveness of the TMP and note the resolution of work zone and/or temporary traffic control problems.

- Revising temporary traffic control standards, procedures and guidance based on the above collected data to improve work zone safety and mobility.
- Defining the appropriate work zone safety training for VDOT personnel, design consultants, construction workers, flaggers, etc.

- **Area Construction Engineers**

  Specific responsibilities of the Area Construction Engineer include:

  - Ensuring that the implementation of all TMPs' in the district is in accordance with the plans, specifications, Virginia Work Area Protection Manual and any other pertinent documents.
  - Supporting the Maintenance of Traffic Coordinator and the Region's Work Zone Safety Coordinator(s) in performing their assigned duties.
  - Verifying that all contractor personnel are trained and hold valid certifications as required by the Department.
  - Advising the appropriate VDOT personnel, as noted in this guidance, work requiring lane shifts, lane closures and/or phase changes two working days prior to implementing this activity.

- **Regional Work Zone Safety Coordinators**

  The regional work zone safety coordinators are a resource to be utilized by the regional and district staff to ensure that work zones operate safely and efficiently with the least amount of inconvenience and impact to the traveling public. Specific responsibilities of the Regional Work Zone Safety Coordinator include:

  - Providing district and regional staff with guidance and recommendations on work zone design and operation.
  - Performing work zone reviews to promote consistency and ensure compliance with work zone procedures, standards and guidance.
  - Monitoring work zone inspections conducted by field personnel and identifying areas that need improvement.
  - Assisting and supporting the Maintenance of Traffic Coordinator in performing their assigned duties

- **Residency Administrators**

  Specific responsibilities of the Residency Administrator include:

  - Ensuring that residency staff receives the appropriate training related to their duties in the development, implementation and review of Transportation Management Plans (TMP).
  - Supporting the Maintenance of Traffic Coordinator and the Region's Work Zone Safety Coordinator(s) in performing their assigned duties.
  - Notifying the Regional Operations Director of work requiring lane closures two working days prior to implementing the lane closure.

- Notifying the Regional Operations Director of height, width and weight restrictions ten working days prior to the imposition of such restrictions.

- **Regional/District/Residency Permit Staff**

Specific responsibilities of the Regional/District/Residency permit staff include:

- Ensuring that the permittee's temporary traffic control plan is in compliance with this document, VDOT specifications, Virginia Work Area Protection Manual and any other pertinent documents.
- Coordinating lane closure needs and height, width and weight restrictions with the permittee and reporting any requests to the Regional Operations Director two working days prior to the lane closure and ten working days for roadway restrictions before any non-emergency work commences.
- Ensuring that proposed lane closures are in compliance with the regional lane closure policy.

- **Contractor**

Specific responsibilities of the contractor include:

- Designating a person assigned to the project who will have the primary responsibility, with sufficient authority, for implementing the TMP.
- Ensuring that contractor personnel assigned to the project are trained in traffic control to a level commensurate with their responsibilities in accordance with VDOT's work zone traffic control training guidelines.
- Advising the appropriate VDOT personnel, as noted in this guidance, work requiring lane shifts, lane closures and/or phase changes two working days prior to implementing this activity.
- Advising the appropriate VDOT personnel, as noted in this guidance, of height, width and weight restrictions ten working days prior to the imposition of such restrictions.
- Performing reviews of the work zone to ensure compliance with contract documents and establish specifications and standards.
- Recommending traffic control improvements to the appropriate VDOT personnel to address field conditions pertaining to traffic flow, visibility, and worker/motorist/pedestrian safety.

- **Permittee**

Specific responsibilities of the permittee include:

- Submitting a temporary traffic control plan that prescribes the necessary traffic control measures for the work to be performed to the appropriate VDOT Permit or Land Development office for approval prior to the commencement of work activities within VDOT right of way.
- Identifying a point of contact that shall be available while the permittee maintains a presence in the right of way with the authority to correct any traffic control deficiencies.

- Designating a person assigned to the project that will have the primary responsibility, with sufficient authority, for implementing the temporary traffic control plan and other safety and mobility aspects of the permit work.
- Ensuring that permittee personnel assigned to the work activity are trained in traffic control to a level commensurate with their responsibilities in accordance with VDOT's work zone traffic control training guidelines.
- Notifying the appropriate VDOT personnel, two days prior to the commencement of work and prior to implementing lane closures' and ten days prior to the imposition of height, width and weight restrictions.
- Maintaining a copy of the temporary traffic control plan at the work site.
- Performing reviews of the work zone to ensure compliance with temporary traffic control plan and establish specifications and standards.

Special Provision Copied Notes

The following Special Provision Copied Notes should be included in a project's contract as noted.

- Contractor Alternate Traffic Control Plan – All Type B & C Projects and select Type A projects.
- Work Zone Traffic Control Management – All Type C Projects and select Type B Projects as determined by the Project Manager based on traffic volumes, TMP complexity, and need for increased and devoted traffic control management.

TRAINING REQUIREMENTS

The Department has established a Work Zone Safety Training Committee (WZSTC) that will present recommendations on procedures, standards, and specifications involving work zone traffic control training issues. The committee will review training courses for approval that are submitted in compliance with an established procedure, as well as review and approve Work Zone Traffic Control Training instructor qualifications. Training courses approved in accordance with this procedure shall be the only training accepted as meeting the standards for qualifying persons to plan, design, implement, inspect, and/or supervise the selection, placement, or maintenance of work zone traffic control schemes and devices in work zones on streets and highways within the Commonwealth of Virginia State Highway System right of way. The State Traffic Engineer's Office shall maintain a list of approved courses and their sponsors/providers. The official list of approved courses, category descriptions, and addresses of course sponsors/providers and approved instructors are provided on the Department's Web site at: http://www.virginiadot.org/business/trafficeng-WZS.asp .

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zone Safety	**NUMBER:** TE-352
	DATE: July 17, 2007
SPECIFIC SUBJECT: Slow Roll Temporary Traffic Control (Slow Roll TTC)	**SUPERSEDES:** TE-344
DIRECTED TO: District Administrators/ Regional Operations Directors	**SIGNATURE:** *R. J. Khoury*

The following guidelines have been developed to ensure consistency for Slow Roll Temporary Traffic Control (Slow Roll TTC) on limited access highways. Activities which may warrant the use of Slow Roll TTC on limited access highways include, but are not limited to: setting of bridge beams, pulling wires or cables across the roadway, placing overhead or cantilever signs, and performing traffic switches from one half of the roadway to the other half. Any planned Slow Roll TTC shall be approved by the Regional Traffic Engineer prior to use.

1. Slow Roll TTC shall only be performed during non-peak travel periods and must be planned to not exceed periods of 15 minutes in duration.

2. The performance of Slow Roll TTC shall include the use of the Virginia State Police (VSP) unless an exception is granted by the Regional Traffic Engineer.

3. Prior to utilizing Slow Roll TTC, a coordination meeting shall be held with all entities involved in the operation to discuss each person's role.

4. At a minimum, a portable changeable message sign (PCMS) or, if available, an overhead changeable message sign (CMS) shall be used a minimum of 1 mile in advance of the beginning of the Slow Roll TTC operation with the following messages: ROAD WORK AHEAD; BE PREPARED TO STOP.

5. A vehicle (contractor, state, or VSP) shall occupy each lane of the route affected by the Slow Roll TTC. All entrance ramps within the Slow Roll TTC operation shall be temporarily closed. A drive through of the route shall be performed prior to beginning the Slow Roll TTC operation to ensure there are no parked vehicles along the roadway which could enter the travel lane during the Slow Roll TTC operation. Once the Slow Roll TTC operation has passed a closed entrance ramp, the ramp may be reopened.

6. Determining where to begin a Slow Roll TTC shall include an evaluation of all factors unique to the road system in question. As a minimum the following items shall be considered in the evaluation:
   a. The time lapse expected for the last uncontrolled vehicle to pass by the site of the planned work.
   b. The assumed maximum time needed for the work operation to be completed.
   c. The projected travel time of the Slow Roll. For example, a travel speed of 10 mph will cover 1 mile in six minutes.
   d. The number of entrance ramps requiring closing at interchanges.
   e. The starting point for the Slow Roll TTC shall be in a tangent section (both horizontal and vertical) of the approach roadway with adequate sight distance.

7. Upon a sufficient gap in traffic, each slow roll vehicle will pull out and occupy a travel lane with their warning lights and hazard lights operating and will travel at a minimum of 10 miles per hour. A shadow vehicle will follow the last motorist vehicle traveling in advance of the slow roll operation vehicles to notify the work crew when the roadway is closed and free of approaching motorist.

8. The lead vehicle in the slow roll operation shall have radio/telephone communication with the work crew. Once the need for the road closure is complete, the work crew shall notify the lead vehicle in the slow roll operation, who in turn will notify the other work vehicles. The slow roll vehicles should gain speed and pull over to the right side of the roadway, starting from the vehicle occupying the left lanes first. The VSP should continue with the flow of traffic to ensure controlled acceleration by the released vehicles.

9. If the slow roll operation vehicles reach the work site before receiving notification that the operation has been completed, they must slow down and/or stop until signaled that the roadway is safe to release traffic.

10. Once the slow roll operation is complete and free flow travel conditions have been re-established, the PCMS or overhead CMS messages shall be modified to remove the BE PREPARED TO STOP message.

cc: Regional Traffic Engineers
Resident Administrators
Division Administrators
Ms. Constance S. Sorrell
Mr. Greg Whirley
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca
Mr. E. D. Arnold

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Warning Signs	**NUMBER:** TE-353
	DATE: September 6, 2007
SPECIFIC SUBJECT: Pedestrians With Disabilities Signs	**SUPERSEDES:** TE-204
DIRECTED TO: District Administrators/ Regional Operations Directors	**SIGNATURE:** R. J. Khory

This memorandum establishes that VDOT will no longer post signs for warning the motoring public that persons with disabilities might be present in or near the roadway. Any signs now in place that were placed in accordance with TE-204 may remain until the child in question reaches the age of thirteen, moves from the community, or the sign must be removed due to maintenance/re-construction needs/efforts.

This directive shall not be interpreted to mean VDOT is opposed to warning sign that warn of potential juvenile pedestrian activity in or near the roadway. Instead, VDOT will install a"Watch for Children" sign (or signs) as prescribed by TE-280.

Background:

VDOT is frequently asked to post signs warning that people (particularly children) with disabilities might be expected to be in or near the roadway.

To date, VDOT, through written directive, has sanctioned only one sign for warning of people with a disability for children with the disability of deafness. Among other restrictions, it has been clearly stated that signing for children with a deafness disability may be considered for a hearing impaired child up to and including the age of twelve years old and that letter of certification from a licensed physician, audiologist, or speech and language pathologist must be provided stating the extent of hearing loss.

In evaluating whether similar directives should be drafted for signs addressing blindness/vision impairments, Autism, Down's syndrome, etc., VDOT has concluded that it can not meet the obligations of the Federal and State codes developed in recent times and enacted to protect a citizen privacy. In part, our decision was based on input from the Virginia Board for People with Disabilities (VBPD). In a statement from that Board, there are references that support this conclusion. A copy of that Board's statement is attached.

In a further effort to evaluate the most suited position that could be taken in particular regarding the disabilities of deafness/hearing impairments and blindness/vision impairments, VDOT also solicited comments from the Virginia Department of the Deaf and Hard of Hearing (VDDHH) and the Virginia Department of the Blind and Visually Impaired (VDBVI). Both of these agencies representatives agreed with the statements provided by VBDP. Documents are attached for reference.

cc: Regional Traffic Engineers
Resident Administrators
Division Administrators
Ms. Constance S. Sorrell
Mr. Greg Whirley
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca
Mr. E. D. Arnold

A letter from Ms Heidi Lawyer, Director of the Virginia Board for People with Disabilities.

08 30 06 summary of meeting on...

E-mail sent to Elaine Ziehl of VDDHH (similar E-mail sent to Robert Burton of DBVI)

VDOT Highway Signs

Reply from Ms Ziehl

RE: VDOT Highway Signs

Documentation of a telephone discussion with Robert Burton of DBVI

FW: VDOT Highway Signs

(RE-FORMATTED COPY)

August 15, 2006

Raymond J. Khoury
Traffic Engineering Division
Virginia Department of Transportation
1221 East Broad Street
Richmond, Virginia 23219

Dear Mr. Khoury:

On Wednesday, August 9, 2006, VDOT traffic engineer Mark Hodges invited Tom Driscoll, the Virginia Board's Strategic Planning and Marketing Manager, and me to meet with him and VDOT staff, Pamela Brookes and Tom Lee regarding requests which VDOT has received for special signs to be placed in neighborhoods of families with children who have autism. These signs would be in addition to or in place of VDOT's current "Watch for Children" signs and similar to the "Deaf Child Area" signs also in its inventory. Mr. Hodges and his team had already identified a number of issues needing consideration regarding this matter and requested our input.

At the close of the meeting, Mr. Hodges asked if we would forward a summary of our concerns and discussions to you. A list of those issues follows:

- **Inclusion vs. Exclusion**: The Virginia Board believes strongly that individuals with disabilities should not be defined by their disabilities and that attention should be called to a disability only when it is required to appropriately accommodate the unique needs of the individual with that disability. With that in mind, we questioned whether calling motorists' attention to the vicinity of a child with autism would be any more useful than simply calling attention to children in general using your current "Watch for Children" sign. Actively playing children are frequently oblivious to their surroundings and to the danger of darting into neighborhood traffic, irrespective of whether they have disabilities. Based upon their age and abilities, all children need to be adequately cautioned and supervised to keep this from occurring. In general, children with autism are as likely to be well supervised as children without it, if not more so. Without some clear indication and experience that children with autism are at greater risk, special signage singling them out seems questionable.

- **Safety & Security**: We have a concern that rather than improving safety for children with autism and their families, special signs calling attention to the nearby residence of a child with autism might instead make them—and their families and neighbors—less secure. Posting such signs might attract individuals wishing to take advantage of child or family whom they perceive as a vulnerable. It might also result in stigmatization and

discrimination by those who do not have a clear understanding of autism or disabilities in general.

- **Certification & Privacy**: The term "autism" covers a range of disabilities with varying cognitive, sensory, and behavioral effects and degrees of severity. Further, these effects and their severity vary based on the age of a child and on the type and frequency of services, supports, and therapies to which the child and his or her family have access. Availability of these services and supports also varies considerably from one locality in Virginia to another. Determining an appropriate threshold for when to post a sign and for periodic re-evaluation of its need would require some type of clearly defined, objective criteria and certification by an appropriate health or disability services professional. For VDOT to require and maintain such certifications would be a complicated and potentially litigious process and require VDOT to comply with stringent federal privacy regulations covering personal health records.

- **Other Disabilities**: Autism is only one of many disabilities that effect children's (and adults') behavior, mobility, senses, and cognitive abilities. These disabilities are identified by multiple terms, in some cases clearly delineated, in other cases overlapping in name and effect, particularly to the layman. For VDOT to create only a sign for children with autism, without considerable well-substantiated justification, could be discriminatory. It would also likely result in similar, disability-specific requests from parents of children with a wide range of other disabilities. For VDOT to create a separate sign for each of these possible disability categories, with its own threshold criteria and certification requirements, would be impossible.

- **All Disabilities**: Creation of a "generic" sign covering all disability categories might address some discrimination concerns, but it would still not eliminate the other inclusion, security, certification, and privacy concerns above. It would most likely just add additional complications. Prevalence charts on the Board's website currently list over twenty different regularly tracked categories of disabilities, and these lists are not comprehensive or without controversy.

- **Diminishing Returns**: As the number and variety of signs increase, their individual and collective effectiveness declines. As that happens, a false sense of security can be engendered which makes the situation more dangerous. A "domino" effect can also ensue, causing negative consequences on adjoining streets. U.S. Census figures indicate that one in five individuals have a significant disability, and that two in seven families have a member with a significant disability. Available data indicates that these ratios apply to Virginia as well. If VDOT were to place a caution sign near the home of every Virginia family with a child having a disability who might request one, those signs'

impact on drivers would quickly become insignificant, and the danger to falsely assured families would be dramatically heightened. VDOT would also be placed in the intolerable position of placing a separate sign for every requesting family or of deciding exactly where to place signs covering multiple families. As families come and go from neighborhoods, VDOT would find itself facing constant requests to add, remove, or relocate signs.

- **People First**: Finally, we cautioned that VDOT would need to be very careful in its use of language on any new signs and in any communications regarding disabilities. References such as "handicapped", "challenged", "special", and "disabled" are considered offensive by many. Some individuals with hearing or vision impairments are comfortable with the use of "deaf" and "blind" as descriptive adjectives and nouns, but not all. For the most part, it is no longer considered appropriate to define people by their disabilities. They are "individuals with a disability", not "disabled individuals" or "the disabled".

The above list of concerns is almost assuredly not comprehensive, but it indicates that VDOT needs to proceed carefully and with due deliberation before creating any new signs specifically for people with disabilities and their families. (VDOT may also wish to re-evaluate its current "Deaf Child Area" signs with these concerns in mind as well.) I have spoken with Leslie Prince, the Policy Manager at the Department for the Deaf and Hard of Hearing (VDDH). While their agency has not taken a position on this issue, Ms. Prince indicated that it was her understanding that very few of the Deaf Child Area signs are in use and that a review of the entire signage program might be appropriate.

The Board feels strongly that the voice of citizens should be heard and therefore is certainly not dismissing the concerns of the requesting parents. In evaluating this program and future actions, it would be important for your agency to seek input from disability and advocacy organizations and parents. Examples would be the various chapters of the Autism Society of Virginia, the ARC of Virginia, etc.

I recommend that before proceeding, you discuss this with the Assistant Attorney General that represents your agency. Following our meeting, I discussed briefly with Colleen Miller, Executive Director of the Virginia Office for Protection and Advocacy. While Ms. Miller is not in a position to offer a legal opinion to your agency, she is willing to speak, upon request to your Assistant AG about the issue if you feel it would be helpful. The concern I posed to Ms. Miller was whether you would face a potential charge of discrimination on the basis of disability by turning down the requests of parents of children with autism when you are honoring the requests for Deaf Child area signs.

As noted in our meeting, I am planning to consult with fellow DD Councils in other states to see if any of them have addressed this issue. We appreciate VDOT's interest in disability issues and in our counsel, and we look forward to working with VDOT in the future. If you have any further questions or if we can be of any additional assistance, please let us know.

Sincerely,

(Signed letter on file in TE Division)

Heidi L. Lawyer

Cc: Lisbet Ward
Board Chair

Hodges, Mark T.

From: Hodges, Mark T.
Sent: Friday, October 06, 2006 1:23 PM
To: 'elaine.ziehl@vddhh.virginia.gov'
Subject: VDOT Highway Signs

Ms Ziehl, thank you for talking to me in regard to our (VDOT Traffic Engineering) concerns surrounding the issue of posting signs for children with disabilities; and thanks to Ms Prince in advance.

Below is a copy of the letter from Ms Lawyer that I spoke of which points to pitfalls and cautions that VDOT should consider. Please let us know if you concur with Ms Lawyer or if you feel that the text of her letter should be edited before we embrace it in our efforts to form a position. Also attached is our current directive regarding posting signs for children with hearing loss. We currently have a moratorium regarding the posting of these signs which was affected last spring and was placed in order to provide us with time to reevaluate this subject as a whole. However, we likely have many of these sign in field locations, as this directive is many years old.

Any help you can offer will be appreciated.

Mark T. Hodges
Engineering Programs Supervisor
Traffic Engineering Division
E-mail Mark.Hodges@VDOT.Virginia.gov
Phone (804) 786-2868
Fax (804) 225-4978

Hodges, Mark T.

From: Ziehl, Elaine S. [Elaine.Ziehl@vddhh.virginia.gov]

Sent: Thursday, October 12, 2006 11:57 AM

To: Hodges, Mark T.

Cc: Lanier, Ronald L.; Prince, Leslie H.; Malheiros, Laurie B.; Bowen, Clayton E.; Talley, Gary W.

Subject: RE: VDOT Highway Signs

Mark,
Thank you for sending the documents regarding the issues surrounding posting signs for children with disabilities. After review and discussion, VDDHH is in agreement with the position stated by Ms. Lawyer in her letter. Leslie Prince, VDDHH Policy and Planning Manager, had discussed the concerns with Ms. Lawyer some time ago and provided input from the prospective of our constituency, the deaf and hard of hearing community.

Please feel free to contact us if you need further information. It was a pleasure speaking with you the other day and we look forward to any updates from VDOT on the situation and resolution.

Elaine S. Ziehl
VA Department for the Deaf & Hard of Hearing
804/662-9705 V/T
elaine.ziehl@vddhh.virginia.gov

Hodges, Mark T.

From: Hodges, Mark T.
Sent: Wednesday, October 25, 2006 3:33 PM
To: Brookes, Pamela G.; Lee, Thomas E., Jr.
Cc: Hodges, Mark T.; Khoury, Raymond J. 'Ray', P.E.; Mahbanoozadeh, Mansour
Subject: FW: VDOT Highway Signs

I received a phone call from Mr. Burton at about 2:30 today relative to the below included e-mail. Mr. Burton apologized for his delay and voiced that he, his Commissioner and the other Assistant Commissioner had discussed our request and the Heidi Lawyer letter and were in general agreement with it. He went on to recapitulate many of the concerns and to state clearly that they too feel that signs along this thinking serve no purpose and might give a false sense of security.

From: Hodges, Mark T.
Sent: Wednesday, October 25, 2006 10:01 AM
To: 'robert.burton@dbvi.virginia.gov'
Subject: RE: VDOT Highway Signs

Mr. Burton, at the risk of being a pest, I am contacting you to ask when we might hope to hear from you regarding the below. I know that when we spoke back in early October, you indicated that you office was extremely busy and that it might take you a week or more to respond, so I used that information to advise those looking to me for action in this regard, that my work would have to wait awhile. I need to up-date those folks and to do so, I need to know what you project as your time line. Thanks for understanding my "doggedness" on this.

From: Hodges, Mark T.
Sent: Friday, October 06, 2006 1:33 PM
To: 'robert.burton@dbvi.virginia.gov'
Subject: VDOT Highway Signs

Mr. Burton, thank you for talking to me in regard to our (VDOT Traffic Engineering) concerns surrounding the issue of posting signs for children with disabilities.

Below is a copy of the letter from Ms Lawyer that I spoke of which points to pitfalls and cautions that VDOT should consider. Please let us know if you concur with Ms Lawyer or if you feel that the text of her letter should be edited before we embrace it in our efforts to form a position. Also attached is our current directive regarding posting signs for children with hearing loss. I provide this to you for reference as it, by the nature of the items that we record, provides a look at how we have managed this in the past. We currently have a moratorium regarding the posting of these signs which was affected last spring and was placed in order to provide us with time to reevaluate this subject as a whole. However, we likely have many of these sign in field locations, as this directive is many years old.

We have never posted signs for children with vision impairments for several reasons. It is interesting to note that this position was supported by your agency when we contacted it about fifteen years ago.

Any help you can offer will be appreciated.

Mark T. Hodges
Engineering Programs Supervisor

Traffic Engineering Division
E-mail Mark.Hodges@VDOT.Virginia.gov
Phone (804) 786-2868
Fax (804) 225-4978

Letter from Hidey Lawyer:

<< File: RE.doc >>
Existing Directive Regarding posting signs for "DEAF CHILD AREA"

<< File: 204 TE-204 Signing for Deaf Child area.doc >>

VIRGINIA DEPARTMENT OF TRANSPORTATION

STRUCTURE AND BRIDGE DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Traffic Structures	NUMBER: IIM-S&B-82 TED- 357
SPECIFIC SUBJECT: Establishing procedures for shop plans, modifications, maintenance, and inspection of traffic structures.	Date: July 23, 2008
	SUPERSEDES: SB-69-02/TE-310 SB-66.1/MM-322 MM-323
DIVISION ADMINISTRATOR APPROVAL: Kendal R. Walus, P.E. /Original Signed State Structure and Bridge Engineer Approved: July 23, 2008 R. J. Khoury, P.E. /Original Signed State Traffic Engineer Approved: July 23, 2008	

EFFECTIVE DATE: This memorandum is effective upon receipt.

This I&IM replaces the following memorandums: SB-69-02/TE-310 *Modifications of Traffic Control Device Structures*, SB-66.1/MM-322 *Inventory of Traffic Control Device Structures*, and MM-323 *Procedure for Review and Retention of Traffic Control Device Shop Drawing/Catalog Cut Submittals*

This memo addresses the following types of traffic structures:

- Overhead span sign structure
- Cantilever sign structure
- Bridge parapet mounted sign structure
- Traffic signal structure
- Offset lighting pole
- Butterfly sign structure
- High mast lighting structure
- Camera pole
- Conventional lighting pole

The purpose of this memorandum is to clarify and update previous memoranda between the Structure and Bridge Division and Traffic Engineering Division and addresses the following areas related to traffic structures: review/retention of shop plans, modifications to structures,

maintenance of structures, and safety inspection. Hereinafter, these structures will be collectively referred to as traffic structures.

Review/Retention of Shop Plans:

The Construction Manager or other manager as appropriate shall forward all but one copy of the plans, computations, and shop drawings for the traffic structures to the Regional Operations Maintenance Manager or other section engineer as appropriate for verification of vertical clearance, sign panel location and size, and other non-structural related requirements. The Construction Manager or other manager as appropriate shall forward one copy of the plans, computations, and shop drawings for the traffic structures listed above to the District Structure and Bridge Engineer for a structural review. The District Structure and Bridge Engineer shall provide a set of comments and/or marked up drawings to the Regional Operations Maintenance Manager or other section engineer as appropriate so that joint comments may be developed in order to avoid conflicting reviews on submittals. The Regional Operations Maintenance Manager or other section engineer as appropriate shall return the comments to the Construction Manager or other manager as appropriate for distribution upon completion of the project to the following:

- Contractor
- Regional Operations Maintenance Manager
- Regional Traffic Engineer
- Municipality
- Project Engineer
- State Materials Engineer response letter only
- District Materials Engineer response letter only
- District Structure and Bridge Engineer
- State Structure and Bridge Engineer (Attention: Engineering Services)

Based on business need, this policy may be modified on projects where consultants are retained by the Department for shop drawing review; however, the District Structure and Bridge Engineer shall be sent a copy of the final approved submittal(s) to assist in the initial acceptance inspection.

The Regional Operations Maintenance Manager or other section engineer as appropriate shall be responsible for maintaining an archive of the As-Built contract plans, shop plans, calculations, and correspondence.

Modifications to Traffic Structures:

No modifications shall be performed / executed on traffic structures without approval of the District Structure and Bridge Engineer. These modifications shall include but not be limited to the following: movement of signals or signs, increase in number or size of signals, sign panels, etc.

Prior to performing modifications to existing traffic structures, the Section Engineer responsible for the design of the modification shall prompt the Regional Operations Maintenance Manager to request a structural review to be performed by the District Structure and Bridge Engineer. At the time of the request, they should provide a copy of the As-Built shop drawings and computations for the traffic structure and plans for the proposed modifications.

The District Structure and Bridge Engineer may coordinate this review as necessary with the Central Office Structure and Bridge Division or a consultant.

For modifications to traffic structures during construction, the Construction Manager or other manager as appropriate shall have the fabricator/designer provide revised computations and plans reflecting the actual field conditions for review and approval.

Maintenance of Traffic Structures:

The Regional Operations Maintenance Manager or other section engineer as appropriate shall be responsible for coordinating and funding all maintenance activities associated with traffic structures, including the development of replacement or relocation plans when warranted. As required, the District Structure Bridge Office will provide structural engineering support.

Safety Inspection:

All inspections on traffic structures shall be performed by the District Structure and Bridge Office or authorized consultant.

Initial Acceptance Inspection:

It is the responsibility of the Construction Manager or other manager as appropriate to notify the District Structure and Bridge Engineer, in writing, upon completion of construction and prior to final acceptance of traffic structures and to provide the following information:

1. Memo requesting the inspection of the traffic structures. This memo is included with this document in appendix A or may be obtained in Microsoft Word ® format on the internet at the following link:

   http://www.extranet.vdot.state.va.us/locdes/electronic%20pubs/Bridge%20Manuals/IIM/SBIIM.pdf

   Click on the link in the table of contents for IIM-S&B-82 and then click on the attachment tab on the left hand side.

2. Upon receipt of the request, the District Structure and Bridge Engineer shall perform the following:
   a. Set up a separate file folder for each traffic structure and add the traffic structure to the appropriate database.
   b. Establish a unique structure number and stencil the number on the traffic structure during the initial inspection.
   c. Complete the inspection report for each traffic structure per the manual, *Procedures for Inventory and Inspection of Traffic Control Device Structure*.

3. The Construction Manager or other manager as appropriate shall coordinate with the Contractor to provide access to the traffic structures to the District Structure and Bridge Engineer representative to perform the inspection and to provide traffic control as needed for the inspection.

4. The District Structure and Bridge Engineer shall notify the Construction Project Manager and Regional Operations Maintenance Manager or other section engineer as appropriate of all deficiencies that require corrective action.

5. Following any corrective action needed from the initial inspection, the Construction Manager or other manager as appropriate shall request in writing from the District Structure and Bridge Engineer the re-inspection of the traffic structures using the same form in step one.

Scheduled Inspection:

The District Structure and Bridge office shall perform scheduled inspection(s) for the traffic structures in accordance with the procedures set forth in the manual, *Procedures for Inventory and Inspection of Traffic Control Device Structures*. The District Structure and Bridge Engineer will perform the following tasks:

1. Re-inspect traffic structures per the established frequency. Typically, traffic structures are inspected every 5 years, but may require more frequent inspection. For example, traffic structures that show signs of section loss, corrosion of anchor bolt, etc. may require a more frequent inspection frequency.

2. After the inspection, forward an electronic copy of the completed inspection report to the Regional Operations Maintenance Manager or other engineer as appropriate and the Residency Administrator.

3. Structural deficiencies, required correction and priority order as noted in the inspection report will be brought to the attention of the Regional Operations Maintenance Manager or other section engineer as appropriate.

Non-scheduled Inspection:

The Regional Operations Maintenance Manager or other section engineer as appropriate shall request a re-inspection by the District Structure and Bridge Engineer of these traffic structures following any planned upgrade, improvement and/or modification.

Upon request, the District Structure and Bridge office shall perform the inspection for the traffic structures in accordance with the procedures set forth in the manual, *Procedures for Inventory and Inspection of Traffic Control Device Structures*. The District Structure and Bridge Engineer will perform the following tasks:

1. Re-inspect traffic structures.

2. After the inspection, forward an electronic copy of the completed inspection report to the Regional Operations Maintenance Manager or the Regional Traffic Operations Manager (as appropriate) and the Residency Administrator.

3. Structural deficiencies requiring correction as noted in the inspection report will be brought to the attention of the Regional Operations Maintenance Manager or other section engineer as appropriate.

Removal from Service:

The Regional Operations Maintenance Manager or other section engineer as appropriate shall inform the District Structure and Bridge Engineer when these traffic structures are removed from service so that they may be removed from the database.

CC:

Chief Engineer
Chief of Systems Operations
Traffic Engineering Division Director
Asset Management Division Director
District Construction Engineers
District PE Managers
District Maintenance Engineers
District Structure and Bridge Engineers
Regional Operations Maintenance Manager
Regional Operations Directors
Residency Administrators
Regional Traffic Operations Manager
Regional Traffic Engineer

Enclosures

Appendix A

REQUEST FOR INSPECTION OF TRAFFIC CONTROL STRUCTURES

INTEROFFICE MEMORANDUM

Date:

Project Number:

Universal Project Code (UPC):

TO:

FROM:

The following traffic control structures require an inspection prior to acceptance by VDOT/City/County:

Structure ID *	Location	Type of Structure	Structure Number

* As referenced on the traffic/sign plans.
(Attach additional sheets if necessary)

Enclosed you will find:

____ 1) A set of traffic/sign plans (plan sheets and layout sheets).
____ 2) PE stamped and approved shop plans (structure fabrication plans).
____ 3) PE stamped and approved foundation plans (if applicable).
____ 4) Computer output/manual design calculations -- superstructure and foundation.
____ 5) Miscellaneous correspondence indicating fabricator, contractor and PE stamped review.

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: ROADWAY SAFETY FEATURES	NUMBER: IIM-LD-222.10 TE-358.5
SPECIFIC SUBJECT: NCHRP 350 TEST REQUIREMENTS	DATE: JUNE 14, 2011
	SUPERSEDES: IIM-LD-222.9 TE-358.4
LOCATION AND DESIGN DIVISION APPROVAL: Mohammad Mirshahi, P.E. State Location and Design Engineer Approved June 14, 2011	TRAFFIC ENGINEERING DIVISION APPROVAL: Raymond J. Khoury, P.E. State Traffic Engineer Approved June 2, 2011

Changes are shaded.

CURRENT REVISION

- This memorandum has been revised to update the VDOT NCHRP 350 Approved Product List for Terminals and Trailer Mounted Attenuators.

EFFECTIVE DATE

- This memorandum is effective upon receipt.

BACKGROUND

- The National Cooperative Highway Research Program (NCHRP) published "Recommended Procedures for the Safety Performance Evaluation of Highway Features" in NCHRP Report 350. As a result of that report, the FHWA issued a requirement that all permanent safety hardware systems included in Federal Aid projects after August 1998 meet NCHRP 350.

- VDOT also extended that requirement to state funded projects. A July 25, 1997 memo from FHWA provided additional requirements regarding dates and conditions of compliance. The compliance date (with some exceptions) was extended to October 1, 1998. This memo also divided work zone devices into four categories with explicit requirements for each of the categories, which we will parallel in this document.

- Subsequent to the July 25, 1997 memo, the following have been made available:

  - July 1, 1998 AASHTO-FHWA Agreement
  - August 28, 1998 memo from the Director, Office of Engineering FHWA, "Crash Tested Work Zone Traffic Control Devices"

LONGITUDINAL BARRIER

- Standard GR-8 (Weak Post) Guardrail has been revised to meet NCHRP 350 testing criteria for high speed roadways. When installations of GR-8 Guardrail have been damaged and need repair/replacement, the guardrail should be "upgraded" to the new Std. GR-8.

- Standard GR-2 (Strong Post) Guardrail using a steel post, and blockouts made of wood or composite, have met NCHRP 350 criteria.

Any existing strong post guardrail installations not in accordance with NCHRP 350 criteria should not be repaired or replaced in kind but upgraded to meet NCHRP 350 when damaged or within the limits of a construction project. When damaged, the extent of damage should govern repair/replacement. If the total run of guardrail is 60 meters (200 feet)±, the entire run shall be replaced with strong post (St'd. GR-2) guardrail. For sections of guardrail that are longer than 60 meters (200 feet), if more than 60% of the entire run has been damaged, the entire run shall be replaced with strong post (St'd. GR-2) guardrail. If less than 60% of the entire run has been damaged, the damaged section should be replaced with strong post (St'd. GR-2) guardrail. Standard GR-3 (Cable) Guardrail met NCHRP 350 criteria.

NEW PAY ITEMS

ITEM CODE	DESCRIPTION	ITEM UNIT
13290	Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13292	Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13294	Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13291	Radial Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13293	Radial Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13295	Radial Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13298	Radial Guardrail GR-8C (NCHRP 350 TL-3)	Linear Feet/Meters
13440	Median Barrier MB-5 (NCHRP 350 TL-3)	Linear Feet/Meters
13441	Median Barrier MB-5A (NCHRP 350 TL-3)	Linear Feet/Meters
13442	Median Barrier MB-5B (NCHRP 350 TL-3)	Linear Feet/Meters

GUARDRAIL TERMINALS

- The MELT (Modified Eccentric Loaded Terminal - Standard GR-7) as it appears in the original 1996 Road and Bridge Standards has not passed NCHRP 350 test requirements to the satisfaction of the FHWA and is therefore not allowed for use after October 1, 1998. The new GR-7 with a revision date of 7/02 specifies designs that meet NCHRP 350 which include proprietary products such as the SRT350 and FLEAT350. These products have been approved by the FHWA for use as flared end terminals. If future testing produces additional options, VDOT's Road and Bridge Standards will be revised appropriately.

- Standard GR-6 Terminal Treatments for W Beam Guardrail is designed to be buried in the cut slope. This terminal design has been revised to meet the NCHRP 350 approved design recommended by FHWA and is furnished as an insertable sheet dated 7/02.

- Standard GR-9 Alternate to the Flared End Terminal is a parallel terminal design that is used for situations in which the flared terminal (Standard GR-7) cannot be installed due to site restrictions. VDOT's Road and Bridge Standards detail specifies that only products approved in accordance with NCHRP 350 test criteria (such as ET-2000, SKT-350, or BEST 350) are acceptable for use as Standard GR-9.

IMPACT ATTENUATORS / CRASH CUSHIONS

- All designs used for permanent installations of impact attenuators/crash cushions must have an FHWA approval letter specifying compliance with NCHRP 350 test requirements and approval by a Professional Engineer in the Location & Design Standards/Special Design Section prior to installation.

- The following alternative crash cushion has been added:

  - TL-2 SCI-70GM, Re-directive Crash Cushion from SCI Products, Inc.
  - TL-3 SCI-100GM, Re-directive Crash Cushion from SCI Products, Inc.

CONCRETE BARRIER

- Concrete Median Barrier meets NCHRP 350; however, testing has proven that impacts with "F" shape barrier resulted in better vehicle stability than with the "New Jersey" shape, especially for smaller vehicles, due to a reduction in the height of the break between the upper and lower slopes. Therefore, VDOT has required the "F" shape concrete median barrier since the January 2000 advertisement. The Department allowed a transition period before requiring the new "F" shape.

- From the January 1996 advertisement until January 2000, contractors were allowed the option of providing either of two types of concrete barrier, as noted below:

  - "New Jersey" shape or "F" shape *

- * Note: "F"-Shape barrier was required on selected projects that required more than 2300 meters (7500 ft.) of barrier or other selected projects when required in contract documents.

BREAKAWAY OR YIELDING SUPPORTS FOR SIGNS AND LUMINAIRES

- Includes items such as wood posts, slip bases, breakaway couplers, frangible bases, etc.

- The Department uses devices that currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.

WORK ZONE DEVICES

- <u>CATEGORY I DEVICES</u>

  - Includes items such as drums, cones, tubular markers, self-erecting delineator posts without any auxiliary device mounted on them except for Type A or C warning lights on drums and ballast located at the base of the devices.

    These devices are small and lightweight channelizing and delineating devices that carry virtually no potential to penetrate windshields, cause tire damage or have a significant impact on the control or trajectory of an impacting vehicle. These devices will, however, require certification by the manufacturer that their device is crashworthy – that it meets the evaluation criteria of NCHRP 350 Test Level 3. However, if the contractor has devices in his inventory that he believes meet Category I, but is having problems obtaining a letter of self-certification for them from the manufacturer, he can self-certify his current inventory of Category I devices as meeting NCHRP Report 350 standards if he is willing to be responsible for the crashworthiness of the devices. This certification may be a one-page affidavit signed by the manufacturer or contractor (Information on what should be contained in the self-certification Letter can be accessed at:
    http://safety.fhwa.dot.gov/roadway_dept/road_hardware/qanda.htm#212)
    When Type A or C warning lights are used on drums, the certification letter shall indicate that the drum and warning light combination is crashworthy.

- <u>CATEGORY II DEVICES</u>

- Includes Category I devices (drums, cones, etc.) with an auxiliary device (warning light except a Type A or C warning light on drums, sign, etc.) mounted on it, portable vertical panel assemblies, portable sign supports, intrusion detectors and alarms, and Type I, II and III Barricades.

- These devices are not expected to produce significant vehicular velocity change, but may otherwise be hazardous by penetrating a windshield, injuring a worker or causing vehicle instability when driven over. The Department has developed an approved list of those devices that comply with NCHRP 350 Test Level 3 and our specifications, and will maintain it on VDOT's web site. When a device is intended to be used that does not appear on the list, a copy of the FHWA acceptance letter for complying with NCHRP 350 will be required from the manufacturer prior to utilizing that device. On construction/maintenance projects the Contractor will be required to furnish a certification letter indicating those devices he intends to use are on the approved list or FHWA acceptance letters for devices not existing on the Department's approved list.

- Category I devices with an auxiliary device attached (except drums with a Type A or C warning light)

  These devices shall have been tested with the type of auxiliary device attached for conformance with NCHRP 350, Test Level 3, and an acceptance letter issued by FHWA.

- Portable Vertical Panel Assemblies

  Portable Vertical Panel Assemblies shall have been tested for conformance with NCHRP 350, Test Level 3, and an acceptance letter issued by the FHWA. Portable vertical panel assemblies with an auxiliary device mounted on it shall not be used unless they have been tested and approved under NCHRP 350, Test Level 3.

- Portable Sign Supports

  - Tripod Type

    Tripod portable sign supports shall not be used.

  - Self-erecting Type

    Self-erecting portable sign supports shall have been tested with the type of sign that is intended to be used with it for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. Other sign materials are allowed for use on the Portable Sign Supports when approved by the FHWA and indicated in an FHWA acceptance letter.

- Intrusion Detectors and Alarms

  These devices shall have been tested for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. Even though these devices are not normally required on projects, the Contractor will be required to furnish a copy of the FHWA acceptance letter if they plan to use such a device.

- Type I and II Barricades

  These devices are not used by the Department and therefore will not affect our operations.

- Type III Barricades

  These devices shall be in conformance with NCHRP 350, Test Level 3, with an acceptance letter issued by the FHWA. Please note that VDOT's Road and Bridge Standards BD-1 and BP-2 shall no longer be used.

- CATEGORY III DEVICES

  - Includes items such as barriers, crash cushions, fixed sign supports, and truck mounted attenuators.

  - These devices can cause significant velocity changes or other potentially harmful reactions to impacting vehicles.

  - Concrete Traffic Barrier Service

    For **temporary** locations, only "F" shape Concrete Traffic Barrier Service shall be used. When used in conjunction with a temporary installation, a positive connection (joint that transfers tension and moment from one segment to another) will be required. Beginning with the January 2000 advertisement, all positive connections must be approved in accordance with NCHRP 350.

    When Temporary Concrete Traffic Barrier Service is being used on any VDOT project, the barrier deflection must be taken into account when planning work zones. The deflection area must remain free of hazards such as steep fill slopes, construction equipment, personnel, etc.

  - Temporary Attenuators/Crash Cushions

    These devices shall have been tested for conformance to NCHRP 350 and an acceptance letter issued by the FHWA. This is effective for devices used by the Department and for construction/maintenance projects beginning with January, 1999 advertisements.

Fixed Sign Supports

The Department uses wood posts and other supports, which are listed in the Department's Special Products Evaluation List (SPEL), for fixed sign supports. These devices currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.

- Truck Mounted Attenuators

  Truck mounted attenuators purchased after October 1, 1998 shall have been tested for conformance to NCHRP 350 and an acceptance letter issued by the FHWA. Truck mounted attenuators used on all Limited Access Highways, and four or more lane Primary Highways with speed limits 55 mph or greater, shall conform to NCHRP 350, Test Level 3.

- CATEGORY IV DEVICES

  - Includes portable items, usually trailer-mounted devices such as area lighting supports, arrow boards, portable traffic control signals, and portable changeable message signs.

  - The FHWA has monitored studies of Category IV Devices since 1993. Studies show there is very little evidence that these devices are being struck frequently enough, nor are they causing injury severities that warrant either shielding with a barrier, or complete redesign of the trailers to make them crashworthy. A crash test matrix for Category IV Devices is being included in the procedures that will replace Report 350. Manufacturers who wish to build and test a crashworthy device will use these test procedures. Although the FHWA encourages the industry to develop safer trailers, crash testing of Category IV Devices will not be required by the FHWA in the foreseeable future. Proper placement of arrow panels and changeable message signs can help reduce the potential for crashes. Guidelines for placing and delineating these work zone trailers may be found in the MUTCD, Sections 6F-52 and 6F-53, the Virginia Work Area Protection Manual, Sections 6F.55 and 6F.56, and AASHTO's Roadside Design Guide, Chapter 9, Section 9.4.2.4 and in FHWA Acceptance Letter WZ-45.

VDOT APPROVED PRODUCTS

- VDOT's Approved Products List is available at:
  http://www.virginiadot.org/business/locdes/nchrp350-index.asp

- For information regarding VDOT's NCHRP 350 Approved Products List, please contact Charles W. Patterson, P.E., Standards and Special Design Section Manager at Chuck.Patterson@VDOT.Virginia.gov or (804) 786-1805.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zone Safety	**NUMBER:** TE-359
	DATE: November 25, 2008
SPECIFIC SUBJECT: Mowing Operations on Limited Access Highways	**SUPERSEDES:**
DIRECTED TO: District Administrators/ District Maintenance Engineers	**SIGNATURE:** R. J. Khoury, P.E. /Original Signed State Traffic Engineer

The 2005 Virginia Work Area Protection manual contains a typical traffic control layout titled “Mowing Operation with Encroachment” TTC 7.0 for use on primary and secondary roadways.

We have recently learned that this layout was misinterpreted and used on limited access highways.

The MUTCD requires the use of a truck mounted attenuator vehicle(s) for mobile operations on limited access highways.

To provide clarification we developed Typical Traffic Control (TTC) Figure 42.0 (Attachment 1) which shall be used on limited access highways or ramps. It is in effect beginning this date.

We have also revised the existing TTC-7.0 and is attached as TTC-7.1. It is to be applied to non-limited access primary and secondary routes mowing operations. (Attachment 2).

cc: Mr. Greg Whirley
Ms. Constance S. Sorrell
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca
Division Administrators
Regional Operations Directors
Regional Traffic Engineers
Resident Administrators
Mr. B. H. Cottrell

TYPICAL TRAFFIC CONTROL
Mobile Mowing Operation with Encroachment on Limited Access Highway
(Figure TTC-42.0)

NOTES

Standard:

1. **Mobile mowing operations shall be used when the mowing tractor or any portion of the mowing equipment is encroaching into the travel lane or on either edge line.**
2. **Each vehicle and mowing tractor involved in the moving/mobile operation shall be equipped with at least one high-intensity amber rotating, oscillating, or strobe light. Illuminated flashing arrows on the shadow vehicles shall be a Type C (96" x 48"). Vehicle hazard warning signals shall not be used instead of rotating lights or strobe lights, but as a supplement**.
3. **Four-corner caution mode shall be displayed on the shadow vehicles when there is no equipment encroachment.**

Option:

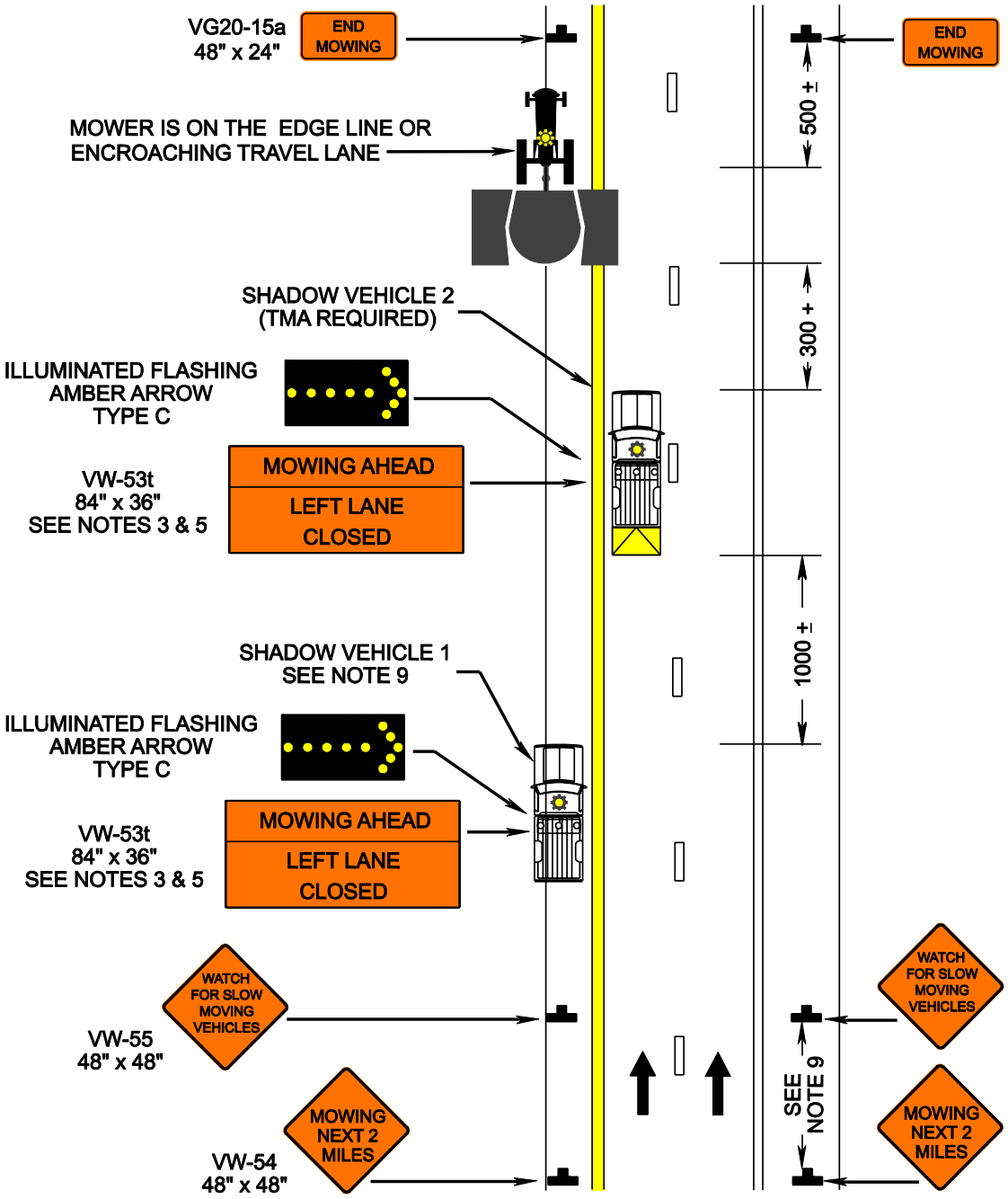
4. The static warning sign on the advanced warning vehicles and arrow panels may be replaced with a vehicle mounted CMS with a minimum of 10" height characters.
5. The top line MOWING AHEAD message on the advanced warning vehicle signs may be replaced with ROAD WORK AHEAD.
6. Arrow direction and designation may change as needed.

Guidance:

7. *Spacing between vehicles may vary, depending on the speed, sight distance, and type of moving operation. Whenever adequate stopping sight distance exists to the rear, the shadow vehicle should maintain the minimum distance and proceed at the same speed as the mowing tractor. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.*
8. *When using a CMS to replace the static sign and arrow panel on the vehicle, each word message phase should be followed by the Type C arrow display.*
9. *Sign spacing distance should be 1300'-1500' for limited access highways.*
10. *No more than 2 complete setups (2 miles each) should be exposed to motorists at any one time.*

Standard:

11. **Ramps entering into the work area shall be signed with VW-54 (MOWING NEXT 2 MILES) and VW-55 (WATCH FOR SLOW MOVING VEHICLES) signs.**
12. **When the mowing tractor is stationary in the travel lane or on the edge line, the shadow vehicle following the mowing tractor shall be in a position 50'-100' in advance of the mowing tractor to provide protection. When the mowing tractor is moving, the shadow vehicle following the mower shall follow at a minimum distance of 300'.**
13. **The first shadow vehicle shall run completely on the shoulder. If the shadow vehicle encroaches into the travel lane, it shall be equipped with a truck mounted attenuator (TMA).**
14. **Each shadow vehicle involved in the moving mowing operation shall have radio communication between vehicles.**



Mobile Mowing Operation with Lane Encroachment on Limited Access Highway (Figure TTC-42.0)

Typical Traffic Control
Mowing Operation with Encroachment
(Figure TTC 7.1)

NOTES

Standard:

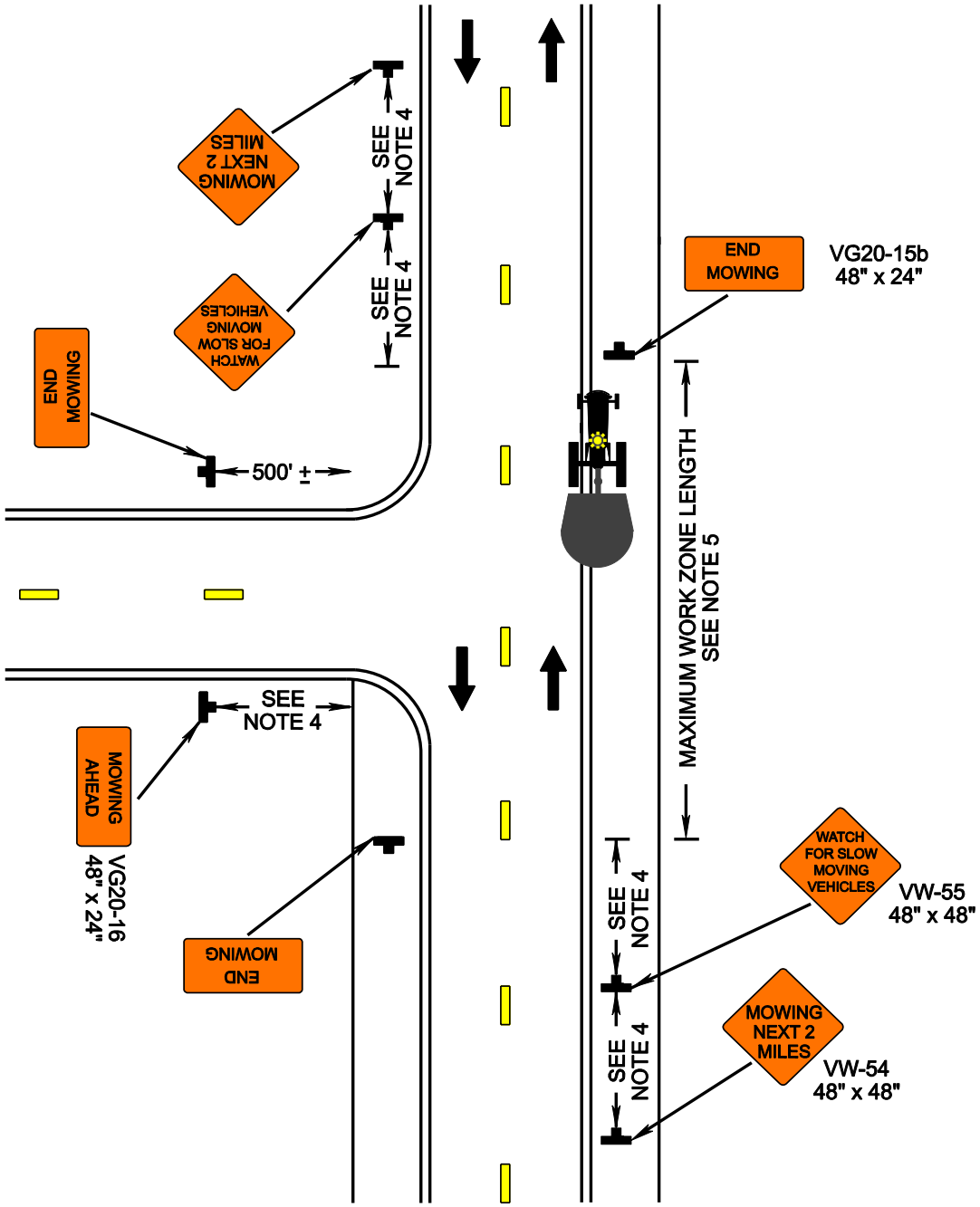
1. **Each vehicle involved in the operation shall be equipped with at least one rotating amber light or high intensity amber strobe or oscillating light visible from 360°.**
2. **on divided highways having a median wider than 8 ', left and right sign assemblies shall be required.**
3. **Connecting roads entering into the work area shall be signed as shown.**

Guidance:

4. *Sign spacing distance should be 500'-800' where the posted speed limit is greater than 45 mph, and 350'-500' where the posted speed limit is 45 mph or less.*
5. *No more than 2 complete setups (2 miles each) should be exposed to motorist at any one time.*
6. *To prevent multiple lane changing by motorists and constriction of traffic flow, mowing operations should be limited to one side of the roadway at a time, or separated by a minimum of 1000 feet between right and left side operations.*

Option:

7. If the operation is completely off the travelway, the 'WATCH FOR SLOW MOVING VEHICLES" sign may be omitted.



Mowing Operation with Encroachment
(Figure TTC-7.1)

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zone Safety	**NUMBER:** TE-360.2 **SUPERSEDES:** TE-360.1
SPECIFIC SUBJECT: Typical Traffic Control for Pre-Storm Treatment Operations	**DATE:** December 08, 2009 **SUNSET DATE:** See Note Below
DIRECTED TO: District Administrators/ District Maintenance Engineers	**SIGNATURE:**

Sunset Date Note: This document shall be considered superseded by any version of the Virginia Work Area Protection Manual issued subsequent to the date shown above.

At a request of the Maintenance Division, the following typical traffic control figure has been developed to ensure consistency when applying sprayed-on pre-storm treatment material in advanced of a forecasted winter weather storm. Due to the slower operating speeds of the treatment application vehicle and the need to keep motorist back from direct contact with the treatment material, a shadow vehicle shall be used for this type of operation. On four or more lane roadways with posted speeds of 45 mph or greater, the shadow vehicle shall be equipped with a Truck Mounted Attenuator (TMA) device.

The 48” x 18” PRE-STORM TREATMENT sign may be eliminated on those application vehicles which have no physical way of attaching the sign to the back of the vehicle. If an application vehicle can display the sign, it should do so. All application vehicles shall display the 18” x 18” KEEP BACK 100 FT sign.

This memorandum is effective upon receipt.

CC: Mr. Greg Whirley — Regional Operations Directors
Ms. Constance S. Sorrell — Regional Traffic Engineers
Dr. Gary Allen — Regional Operations Maint. Mgrs.
Mr. Malcolm T. Kerley, P.E. — Resident Engineers
Mr. Roberto Fonseca — Mr. B. H. Cottrell
Division Administrators

Typical Traffic Control
Pre-Storm Operations
(Figure TTC 44.1)
NOTES

Standard:

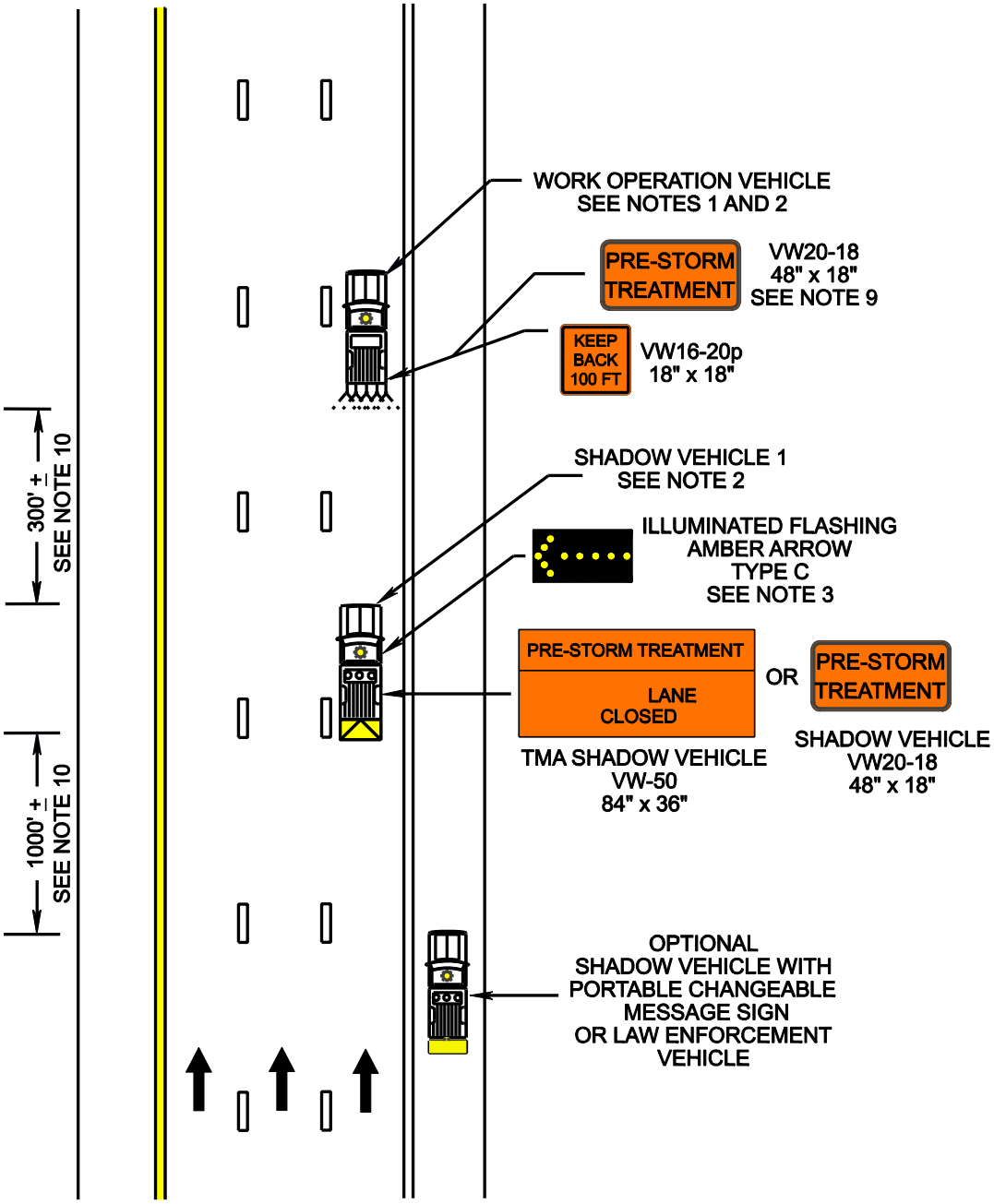
1. **Each vehicle involved in the moving operation shall be equipped with at least one high-intensity amber rotating, oscillating, or strobe light. The illuminated flashing arrow on Shadow Vehicle 1 shall be a Type C (96 x 48 inch) arrow panel unless replaced with a Changeable Message Sign (CMS). Vehicle hazard warning signals shall not be used instead of rotating lights or strobe lights, but as a supplement**.
2. **Shadow Vehicle 1 shall be equipped with a truck mounted attenuator (TMA) for operations on a four or more lane roadway with posted speeds of 45 mph or greater.**
3. **The shadow vehicle on two-lane roadways shall not display a flashing arrow. The display shall be either a type B or C arrow panel operating in the caution mode or a high-intensity amber rotating, oscillating, or strobe light.**
4. **For operations in the center lane of multi-lane roads, Shadow Vehicle 1 shall display a flashing double arrow.**
5. **Each vehicle involved in the moving operation shall have radio or mobile communication between vehicles.**

Option:

6. The static warning sign and arrow panel on the advanced warning vehicle may be replaced with a vehicle mounted CMS with a minimum of 10" height characters.
7. Arrow direction may change as needed. The lane designation on VW-50 may be covered due to the rapid lane changes during the brine application.
8. Actual conditions could dictate more traffic control device needs in the operation. On high speed, high volume roads, an optional shadow vehicle on the shoulder with a Portable Changeable Message Sign (PCMS) or a marked law enforcement vehicle driving on the shoulder only may be used to further enhance safety. Suggested messages for the PCMS: PRE STORM WORK, RIGHT (or LEFT, CENTER) LANE CLOSED.
9. The PRE-STORM TREATMENT sign may be eliminated from the work operations vehicle if physically impossible to mount the sign to the back of the vehicle.

Guidance:

10. *Spacing between vehicles may vary, depending on the speed, sight distance, and type of pre-storm treatment being applied. Whenever adequate stopping sight distance exists to the rear, the shadow vehicle(s) should maintain the minimum distance shown and proceed at the same speed as the work operation vehicle. The shadow vehicle(s) should slow down in advance of vertical or horizontal curves that restrict sight distance.*
11. *When using a vehicle CMS to replace the static sign and arrow panel on Shadow Vehicle 1, each word message phase should be followed by a Type B arrow display.*
12. *Advanced warning messages should be considered on overhead Changeable Message Signs to enhance the safety of the operation. Suggested messages: PRE-STORM TREATMENT AHEAD, RIGHT (or LEFT, CENTER) LANE CLOSED.*



Pre-Storm Treatment Operation
(Figure TTC-44.1)

VW16-20p
This sign is intended to be installed on back of the work operation vehicle during pre-storm treatment operations.

SHAPE		Square
COLOR	Message and Border:	Black (Non-Reflectorized)
	Field:	Orange (Reflectorized)
SIZE	Horizontal:	18"
	Vertical:	18"
MESSAGE	Line 1 Capitals:	3" D
	Line 2 Capitals:	3" D
	Line 3 Numerals & Capitals:	3" D
MARGIN WIDTH		None
BORDER WIDTH		None
CORNER RADIUS		1 1/**2**"

VW-50
This sign is intended to be installed on the truck mounted attenuator shadow vehicle performing pre-storm treatment operations.

SHAPE		Horizontal Rectangle
COLOR	Message and Border:	Black (Non-Reflectorized)
	Field:	Orange (Reflectorized)
SIZE	Horizontal:	84"
	Vertical:	36"
MESSAGE	Line 1 Capitals:	6" B
	Solid Bar:	1 1/4"
	Line 2 Capitals:	6" C
	Line 3 Capitals:	6" C
MARGIN WIDTH		3/4"
BORDER WIDTH		1 1/4"
CORNER RADIUS		None

Notes: Line 2 lane designation legend may be covered during pre-storm treatment operation only.

VW20-18
This sign is intended to be installed on back of the work operation vehicle and the shadow vehicle without a truck mounted attenuator in a pre-storm treatment operation. The sign may be eliminated from the work operation vehicle if it is physically impossible to mount the sign to the back of the vehicle.

SHAPE		Horizontal Rectangle
COLOR	Message and Border: Field:	Black (Non-Reflectorized) Orange (Reflectorized)
SIZE	Horizontal: Vertical:	48" 18"
MESSAGE	Line 1 Capitals: Line 2 Capitals:	5" D 5" D
MARGIN WIDTH		1/2"
BORDER WIDTH		3/4"
CORNER RADIUS		1 1/2"

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: REGULATORY SIGN	**NUMBER:** TE-361
	DATE: May 4, 2009
SPECIFIC SUBJECT: Sign for Limiting Use and Activity on Pedestrian Swing Bridges	**SUPERSEDES:**
DIRECTED TO: District Administrators/ District Maintenance Engineers/ District Bridge Engineers	**SIGNATURE:** R. T. Khoury

At a request of the Structure and Bridge Division, the attached traffic control Regulatory Sign has been developed. The installation of this sign will be at the discretion and direction of the State Structure and Bridge Engineer or the District Structure and Bridge Engineer.

This sign is intended to be placed at or within ten foot of each entry to pedestrian swing bridges.

This sign will replace any sign that might exist in accordance with Section 16.9.6 Foot Bridges as shown in the "Maintenance Best Practice" manual dated August 2008. That Section reads:

> Foot bridges that were previously maintained by the counties on the Secondary System shall be maintained by the Department, and are to be posted with a sign reading:
>
> NOTICE – WALK CAREFULLY, DO NOT RUN OR OTHERWISE CAUSE THE BRIDGE TO SWAY.

The Maintenance Division has agreed that future editions of this manual will have reference to posting the attached sign.

CC: Mr. Greg Whirley
Ms. Constance S. Sorrell
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca
Division Administrators
Regional Operations Directors
Regional Traffic Engineers
Regional Operations Maint. Mgrs.
Resident Administrators
Mr. B. H. Cottrell

Legend and boarder	Black
Background	Yellow upper portion White lower portion

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Administrative and Engineering	**NUMBER:** TE-362.1 **SUPERSEDES:** TE-362
SPECIFIC SUBJECT: Sealing and Signing of Plans and Documents by Licensed Professional Engineers	**DATE:** June 4, 2009 **SUNSET DATE:** N/A
DIRECTED TO: District Administrators Regional Operations Directors State Location & Design Engineer	**SIGNATURE:** R. T. Khoury

This memorandum is effective for all RAAP projects starting with a December 2009 advertisement date. The effective date for No Plan RAAP, SAAP projects and for all technical documents requiring to be sealed and signed is July 1, 2009.

Chief Engineer Mr. Malcolm Kerley, P.E., formed a committee to transition VDOT into compliance with the Code of Virginia, §54.1-402.1. The committee had as one of its primary objectives the function of determining which Engineering-related Plans and Documents, referred hereafter as Products, are required to be sealed and signed by a licensed Professional Engineer, and which products are exempt (See Note A).

The following Traffic Engineering Products are to be sealed and signed:

1) Traffic Engineering Studies and Recommendations
   a) Speed Limit Studies – *use standard speed study report (includes seal & signature box)*
   b) Signal Warrant Studies – *use standard signal warrant study report (includes seal & signature box)*
   c) Traffic Impact Analysis conducted by VDOT - *insert seal & signature box in Attachment B into 1st page header of document*
2) Advertised Construction Plans – *use standard seal and signature blocks on plan sheets as shown in Attachment A.*
   a) Traffic Control Device Plans
      i) Pavement Marking Plans
      ii) Sign Plans
      iii) Traffic Signal Plans
      iv) Roadway Lighting Plans
   b) Transportation Management Plans (per IIM 241.3; for both Construction and Maintenance projects – preparer of TMP will seal & sign)

i) Includes changing speed limit for Work Zones – *use form from TE Memorandum 350 (includes seal & signature box)*

3) Traffic signal design and modification – *insert seal & signature box in Attachment B into 1st page header of document*
   a) New signal phasing and changes to signal phasing
   b) New clearance timing and changes to clearance (yellow and all-red) timing

4) Safety studies requiring detailed engineering and/or detailed accident analysis or corridor traffic safety studies (See Note B) - *insert seal & signature box in Attachment B into 1st page header of document*

5) Guardrail recommendations - guardrail design - *use standard seal and signature blocks on plan sheets as shown in Attachment A.*

6) Through Truck Restriction Studies and Recommendations (See Note C) – *use standard through truck restriction report (includes seal & signature box)*

7) Operational / Capacity Analysis (See Note D) - *insert seal & signature box in Attachment B into 1st page header of document*

8) Traffic Control Device-related additions or modifications to the Road and Bridge Specifications and Road and Bridge Standards - *insert seal & signature box in Attachment B into 1st page header of document detailing the new or modified standard. Note that traffic control device standards, specifications, and insertable sheets in effect on July 1, 2009 are grandfathered and not sealed.*

Notes:

A. Products required to be sealed and signed may be signed by an exempted engineer through June 30, 2010.

B. A review of crash data and the physical characteristics of the roadway that includes an evaluation of potential engineering countermeasures (physical roadway improvements and/or use of traffic control devices) to reduce the potential for crashes at that location or along that section of road. The resulting product (may be a simple design sketch) shall be sealed and signed.

C. Through truck restriction studies and recommendations respond, according to law, to a formal request by a local governing body to restrict a particular roadway to through truck traffic. Studies involve a review of crash and traffic data and the physical characteristics of both the roadway requested to be restricted to through truck traffic and the identified alternate route, as well as public comments received as required by law, and the criteria adopted by the Commonwealth Transportation Board (CTB). The study includes a recommendation to the CTB or designee to approve or deny the formal request for a through truck restriction on that particular roadway.

D. A review of the volume and types of traffic and the physical characteristics of the roadway that includes capacity analysis or traffic flow simulation and considers potential roadway or traffic control improvements to improve traffic flow through the location or section of roadway.

The following Traffic Engineering Products were determined by this committee as those not requiring sealing and signing:

1. Pedestrian / Bicycle Facility studies
2. Street Lighting Warrant studies

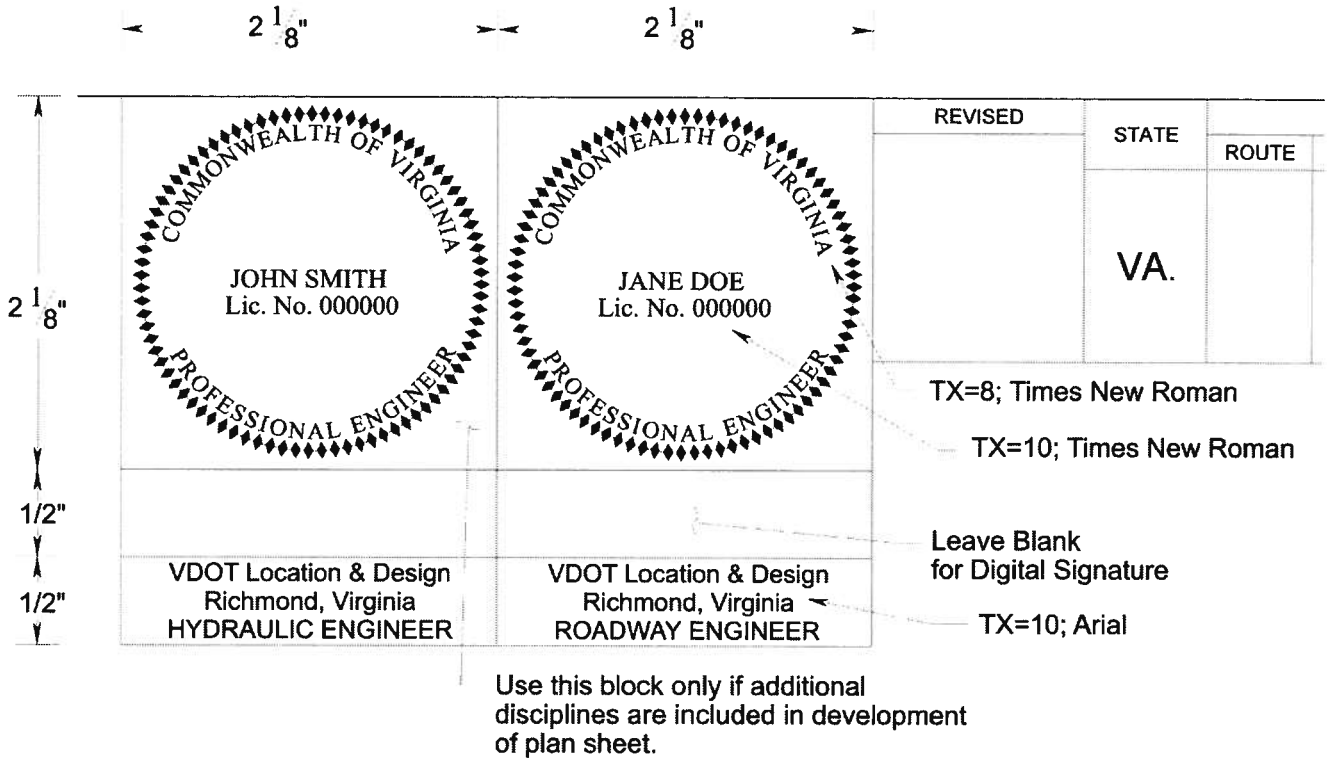
3. Investigations and field reviews resulting in sign and/or pavement marking installation following established policy and standards, i.e. warning signs, guide signs, route shields, edgeline, centerline, pavement messages, etc.
4. Planning level studies (i.e. Feasibility Studies, Small Urban Plans, State Highway Plans, Regional Long-Range Plans, Corridor Studies)
5. Temporary Traffic Control plans that only reference the Work Area Protection Manual.
6. Signal timings for minimum and maximum green, and changes to cycle lengths, splits, and offsets.
7. Road Safety Assessment reports.

For locally administered projects, please refer to the *Guide for Local Administration of Virginia Department of Transportation Projects*. This document can be found on the Local Assistance Division webpage at: http://www.virginiadot.org/business/local-assistance.asp

cc: Regional Ops Maintenance Managers
Regional Traffic Engineers
Regional Traffic Ops Managers
Resident Administrators
Ms. Constance S. Sorrell
Mr. Greg Whirley
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Roberto Fonseca

Attachment A

The upper right corner next to the project information bbck is the preferred location of the blocks for sealing and signing.



Drawing/Example not to scale.

Note: Signature Blocks are not part of the sheet cell. They are separate cells that can be placed inside the sheet cell. The edit test command can be used to modify text as needed.

While the preferred orientation horizontal, these blocks may be placed vertically, or in an alternate location if necessary.

INTERIOR PLAN SHEETS
UPPER RIGHT CORNER – VDOT IN-HOUSE & CONSULTANT PLANS
SEALING AND SIGNING OF PLANS

Attachment B

This seal & signature block should be placed on the first page of traffic engineering reports and studies not having a standard report template, preferably in the upper right corner. The electronic seal is placed in the upper box and the electronic signature with date stamp is placed in the center box using VDOT's electronic signature software. Before placing the electronic signature, edit the bottom box to indicate the office location of the signer, e.g. Richmond, Virginia; Salem, Virginia; etc.

VDOT - Traffic Engineering [Office Location] Traffic Engineer

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

NUMBER: TE-363	**DATE:** July 28, 2009
SUPERSEDED: N/A	**SUNSET DATE:** (see footnote)
GENERAL SUBJECT: Engineering and Administration	
SPECIFIC SUBJECT: Use of Ballbank Indicator Device	
DISTRIBUTION TO: Regional Operations Directors Regional Traffic Engineers Regional Operations Maintenance Managers	

COMMONWEALTH OF VIRGINIA
RAYMOND J. KHOURY
Lic. No. 032146
PROFESSIONAL ENGINEER

VDOT - Traffic Engineering
Richmond, Virginia
Traffic Engineer

The Regional Traffic Engineers have brought to my attention the fact we, as an agency, do not have a universal practice regarding the method used to establish the need for Horizontal Alignment Signs (W1-1 through W1-5, W1-11, W1-15); and, the posting of Advisory Speed Panels with these signs. To this end, they have performed a literature and recommendations research for the latest trends and practices.

After a review of available literature and recommendations (National review - Executive Summary attached), it has been concluded that the use of the 85% speed as gained from speed studies will not meet the need of VDOT as well as the use of the Ballbank/limiting angle method would. Therefore, the Ballbank/limiting angle method will be our standard with the following set as our limiting angle practice.

For a posted speed from **0 to 24 MPH**, the limiting angle shall be **16 degrees**.
For a posted speed from **25 to 34 MPH**, the limiting angle shall be **14 degrees**.
For a posted speed from **35 to 49 MPH**, the limiting angle shall be **12 degrees**.
For a posted speed from **50 and greater**, the limiting angle shall be **10 degrees**.

This standard is adopted for statewide use with the issuance of this document.

CC: Mr. Greg Whirley
Ms. Constance S. Sorrell
Dr. Gary Allen
Mr. Malcolm T. Kerley, P.E.
Mr. Robert Fonseca
District Administrators
Division Administrators
Resident Administrators
Mr. B. H. Cottrell

Sunset upon adoption of a *Virginia Supplement to the MUTCD* subsequent to the date of issuance of this document

Review of Ball-Bank Reading Criteria for Advisory Speed on Curves

Traffic Engineering Section

Jung-Taek Lee

May 13, 2009

Executive Summary

It has been reported that about 25 percent of all fatalities occur on curved sections of a roadway. Fatalities are three times more likely to result on a curved section than on a similar tangent section. In rural areas, about two-thirds of all fatalities take place on curved sections. To reduce potential accidents on curves, criteria for safe speed has been studied since the 1930's, resulting in a variety of methods.

In 1935 the Bureau of Public Roads issued research testing of safe driving speeds on curves, resulting in side friction factors from 0.07 to 0.20 with an average of 0.16 for speeds between 20 and 60 mph. In 1937 the Missouri State Highway Department began experiments with ball-banking indicators, reporting that a 10-degree ball-bank reading corresponded to an approximate side friction factor of about 0.14 to 0.15, depending on the body roll of the vehicle. It was reported in 1995 that 88 percent of states, cities and counties use ball-bank indicators. Since the 1940's, it has been recommended that the ball-bank reading for setting the advisory speed on a curve would be:

- 14-degrees for speeds below 20 mph
- 12-degrees for speeds between 20 and 35 mph
- 10-degrees for 35 mph or greater

The latest national *MUTCD* includes language of ball-bank reading of 16-degrees for the section of advisory signs, and the *2001 Traffic Control Devices Handbook* by ITE recommended earlier ball-bank reading criteria.

However, both the methods and ball-bank criteria for setting advisory speed on curves vary from state by state and even within a state. Furthermore, over the past few decades, arguments on the criteria have risen to either modify or to omit the ball-bank reading language in many references. Recently the Regulatory and Warning Signs Technical Committee (RWST) for the National Committee on Uniform Traffic Control Devices (NCUTCD) recommended removing advisory speed posting recommendations, such as ball-bank values, from future versions of the *MUTCD* and simply recommended the use of the term "engineering judgment." The committee also recommended the increase of ball-bank criteria by 2-degrees to a new 12-, 14- and 16-degree threshold in the next edition of *Traffic Control Devices Handbook* by ITE, which is comparable to the AASHTO 2003 *Greenbook* design values.

In the state of Virginia, the use of ball-bank criteria also varies from the national *MUTCD* or a typical value of 10-degrees. This report presents findings in historical ball-bank criteria and the ball-banking criteria use in other states.

Major Chronicle of Ball-Bank Reading Criteria

1940 *Marking Highway Curves with Safety Speed Indications*, proceedings of the Annual Meeting of the Highway Research Board (by Moyer, R.A. and D.S. Berry), Volume 20, pages 399 to 428:

- 10-degree ball-bank reading was reported to correspond to a side friction factor of about 0.14 to 0.15
- 10-degree became a primary factor in application of the ball-bank indicator for curve signing
- Further finding in the same report:
    - 10-degree (30 mph <Speed<= 50 mph)
    - 12-degree (20 mph <Speed<= 30mph)
    - 14-degree (Speed <= 20 mph)

1983 *Traffic Control Devices Handbook* by FHWA:

- 10-degree (35 mph <Speed<= 60 mph)
- 12-degree (20 mph <Speed<= 30mph)
- 14-degree (Speed <= 20 mph)

It is to be noted that many states simply use the 10-degree reading to represent the maximum safe speed as a conservative value as provided by this single threshold.

1991 *Analysis of Advisory Speed Setting Criteria, Public Roads* (by Chowdhury, M.A., D.L. Warren and H. Bissell), Volume 55, Number 3, pages 65 to71:

- 12-degree (40 mph <Speed)
- 16-degree (30 mph <=Speed<= 40 mph)
- 20-degree (Speed < 30 mph)

1999 *Relationships between Ball Bank Indicator Readings, Lateral Acceleration Rates, and Vehicular Body-Roll Rates* (by Carlson P.J. & and Mason, J.M.), TRR 1658, pages 34 to 42:

- Tested with 1992 Ford Taurus on a test track.
    - 9-degree (30 mph <Speed)
    - 12-degree (20 mph <=Speed<= 30 mph)
    - 16-degree (Speed < 20 mph)

1999 *Advisory Speeds on Maryland Highways Technical Report* (by Brudis & Associates, Inc. (BAI)), MDOT, Hanover, Maryland:

Evaluated “lean angle” as a value equating to the ball-bank angle to MDOT; 42 MD curves on rural roads:

Posted Advisory Speed	Average Lean Angle	85th Percentile Speed
15 mph	15.5 degrees	26 mph
20 mph	18.3 degrees	30 mph
25 mph	16.0 degrees	36 mph
30 mph	15.0 degrees	45 mph
35 mph	15.6 degrees	45 mph
40 mph	13.2 degrees	52 mph
45 mph	16.3 degrees	55 mph

2000 *MUTCD 2000*:

Engineering judgment is a standard to indicate the need to advise road users of the recommended speed on an exit, a ramp, or a curve (W13-2, @13-3, W13-5).

2001 *Traffic Control Devices Handbook* (ITE 2001); newer edition of *1983 FHWA Traffic Control Devices Handbook*:

- 10-degree (35 mph <Speed<= 60 mph)
- 12-degree (20 mph <Speed<= 30mph)
- 14-degree (Speed <= 20 mph)

2003 *MUTCD 2003* (Revisions 1 and 2)
Section 2C.36 Advisory Exit, Ramp, and Curve Speed Signs (W13-2, W13-3, W13-5)
Section 2C.46 Advisory Speed Plaque (W13-1):

Option — "The advisory speed may be the 85th percentile speed of free-flowing traffic, the speed corresponding to a 16-degree ball bank indicator reading, or the speed otherwise determined by an engineering study because of unusual circumstances."

Support — "A 10-degree ball-bank indicator reading, formerly used in determining advisory speeds, is based on research from the 1930's. In modern vehicles, the 85th-percentile speed on curves approximates a 16-degree reading. This is the speed at which most drivers' judgment recognizes incipient instability along a ramp or curve."

2004 *A Policy on Geometric Design of Highways and Streets 2004 Edition* provides summary diagrams of side friction factors for speed on curves from various research findings in Exhibits 3-10, 3-11 and 3-12:
Summary table of side friction factor values from *Consistency and Effectiveness of Advisory Speeds: An Evaluation of Current Posting Techniques*, (by Joshan W. Rohani, Master's Thesis, Oregon State University, 2007):

Table A1.1: Side Friction Factor Values

Speed, mph	Moyer & Berry (1940) *f* values	Carlson & Mason 1999		AASHTO 1990 & 2001 Max. *f* values		Bonneson, 2000 (Interpolated)	MRI, 2003 Values shown are max. demand *f*		AASHTO 2004 Max. *f* values (All Roads)
		Adjusted Moyer & Berry Values	Proposed Values	Low Speed	High Speed or Rural		Car	Truck	
20	0.21	0.24	0.28	0.300	0.170	0.223	0.17	0.19	0.27
25	0.18	0.21	0.21	0.252	0.165	0.209	---	---	0.23
30	0.18	0.21	0.21	0.221	0.160	0.193	0.16	0.18	0.20
35	0.15	0.17	0.15	0.197	0.155	0.178	---	---	0.18
40	0.15	0.17	0.15	0.178	0.150	0.164	0.15	0.17	0.16
45	0.15	0.17	0.15	0.163	0.145	0.145	---	---	0.15
50	0.15	0.17	0.15	---	0.140	0.134	0.14	0.15	0.14
60	---	---	---	---	0.120	0.103	0.12	0.13	0.12
70	---	---	---	---	0.100	0.075	0.10	0.11	0.10
80	---	---	---	---	0.080	---	0.08	0.09	0.08

<u>2007</u> Regulatory and Warning Signs Technical Committee (RWST) for the National Committee on Uniform Traffic Control Devices (NCUTCD):

- NCUTCD recommended removing advisory speed posting recommendations, such as ball-bank values, from future versions of the *MUTCD* and simply recommend the use of the term “engineering judgment.”
- Recommended the ball-bank criteria be increased by 2-degrees from 10-, 12-, 14-degree thresholds to a new 12-, 14- and 16-degree threshold in the next edition of *TCD Handbook* by ITE, which is comparable to the *AASHTO 2003 Greenbook* design values:
    - 12-degree (30 mph <Speed<= 60 mph)
    - 14-degree (20 mph <=Speed<= 30 mph)
    - 16-degree (Speed <= 20 mph)

Documented State Ball-Bank Readings

<u>California MUTCD</u> (FHWA's *MUTCD* 2003 Revision 1, as amended for use in the state of California. As of September 26, 2006, the chart is used to determine comfortable speed from ball-bank indicator readings.

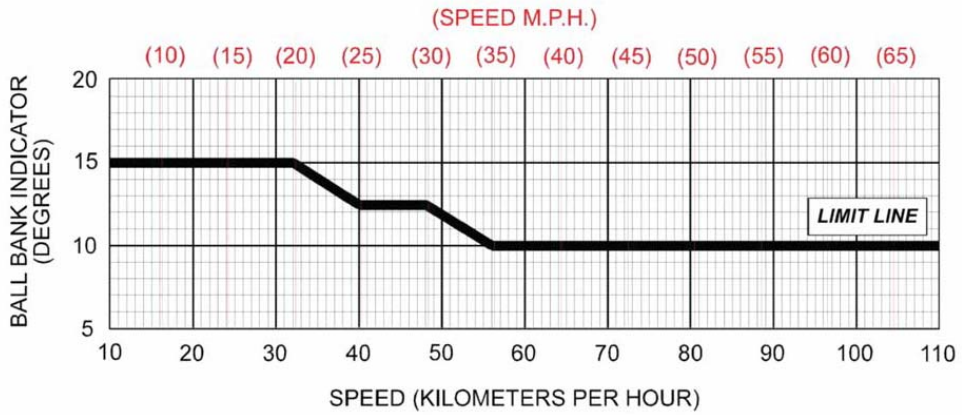
<u>California MUTCD Section 2C.101 (CA)</u>

Figure 2C-101 (CA). Determination of Comfortable Speed From Ball Bank Indicator Readings

Driver_____
Observer_____
Vehicle_____
Date_____

Type of Pavement_____
Condition of Pavement_____
Min. Sight Dist. Thru Curve_____
Approach Speed
(Estimated or Observed)_____

Co._____Rte._____PM_____
Sta._____To_____
Direction_____
Weather_____



Ball Bank Readings	Advisory Speed
10 degrees	> 35 mph (55 km/h)
12.5 degrees	25-30 mph (40 to 50 km/h)
15 degrees	<= 20 mph (30 km/h)

<u>New York State MUTCD</u> NYS Supplement Revision 1 replaces entire section of *Advisory Speed Plaque* (W13-1). Three methods are proposed under the subheading:

Option

The advisory speed may be determined using one of the following methods:

A. A calculation of the speed using the curve radius, superelevation, and the simplified curve formula from AASHTO's *A Policy on Geometric Design of Streets and Highways 2004*, using a side friction factor of:
    1. 0.24 for speeds up to 24 mph
    2. 0.21 for speeds of 25 to 34 mph
    3. 0.18 for speeds of 35 to 49 mph
    4. 0.15 for speeds of 50 mph or more

B. A calculation of the speed using ball bank readings of:
    1. 16 degrees for speeds up to 24 mph
    2. 14 degrees for speeds of 25 to 34 mph
    3. 12 degrees for speeds of 35 to 49 mph
    4. 10 degrees for speeds of 50 mph or more

C. A calculation of the speed using an engineering analysis that considers all of the factors:
    1. Approach speeds.
    2. Roadway geometry including width, radius, superelevation, stopping sight distance, and horizontal sight distance
    3. Truck rollovers
    4. Roadside hazards
    5. Pavement surface conditions
    6. Crash experience
    7. Driver expectancy

Support:
The ball bank readings for advisory speeds are based on the side friction factors used for curve design in the AASHTO's *A Policy on Geometric Design of Streets and Highways 2004*. The values used for the advisory speed are more conservative for speeds under 50 mph to account for the tendency of vehicles with a high center of gravity to roll over before skidding at lower speeds.

Oregon Department of Transportation State *MUTCD* directs a method in Sign Policy and Guidelines under the Traffic Roadway Section:

Values for Determining Comfortable Safe Speeds on
Horizontal Curves Using a Ball-Bank Indicator

Curve Speed in Miles-per-Hour	Ball-Bank Reading Limiting Values in Degrees
15	13
20	13
25	13
30	13
35	10
40	10
45	10
50	10
55	10
60	7
65	7

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

NUMBER: TE-364	**DATE:** August 14, 2009	COMMONWEALTH OF VIRGINIA RAYMOND J. KHOURY Lic. No. 032146 PROFESSIONAL ENGINEER
SUPERSEDED: None	**SUNSET DATE:** None	
GENERAL SUBJECT: Traffic Signs		
SPECIFIC SUBJECT: No Loitering Signs		
DISTRIBUTION TO: • District Administrators • Regional Operations Directors • Regional Traffic Engineers • Regional Operations Maint. Managers • Maintenance Div. Administrator		VDOT - Traffic Engineering Richmond, Virginia Traffic Engineer

The 2008 General Assembly amended the Code of Virginia Section 46.2-930 to provide the Commissioner with the authority to place signs to prohibit loitering on bridges and any portions of highway right-of-way if determined to present a public safety hazard (see attached statute – page 4 of this document). Cities and towns have the authority to adopt their own procedures for placing such signing on their streets and bridges.

The 2009 General Assembly further amended this Section of the Code (reference attached), changing it to allow counties the privilege of determining that loitering activity is a public safety hazard at a given location and the authority to adopt their own procedures for placing such signing on their streets and bridges. This 2009 change also required that *"Local jurisdictions shall obtain concurrence from the Commonwealth Transportation Commissioner on the placements of signs on the right-of-way of any bridge or highway under the jurisdiction and control of the Commonwealth Transportation Commissioner or the Virginia Department of Transportation."* It further states *"however, the local jurisdiction shall be responsible for all costs of the production, installation, and maintenance of the signs".* The effective date of this amended Section of the Code of Virginia was July 1, 2009.

VDOT should not post such a sign on its own accord; but, should rely on the local government to request the installation of these signs within the highway rights-of-way.

The locality should clearly show how the No Loitering signs will aid in the enhancement of safety. The Commissioner's concurrence for the placement of the signs within the right-of-way shall be through the issuance of a Land Use Permit. The permitting process for the signs shall be used to record where such signs are installed, by whom (establishing responsibility for maintenance), and most importantly, shall, for the record, include all documentation inclusive of the jurisdiction's resolution.

<u>Locality's Responsibilities</u>

To initiate action, the locality shall first, by resolution adopted by the governing body, define the term "Loitering" as it will be applied in that jurisdiction. VDOT should direct their attention to the case law of Lytle v. Doyle, 326 F.3d 463 (4th Cir. 2003), Page 469 as it defines *""loitering" by stating it has "by long usage acquired a common and accepted meaning."* Further, it says that according to Webster's Dictionary, this meaning is *"to stand idly about";* and Page 470 states "*the State may act to protect its substantial and legitimate interest in traffic safety"* with *"time, place, and manner restrictions."* Though the term "State" is used in this case history, it is reasonable to assume that a local government would also have the right to act similarly.

In addition, the jurisdiction shall request from VDOT, accompanied by the resolution adopted by the governing body, permission in the form of a Land Use Permit application, to install the appropriate signs on state-maintained right-of-way, as stipulated in Section 46.2-930 of the Code of Virginia. This request for permission shall be submitted to the appropriate Permits Section or office.

The resolution shall identify the location of the site(s) where a loitering problem is creating a public safety hazard, as documented by the local law enforcement agency. Evidence of such public safety hazard shall be submitted with the resolution and signed by the chief law enforcement officer of the jurisdiction. Supporting evidence may include recurring and regular occurrences of some or all of the following traffic safety issues. The list below is not all inclusive and other traffic safety guidelines may be considered by the locality.

- Lack of pedestrian facilities to accommodate the activities
- Documented complaints of such activities impacting the traffic safety to motorists and pedestrians
- Documented indications that such activities restricted the sight distances at the intersection
- Documented indications that such activities restricted public transit, emergency responses access
- Documented indications that such activities obstruct, delay or interfere with the normal flow of pedestrian or vehicular traffic along a section of a highway or at an intersection
- Documented accident history due to conflicts with such activities
- Indication of lack of sufficient roadway lighting at the site during certain time period to ensure the safety of pedestrians

The resolution shall include the location(s) where the signs are proposed to be installed. VDOT reserves the right to review all requests to assure compliance with state and federal signing standards and guidelines.

The enforcement of the no loitering resolution shall be the responsibility of the local government.

VDOT Responsibilities

The Permits Section or office, upon receipt of the adopted resolution, permit request, and documented evidence of the public safety hazard, shall conduct a field review with assistance from the regional traffic engineer, to assure the proposed signs will not be in conflict with other traffic control devices or VDOT guidelines. The Permits Section or office shall submit all documents to the VDOT District Administrator with a recommendation to accept or deny.

If the District Administrator, acting on the authority delegated to him by the Commissioner, finds the jurisdiction's request and documentation sufficient, he shall accept it and have a no fee permit issued, allowing the locality to install the sign(s) as soon as practical. The District Administrator or the Permits Section or office acting on his behalf, will notify the jurisdiction of his actions. A copy of all actions shall be maintained in the Permits Section or office.

For those sign locations where the District Administrator finds the request and documentation to be sufficient and determines that signs will be allowed under a permitting process, he/she shall have the permit issued with a term limit of five (5) years. In order for the local government to continue use of these signs beyond the five year period, a full review, with documentation, shall be conducted by the local government and a new permitting process shall be initiated by them.

Decisions of the District Administrator may be appealed to the Commonwealth Transportation Commissioner.

All signs allowed by VDOT under this policy shall be designed and installed in accordance with federal and state guidelines. The following is offered as a guide:

> NO LOITERING signs are directed to the pedestrian and not the motor vehicle operator. As such, they should be kept small in size. The MUTCD series of signs for parking restrictions should be use as the model for these signs. A sign(s) of size, shape and color similar to the R7 series of signs, having the words NO LOITERING and a descriptor such as ON BRIDGE, WITHIN 50 FOOT OF INTERSECTION, BETWEEN SIGNS, etc shall be installed. The installation should be such that the position of the sign will capture the attention of approaching foot traffic as opposed to the vehicular traffic.

cc: Mr. David L. Ekern, P.E.
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Regional Traffic Engineers
Regional Operations Maintenance Managers
Residency Administrators
Division Administrators
Mr. B. H. Cottrell

CHAPTER 503

An Act to amend and reenact § 46.2-930 of the Code of Virginia, relating to loitering in the rights-of-way of certain highways.

[H 1629]

Approved By the Governor March 27, 2009

Effective July 1, 2009

Be it enacted by the General Assembly of Virginia:

1. That § 46.2-930 of the Code of Virginia is amended and reenacted as follows:

§ 46.2-930. Loitering on bridges or highway rights-of-way.

Pedestrians shall not loiter on any bridge or in any portion of the right-of-way of any highway where loitering has been determined by the Commonwealth Transportation Commissioner or the local governing body of any *county*, city, or town to present a public safety hazard and on which the Commonwealth Transportation Commissioner or the governing body of any *county*, city, or town has posted signs prohibiting such action. *Local jurisdictions shall obtain concurrence from the Commonwealth Transportation Commissioner on the placements of signs on the right-of-way of any bridge or highway under the jurisdiction and control of the Commonwealth Transportation Commissioner or the Virginia Department of Transportation; however, the local jurisdiction shall be responsible for all costs of the production, installation, and maintenance of the signs.* Any person violating the provisions of this section shall be guilty of a traffic infraction.

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Engineering & Administration	**NUMBER:** 365.0 **SUPERSEDES:** N/A
SPECIFIC SUBJECT: Speed Limit Change Process	**DATE:** 02/11/11 **SUNSET DATE:** N/A
DIRECTED TO: District Administrators Regional Operations Directors Regional Traffic Engineers	**SIGNATURE:**

DPM 9-7 (Speed Limits on State-Controlled Roads) establishes general policy on setting speed limits, and delegates the Commonwealth Transportation Commissioner's authority to change speed limits in accordance with §§ 46.2-870 and 46.2-878 of the *Code of Virginia*. This memorandum provides procedures on how this authority is to be implemented.

Duties and Roles

Regional Traffic Engineers shall:

1. Review speed limit change requests submitted to VDOT and determine which requests meet the eligibility criteria for a full study.
2. Conduct the required engineering study using the latest methodology and policy guidance, and solicit available data, concurrence or comments from state and local law enforcement authorities and from the locality as appropriate.
3. Sign and seal engineering study.
4. Keep the District Administrators apprised of speed studies and results.
5. Approve the speed limit.
6. Forward the final, signed & sealed engineering studies with Regional Traffic Engineer approval signature, to the Central Office Traffic Engineering Division. For interstate routes, concurrent approval is required by the State Traffic Engineer.

Regional Operations Directors shall:

1. Insure the installation of the speed limit signs in a timely fashion, normally within 30 calendar days of the determination that a speed limit be posted or changed.
2. Notify the Central Office Traffic Engineering Division of the date & location of all speed limit postings.

The State Traffic Engineer shall:

1. Provide concurrent approval, as appropriate, for speed limit changes for study recommendations on interstate highways.
2. Maintain the written records of speed limit changes as required by the *Code of Virginia* in the Central Office.
3. Maintain a database of speed limits on VDOT-maintained roads.
4. Annually audit a sample of speed limit studies to improve consistency and conformity.

Speed Study Review Criteria

The criteria used by VDOT, in determining whether a full speed study should be performed, vary based on the type of road and type of speed limit. Criteria shall be applied by State and Regional Traffic Engineers as follows:

Statutory Speed Limits – Statutory speed limits are not generally posted on secondary roads but are typically posted for primary routes. If a determination is made to post the speed limit, and the statutory speed limit for that road is appropriate based on engineering judgment, then the statutory speed limit may be posted without conducting a full speed limit study. If the maximum safe speed of the horizontal or vertical alignment of the road is below the statutory speed limit, appropriate warning signs must be posted prior to posting the statutory speed limit. All Rural Rustic Roads are to be posted. Statutory speed limits for various localities and types of roads are set out in §§ 46.2-870, 46.2-873.1, 46.2-873.2, and 46.2-874 of the *Code of Virginia*.

Posted Speed Limits – Posted speed limits may be based on statutory limits or established through speed limit studies. If there has been no significant change (e.g., there has been no significant increase in the frequency or severity of crashes, no significant increase in traffic volumes or roadside development) since a properly established speed limit was last posted, since the last speed study was conducted, or within an appropriate evaluation period, and there has been no improvement to the roadway (e.g., no project completed to reconstruct or realign the roadway), then a study does not need to be conducted and the posted speed limit may remain.

Low Volume Roads - If the road is unpaved, or has a traffic count of less than 400 vehicles per day (VPD) and averages fewer than three crashes per year over a recent 3 year period, it should be reviewed only for warning signs or other necessary traffic control devices. If there is a crash history where an average of three or more crashes per year over a recent 3 year period has occurred; or, if there are more than 10

entrances, on a single side, per mile of roadway, a more detailed field review of the road section should be conducted.

Interstates – For consideration of Interstate speed limit increases, the roadway should be compared to the criteria in VDOT's Guidelines for Interstate Speed Zoning to determine if the existing speed limit is appropriate. If the existing speed limit appears appropriate in comparison with the Guidelines, then the speed limit remains the same and a study is not required. Where a decrease in the speed limit for a section of Interstate is being considered, and there has been no significant change (e.g., there has been no significant increase in the frequency or severity of crashes and no significant increase in traffic volumes) since the speed limit was last posted, since the last speed study was conducted, or within an appropriate evaluation period, then the speed limit remains the same and a study is not required.

Reference

- *Code of Virginia*, §§ 2.2-604 and 33.1-8
- *Code of Virginia*, §§ 46.2-870, 46.2-873.1, 46.2-873.2, 46.2-874, 46.2-878
- DPM 9-7 (Speed Limits on State-Controlled Roads) [2/11/2011]
- VDOT's Guidelines for Interstate Speed Zoning
- VDOT's Speed Study Template

CC: Mr. Greg Whirley
Mr. Charles Kilpatrick, P.E.
Ms. Constance S. Sorrell
Mr. Malcolm T. Kerley, P.E.
Regional Operations Maintenance Managers
Residency Maintenance Managers

Date: 2/11/11
Approved: Gregory A. Whirley

DPM Number: 9-7
Supersedes: None

SPEED LIMITS ON STATE-CONTROLLED ROADS

Introduction

The Virginia Department of Transportation's (VDOT's) approach to reviewing and setting speed limits on state-controlled roads includes three major components:

1. VDOT performs periodic reviews of corridors to determine whether speed limit changes are appropriate.
2. VDOT reviews many roads that have statutory speed limits but are not posted to determine if appropriate warning signs are warranted.
3. VDOT may perform speed limit reviews upon request.

This memorandum delegates to VDOT staff the authority to establish speed limits on state-controlled roads, as allowed by law.

Commissioner Delegation of Authority

Pursuant to §§ 2.2-604 and 33.1-8 of the *Code of Virginia,* the Commissioner hereby delegates to the State Traffic Engineer and the VDOT Regional Traffic Engineers authority to perform the duties of the Commonwealth Transportation Commissioner with regard to changing speed limits in accordance with §§ 46.2-870 and 46.2-878 of the *Code of Virginia*. The Commissioner also approves detailed procedures to implement this delegation set out in Traffic Engineering Memorandum 365.0,"Speed Limit Change Process."

All previous delegations regarding the duties as described herein, regardless of form, are hereby rescinded. If the position of State Traffic Engineer or any of the Regional Traffic Engineer positions should become vacant, that person appointed in an acting capacity to those positions shall have the same authority as that delegated to the State Traffic Engineer or the Regional Traffic Engineers, as appropriate.

Authorizing these positions to perform the acts described herein is in no way intended to abrogate the authority or ability of the Commissioner to accomplish these acts himself/herself, if he/she so desires. Consequently, in this sense, the duties and responsibilities are concurrent. Furthermore, this expressed delegation of authority is not intended to negate the authority or ability of the Commissioner to delegate further responsibilities in specific situations, as he/she may deem necessary.

Continued on next page

Reference

- Code of Virginia, §§ 2.2-604 and 33.1-8.
- Code of Virginia, §§ 46.2-870, 46.2-873.1, 46.2-873.2, 46.2-874, 46.2-878.
- VDOT's Guidelines for Interstate Speed Zoning.
- Traffic Engineering Division Memorandum 365.0, "Speed Limit Change Process."

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION
MEMORANDUM

GENERAL SUBJECT: WARNING SIGNS	**NUMBER:** TE-369.0 **TO SUPERSEDE:** N/A
SPECIFIC SUBJECT: DEER AND OTHER LARGE ANIMAL CROSSING WARNING SIGNS	**DATE:** December 1, 2011 **SUNSET DATE:** Upon Inclusion In the VaS-MUTCD
DIRECTED TO: Regional Operations Directors District Administrators	**SIGNATURE:**

This memorandum provides policy, guidance, and options regarding the installation of deer and other large animal crossing warning sign.

The provisions of the current MUTCD addressing deer and other large animal crossing warning signs shall be followed in all VDOT applications; and, are amended to include the following:

STANDARD:
Large Animals may cross roadways infrequently and at random; or, may cross more frequently within an area that is a favored habitat, on a migratory route or a feeding route. Large Animal crossing warning signs such as Deer Crossing Warning Sign (W11-3) shall only be used in recognition of these habitat, migratory, or feeding occurrences and shall not be installed due to a random crossing or a limited number of vehicle-large animal collision.

GUIDANCE:
Deer Crossing Warning (W11-3) signs or other large animal crossing warning signs should be installed when the following combination of conditions are satisfied:

1) For any period of two years, there should be at least five reported large animal-vehicle crashes per mile per year; and,
2) Posted speed is 45 mph or greater.

OPTION:
When land use or traffic pattern changes occur or when deer or other large animal crossing incidences indicate that there has been a change in the habits of the animals; but, less than a two year crash history is available, an engineering study may be conducted. Based on the study results, the Regional Traffic Engineer may determine that the installation of Deer Crossing Warning (W11-3) signs or other large animal crossing warning signs is an appropriate action; and, if so, may call for the installation of such a sign.

GUIDANCE:
New installations and replacements of existing Deer Crossing Warning signs or other large animal crossing warning signs should include a mileage plaque (W7-3aP) posted in increments of 1, 2 or 3 miles. If a continuous crossing area extends beyond 3 miles, additional sign assemblies should be installed approximately every 3 miles. Even though in some cases, the concentrated areas of crossing activity may indicate that the mileage plaque posting could be less than 1 mile, the use of 1 mile is recommended as the minimum based upon motorists expectations, and the fact that the large animals may traverse the shoulder beyond the point of concentrated crossings.

Where the large animal crossing has been eliminated through wildlife fencing or other access modifications; or, where changes in the habitat or routing have substantially lessened the crossing activity, the existing warning signs should be removed or relocated as might be appropriate.

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VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Engineering & Administration	**NUMBER:** 370.0 **SUPERSEDES:** N/A
SPECIFIC SUBJECT: Variable Speed Limit Implementation Requirements and Guidance	**DATE:** 12/12/11 **SUNSET DATE:** N/A
DIRECTED TO: District Administrators Regional Operations Directors Regional Traffic Engineers Regional Transportation Operations Managers	**SIGNATURE:** State Traffic Engineer

Background

Variable Speed Limits (VSL) are speed limits that change based on road, traffic, and weather conditions. VSL systems enable transportation managers to dynamically change the posted speed limit to a more appropriate speed in response to prevailing conditions. This change in posted speed may be either regulatory or advisory in nature. This policy applies to regulatory VSL systems and may be used as guidance for advisory VSL systems. Typically, VSL are implemented for two reasons: congestion and weather. In congested conditions, variable speed limits have been used to successfully harmonize traffic such that throughput can be maintained without a degradation to stop and go traffic. The reduction in speed prior to a queue can also reduce rear end crashes.

Where visibility is diminished or poor weather conditions prevail, speed limits are reduced to suggest or require a safe driving speed. This is particularly helpful where the weather condition is not expected, such as in a sudden fog situation, and where the drivers need guidance in selecting a safe speed which is often indicated by wide variations in operating speeds.

The authority to set VSL is given in the *Code of Virginia Section 46.2-881.* This memorandum outlines the requirements and provides general guidance on how that authority is to be implemented for new installations. Given the complex nature of traffic management, it is not meant to consider every situation that may occur. The engineer must utilize his or her best judgment.

Governing Documents

Code of Virginia Section 46.2-881. It shall be unlawful to drive any motor vehicle, trailer, or semitrailer on any public bridge, causeway, viaduct, or in any tunnel, or on any interstate at a speed exceeding that indicated as a maximum by signs posted thereon or at its approach by or on the authority of the Commonwealth Transportation Commissioner.

The Commonwealth Transportation Commissioner, on request or on his own initiative, may conduct an investigation of any public bridge, causeway, viaduct, tunnel, or interstate and, on the basis of his findings, may set the maximum speed of vehicles which such structure or roadway can withstand or which is necessitated in consideration of the benefit and safety of the traveling public and the safety of the structure or roadway. The Commonwealth Transportation Commissioner is expressly authorized to establish and indicate variable speed limits on such structures or roadways to be effective under such conditions as would in his judgment, warrant such variable limits, including but not limited to darkness, traffic conditions, atmospheric conditions, weather, emergencies, and like conditions which may affect driving safety. Any speed limits, whether fixed or variable, shall be prominently posted in such proximity to such structure or roadway as deemed appropriate by the Commonwealth Transportation Commissioner. The findings of the Commissioner shall be conclusive evidence of the maximum safe speed which can be maintained on such structure or roadway.

The 2009 Manual of Uniform Traffic Control Devices (MUTCD) Section 2B.13, Paragraph 18: states that "A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is displayed at the proper times." In order to display the appropriate speed limit at the proper times, much thought and consideration must go into development of the VSL system. Speed limit influencing factors must be collected and evaluated to determine the appropriate regulatory speed limit and to display that speed limit at the proper time.

Investigation: The investigation, as required by the Code of Virginia, shall analyze and document corridor wide traffic flow characteristics and any related safety concerns. In addition, it shall provide an explanation as to how the use of VSL will impact both those traffic flows and safety concerns.

Requirements:

Operational Capabilities:

- The VSL subsystem shall be fully integrated into the Traffic Operations Center (TOC's) current operating software platform.
- A combination sign consisting of a static sign, continuously flashing lights and a changeable message board shall be placed prior to entering the VSL corridor. The static message shall read "Speed Limit May Vary Next XX Miles" with the changeable message board identifying the reason for the varied speed. Additional combination signs should be installed immediately after each interchange access point. A static sign with the message "End Variable Speed Limit" shall be placed prior to exiting the VSL corridor. The ROD should work with public affairs representatives and the local media to educate and inform the motorists of the system's purpose and their legal responsibilities as motorists driving within its boundaries.
- VSL signs shall use amber LED display technology when posting variable speed limits in response to low-visibility, fog-related conditions.

- VSL signs, cameras and communication equipment shall be designed and equipped with an uninterruptable power supply to minimize disruption during power outages. UPS shall be configured to operate the above equipment for a period of at least 6 hours.
- VSL sign structures can be installed on either span or shoulder mounted sign structures. If shoulder mounted structures are used then VSL signs shall be installed on both the right and left shoulders to increase visibility to drivers. When displaying variable speeds the same speed limit shall be displayed on both adjacent shoulder mounted signs.
- Differential speeds by lane are not recommended due to enforceability, compliance, and safety concerns, but will be considered for congestion management purposes provided the effect of such speeds on corridor operations and safety are thoroughly analyzed and the State Traffic Engineer approves their use. Additionally, deployment of differential speed limits shall require the use of sign structures capable of displaying an individual overhead VSL sign for each lane of travel.
- In order to generate higher levels of compliance, LED changeable message signs shall be used throughout the VSL corridor to inform motorists of the condition causing the change in speed. Changeable message signs shall be installed on either span or shoulder mounted sign structures.
- An algorithm shall be developed to determine the appropriate speed limit. The algorithm shall consider all relevant variables such as, but not limited to: data collection points, VSL sign locations, travel times between signs, posted speed limits, operating speeds, roadway geometry, roadway grade, visibility profiles, stopping distances and typical traffic flow variables. These inputs shall be used to determine the appropriate variable speed limits, duration times and change intervals. The algorithm shall be signed and sealed by the licensed PE developing it.
- When operationally feasible, speed limits should not be changed by more than 10 mph increments. The maximum VSL shall never exceed the roadway's previously posted maximum speed limit as documented in the below resolution.
- The locations and spacing of VSL and changeable message signs will be directly influenced by the algorithm parameters. However, it is expected that spacing should be between 0.5 and 2 miles. Signs should be located close enough to the detection device(s) triggering the speed limit so the speed accurately reflects the condition but far enough in advance to provide sufficient time for the driver to react to the message being displayed and reduce their speed accordingly.
- VSL corridors should be equipped with low light, pan, tilt, zoom cameras located to verify the event causing the change in speed. This imagery should be transmitted back to the local TOC for real time operator viewing and verification.
- VSL systems shall be designed to operate either automatically or semi-automatically and shall include operator concurrence and override capabilities.
- All regulatory VSL systems shall be capable of providing the actual posted speed limit to the Virginia State Police or other primary law enforcement agency in near real-time so that the posted speed limit can be enforced. Advisory VSL systems are not required to have this capability.
- All changes in displayed speed shall be documented in an easily searchable database. Documentation shall include reason for the speed limit change, speed limit change, duration of speed limit change, and VSL sign location(s) displaying change. *The Code of Virginia Section 46.2-878* requires the documentation to be filed in the Central Office. However, an acceptable alternative is to provide Central Office Traffic Engineering staff with readily available access.

Concept of Operations: Prior to developing a VSL system, an approved Concept of Operations is required in accordance with the latest versions of ANSI/AIAA G-043-1992 as detailed in Systems Engineering Guidebook for ITS V3.0-Section 8.4.5 Concept of Operations Template as provided in the US DOT, FHWA website at http:// www.fhwa.dot.gov/cadiv/segb/index.htm. This includes but is not limited to

- Scope – overview of system to be built.
- Referenced Documents – list of supporting documentation & other resources useful in understanding operations of system.
- User oriented operational description – how goals and objectives are accomplished. It describes strategies, tactics, policies and constraints.
- Operational needs – describes what the system needs to do that is not currently being done.
- System overview – describes scope of system to be developed, users of system, what it interfaces with, its states and modes, the planned capabilities, its goals and objectives and system architecture.
- Operational environment – describes physical operational environment in terms of facilities, equipment, computing hardware, software, personnel, operational procedures and support necessary to operate deployed system.
- Support Environment – describes physical support environment of the operational environment.
- Operational scenarios – Each scenario describes a sequence of events, activities carried out by the user, the system, and the environment.

Systems Requirements: Requires an approved System Requirements document in accordance with the latest version of IEEE Standard 1233 Guide for Developing System Requirement Specification as detailed in Systems Engineering Guidebook for ITS V3.0 –Section 8.4.6 Requirements Template as provided in the US DOT, FHWA website at http:// www.fhwa.dot.gov/cadiv/segb/index.htm. This includes but is not limited to:

- Scope of system or subsystem – full identification of system or subsystem.
- Requirements – functional, performance, interface, data, non-functional, enabling and constraints.
- Verification methods – identification of method for each requirement. (Demonstration, test, analyze, inspection)
- Supporting documentation – reference section for understanding of the requirements.
- Traceability matrix – table that traces requirements to higher level requirements or user requirements.

Approvals:

- VSL Documentation - Roadway Investigation, the Concept of Operations, the Systems Requirements and the algorithm to control the VSL system shall be approved by the Regional Traffic Engineer.
- The use of differential speeds by lane, if used, shall be approved by the State Traffic Engineer.
- Resolution - A resolution describing the VSL project, project limits, existing posted speed limits and referencing the approved roadway investigation, concept of operations,

systems requirements document and algorithm, shall be signed by the Commissioner. If VSL are advisory in nature then a resolution is not required.

References

- *Code of Virginia*, §§ 2.2-604 and 33.1-8
- *Code of Virginia*, §§ 46.2-870, 46.2-873.1, 46.2-873.2, 46.2-874, 46.2-878

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VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION
MEMORANDUM

GENERAL SUBJECT: GUIDE SIGNS	**NUMBER:** TE-372.0 **TO SUPERSEDE:** N/A
SPECIFIC SUBJECT: REFERENCE LOCATIONS SIGNS (RLS), INTERMEDIATE RLS, ENHANCED RLS	**DATE:** January 10, 2012 **SUNSET DATE:** Upon Inclusion In the VaS-MUTCD
DIRECTED TO: Regional Operations Directors Regional Traffic Engineers Regional Operations Maintenance Managers Regional Traffic Operations Managers	**SIGNATURE: State Traffic Engineer**

To assure that Virginia has and maintains a Reference Location Signs (RLS) program suited to its unique needs, Section 2H.05 and Section 2H.06 of the MUTCD are hereby altered.

Section 2H.05 of the current MUTCD, Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a), is <u>replaced</u> by the following:

Support:
There are two types of reference location signs in use nationally:
A. Reference Location (D10-1, 2, and 3) signs show an integer distance point along a highway, and
B. Intermediate Reference Location (D10-1a, 2a, and 3a) signs, showing a decimal between integer distance points along a highway.

Standard:
Except as allowed by the paragraph that immediately follows this paragraph, Reference Location signs and Intermediate Reference Location (D10-1a, D10-2a, and D10-3a) signs (see figure 1) shall be placed on Freeway facilities that are a part of the Interstate System of routes and on all other Commonwealth maintained routes where the entire length of the route is controlled as a Freeway to assist road users in estimating their progress, to provide a means for identifying the location of emergency incidents and traffic crashes, and to aid in highway maintenance and servicing. Placement of Reference Location signs and Intermediate Reference Location (D10-1a, D10-2a, and D10-3a) signs shall be such that a sign appears every two tenths (0.2) of the measured mile.

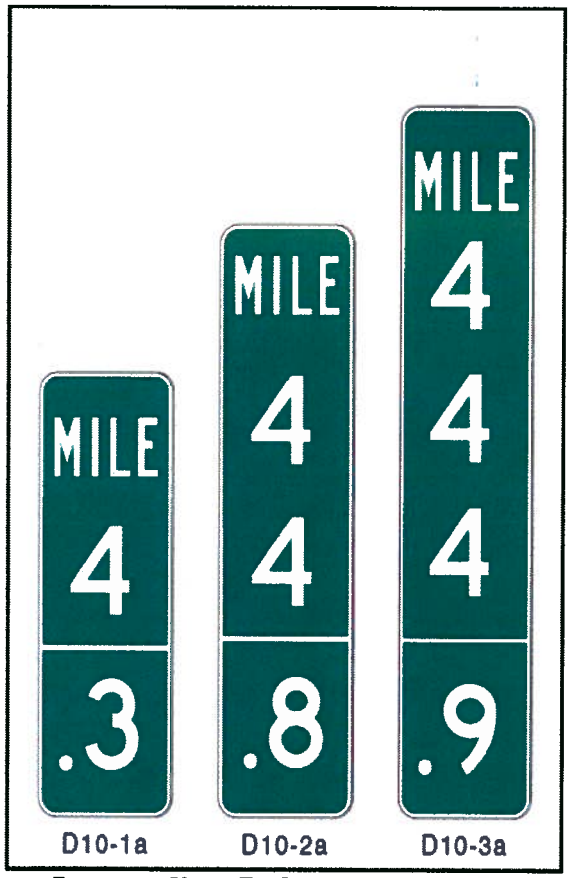
Certain highly urbanized sections of Interstate designated routes and highly urbanized sections of other Freeway routes may be left devoid of Intermediate Reference Location signs. Reference Locations signs shall still be provided. This exception applies only when conditions A; and, either B or C, as shown below, exist.

A. Route segment passes through an area so urbanized that at least three motorist identifiable signs that provide messages unique to that sign; such as, overpass and underpass naming signs, waterway naming signs and/or interchange advance or actions signs, exist per mile of segment; and,

B. Route segment is marked by narrow shoulders, separated acceleration-deceleration roadways, parapet walls, and other constrictions in conflict with optimal placement of Intermediate Reference Location Signs; and

C. Route segment has geometrics that would predictably cause issues with maintaining Intermediate Reference Locations signs due to snow removal operations, grass cutting operations, and other similar activities.

Where engineering evaluations clearly support the use of one tenth (0.1) of the mile spacing of the Intermediate Reference Location Signs, such spacing may be allowed, with approval of the State Traffic Engineer. No section of roadway having one tenth (0.1) mile spacing intervals of Intermediate Reference Location Signs shall be less than three miles in length except where the route is less than 3 miles in total length.



Intermediate Reference Location Signs and Reference Location Signs used with Intermediate Reference Location Signs

FIGURE 1

Support:
Engineering evaluations used to support the placement of Intermediate Reference Location Signs at one tenth (0.1) mile intervals should reference such factors as an abnormally high accident rate; or, an unusually high call rate to emergency dispatchers; or, where few identifiable references exist (e.g. rural areas with few signs, limited number of cross roads, and devoid of landmarks); or, where weather issues such as fog, are prevalent.

Guidance:
Reference Location and Intermediate Reference Location signs should be placed on Freeway (fully controlled access) sections of highway that are a part of a Route where the entire length is not limited

access, but where the Freeway portion is greater than three (3) miles in length and where there might be reference location sign continuity with other segments of the same route where Reference Location sign placements exist.

Reference Location and Intermediate Reference Location signs should be placed on routes controlled as Expressway routes in accordance with the provisions set for Freeway Routes.

Option:
Reference Location Signs (D10-1 to D10-3 – see figure 2) alone or in conjunction with Intermediate Reference Location signs (D10-1a to D10-3a –see figure 1) may be installed along any section of a highway route or ramp (limited access or non-limited access) to assist road users in estimating their progress, provided reference location sign continuity with other segments of the same route is maintained; to provide a means for identifying the location of emergency incidents and traffic crashes, and to aid in highway maintenance and servicing.

Standard:
Reference Location signs used with Intermediate Reference Location signs shall display a decimal point and a zero numeral.

Option:
Reference location signs use alone (where permitted) and not in conjunction with Intermediate Reference Location signs may be displayed without a decimal point and a zero numeral (D10-1, D10-2, D10-3 [see figure 2]).

Standard:
When placed on Freeway or Expressway routes, Reference Location signs and Intermediate Reference Location signs shall contain 10-inch white numerals on a 12-inch wide green background with a white border. A white separator line shall be used between the integer and the decimal reference. The signs shall be 36, 48, or 60 inches in height for two, three, or four digits, respectively, and shall contain the word MILE in 4-inch white letters.

When placed on non Freeway or non Expressway routes, reference location signs and Intermediate Reference Location signs shall, as a minimum, contain 6-inch white numerals on a green background that is at

Reference Location Signs used without Intermediate Reference Location Signs

FIGURE 2

least 10 inches wide with a white border. The signs shall be 27, 36, or 48 inches in height for two, three, or four digits, respectively, and shall contain the word MILE in 4-inch white letters. A white separator line shall be used between the integer and the decimal reference.

Reference location signs and Intermediate Reference Locations signs shall have a minimum mounting height of 4 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the roadway, and shall not be governed by the mounting height requirements prescribed in Section 2A.18 of the MUTCD.

On Freeway and Expressway routes, the distance numbering shall be continuous for each route within the State, except where overlaps occur (see Section 2E.31 of the MUTCD). Where routes overlap, reference location sign continuity shall be established for only one of the routes. If one of the overlapping routes is classified as an Interstate route, that route shall be selected for continuity of distance numbering.

Standard:
Where a Freeway or Expressway route exist that is greater than three miles in length as stipulated above, but does not constitute an entire route, (such as sections of continuous routes around urbanized or built-up areas to replace more congested "business routings") Reference Location signs (if used) shall reference a mileage consistent with the actual mileage point on that route (devoid of any other Business Route sections) measured along the northbound or eastbound roadway. Should an added Freeway/Expressway portion of a continuous route (relocated or realigned portion) add mileage to that route, existing portions of the same route that lie ether north or east of the added section and have Reference Location signs existing, shall not be reposted to accommodate the new mileage addition. Instead, the added section shall be posted using Reference Location signs that accommodate an equality principle.

Option:
Where needed, the accommodation of an equality principle in the Reference Location Sign display, in order to avoid the renumbering of other, previously numbered, Route sections of the same Route, should follow the principle outlined in the following paragraph or another similar principle.

Support:
Reference Location signs should be positioned to provide equal spacing between the signs unless the spacing will be greater than two tenth (0.2) mile. In that event, signs shall be installed to ensure that duplicate numbers are not indicated. An example of one method is shown in Figure 3. That Figure depicts the addition of a new road segment that bypasses a community. The old road segment (becoming a business route) should have all reference location signs, which might have existed before the completion of the new routing, removed.

Section 2H.06 of the current MUTCD, Enhanced Reference Location Signs (D10-4, D10-S), is <u>amended</u> to include the following:

Standard:
Except where already in use on or before August 1, 2011 or where allowed by the paragraphs that follow; Enhanced Reference Location Signs (D10-4 and D10-5, see Figure 4) shall not be used on limited access routes or other routes maintained by the Commonwealth.

REFERENCE LOCATION SIGN NUMBERING EQUALITY AFTER RELOCATING OR REALIGNING PRIMARY ROUTE (Rendering Old Route as "Business Route")

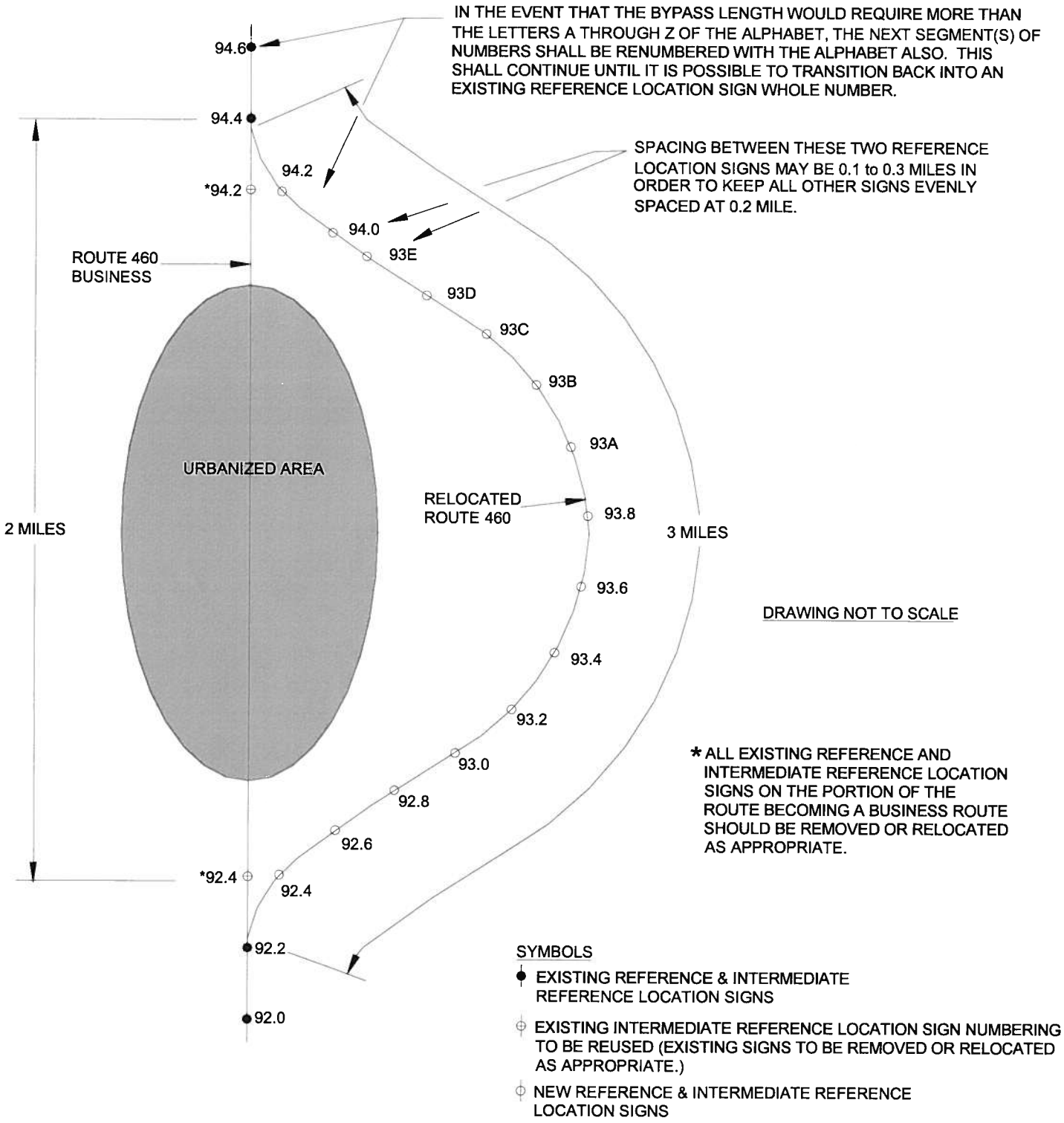


FIGURE 3

Option:
Exceptions for the usage of Enhanced Reference Locations signs may be requested to the State Traffic Engineer with final approval by the Chief of Systems Operation.

For those Enhanced Reference Location Signs (D10-4 and D10-5) that might exist, said sign may continue to remain in service and may be replaced due to individual signs being damaged by such occurrences as errant vehicle knockdown, mowing or snow plowing operations, etc. All existing Enhanced Reference Location Signs (D10-4 and D10-5) in a series must be replaced by non-enhanced Reference Location signs when the majority of the signs in the series reach the end of their service life.

Enhanced Reference Location Signs

FIGURE 4

Where other entities, such as private toll roads or abutting States are using Enhanced Reference Location Signs (D10-4 and D10-5), Enhanced Reference Location Signs may be used in a similar display on routes maintained by the Commonwealth; but only to a point on that route where a reasonable transition to Reference Location and Intermediate Reference Location Signs (D10-1, D10-2 and D10-3) can be made. Reasonable transition points are considered to be major interchanges, major natural barriers (wide river crossings, etc.), or other points where it may be less obvious to the motorist that a transition has been made.

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