Construction Management and Training

Advanced Work Zone Safety Study Guide Index

Schedule - We will work until 4:30 the first day
Hopefully taking the exam by 2:30 the second day

Check List
Truck Mounted Attenuator
Portable Changeable Message Sign (PCMS)
Arrow Board

Letter "Failure to Perform"

Categories for TMP
IIM-TE-351.5 TMP Requirements
IIM-241.7 – TE 351.5 Traffic Management Plan
Exercise 6 – Traffic Barrier & Channelizing Exercise
Exercise 6a – ROR Chart All Others
Exercise 6b – ROR Chart for Limited Access
Exercise 8 – Detour
Exercise – drawing for detour
Exercise 9 – Bridge Replacement
Exercise – Tapers & Buffers
Exercise – Barrier
Urban Exercise Blank
ROR Charts

Construction Management and Training

Work Zone Safety Device Check List – Truck Mounted Attenuator

Virginia Work Area Protection Manual (Section 6F-95) (Page 6F-77)

When used:

A. When closing a lane on four or more lane roadway with posted speed of 45 mph or greater

B. On shoulders of multilane roadways with a posted speed of 45 mph or greater for operations with a duration greater than 60 minutes.

C. On shoulders, ramps and loops or interstate and Limited Access highways

D. When a mobile operation occupies all or part of the travel lane on a multi-lane roadway with a posted speed of 45 mph or greater

E. For planned operations involving snooper trucks or bucket trucks regardless of the posted speed limit

F. Other locations where the Regional Traffic Engineer feels such protection is warranted

_____ Certification that the unit conforms to NCHRP 350 test level 3

_____ In good condition, i.e. no holes, major dents, etc.

_____ Rear Panel shall have alternate 6-inch-wide orange and black chevron sloped downward at a 45-degree angle starting at the middle.

_____ Manufacturer's instructions available upon request (suggest they stay in the truck)

_____ The required weight of the support vehicle noted in the manufacturer's instructions

_____ A weigh ticket for the support truck (with specific identification to the truck.)

_____ The truck shall be parked in second gear or in park if automatic

_____The parking brake shall be applied

_____The wheels shall be aligned straight ahead

_____ THE WHEELS SHALL NOT BE CHOCKED (the manufacturer should tell you)

DATE INSPECTED: _____

SIGNATURE OF INSPECTOR: _____

Construction Management and Training

Work Zone Safety Device Check List – Portable Changeable Message Sign

Virginia Work Area Protection Manual (Section 6F-68) (Page 6F – 40-43)

When Used:

- ✓ Ahead of the work area to advise of adverse conditions
- ✓ Ahead of the work area to advise of impending work/event
- ✓ Where speed is expected to drop substantially or suddenly
- ✓ Where queuing and delays are expected
- ✓ Where there are changes in the surface conditions
- ✓ Incident management
- ✓ Where there is a new road/travel pattern

What to look for:

A. _____ Minimum of 7 feet above the road way in urban areas
B. _____ Minimum of 5 feet above the road way in rural areas
C. _____ Red and White conspicuity strip along the front
D. _____ Tow vehicle completely removed from the unit and away from the taper
E. _____ Outriggers/support legs deployed and leveled
F. _____ When two or more are used, they must be 1000 feet apart and on the same side of the road
G. _____ Message in accordance with Appendix D of the Virginia Work Area Protection Manual

Remember:

When placed on the roadway or within the clear zone; there are always **4 Type II Channelizing Devices (Drums)** placed in front of the arrow board beginning at the front wheel and proceeding forward. No channelizing devices go at the rear wheel unless it is in addition to the other 4. See page 6F-43 in the Virginia Work Area Protection Manual.

When placed in the median where it is in both clear zones (each direction) drums are placed in advance of **BOTH** directions.

Construction Management and Training

Work Zone Safety Device Check List – Arrow Board

Virginia Work Area Protection Manual (Section 6F-69) (Page F-43-46)

When Used:

- ✓ On the shoulder at the beginning of each taper
- ✓ On vehicles in a mobile operation
- ✓ in the 4 corner mode when blocking the shoulder
- ✓ If there is no room on the shoulder move up into the taper until it fits
- ✓

What to look for:

A. _____ Minimum of 7 feet above the road way
B. _____ Red and White conspicuity strip along the front
C. _____ Tow vehicle completely removed from the unit and away from the taper
D. _____ Outriggers/support legs deployed and leveled
E. _____ no lights out in the head for more than 30 minutes
F. _____ one light out in the stem for the shift
G. _____ center light always out
H. _____Support vehicle (if used) shall have a rotating amber high-intensity light

Remember:

There are always **4 channelizing devices** placed in front of the arrow board beginning at the front wheel and proceeding forward. No channelizing devices go at the rear wheel unless it is in addition to the other 4. See page 6F-43 in the Virginia Work Area Protection Manual.

The channelizing devices are the same as are in the taper. i.e. cones if the taper is made up of cones and drums if the taper is made up of drums.

COMMONWEALTH of VIRGINIA

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

Charles A. Kilpatrick, P.E.
Commissioner

April 3, 2015

TO: **Work Zone Traffic Control Training Instructors**

FROM: **David B. Rush, WZS Training Committee Chairman** DBR

Re: **Failure to Perform Satisfactory Work Zone Traffic Control Techniques by Trained Personnel**

It has been brought to our attention that on occasion, Work Zone Traffic Control (WZTC) trained personnel have failed to apply the proper techniques to meet the requirements when installing, reviewing, or managing the installation and removal of work zone traffic control. The purpose of these training courses is to provide train personnel. In turn, trained individuals must apply this knowledge to provide safe work zones for workers, motorist, pedestrians, bicyclist and other road users. Failure to apply proper WZTC techniques affects not only safety but could have legal consequences if it contributes to a crash in a work zone.

Procedures are being develop to address suspension of a WZTC training verification card and the steps needed to release the suspension. Suspension of a training verification card will remove the responsibilities associated with the possession of a WZTC training card – meeting the requirements to install, review, make adjustments to and the removal of work zone traffic control or supervise those who perform these functions.

Until the procedures are finalized and released, current language in Section 105 of the VDOT Road and Bridge Specifications may be applied by VDOT Project personnel to those who fail to adequately apply the training they have received through the WZTC training courses.

105.05—Character of Workers, Work Methods, and Equipment

(a) Workers

Workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special or skilled work shall have sufficient experience in such work and in the operation of equipment required to perform it properly and satisfactorily.

Any person employed by the Contractor or any subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, when directed in writing by the Engineer, be removed by the Contractor or subcontractor employing the person and shall not be employed again on any portion of the work without the written approval of the Engineer. If

the Contractor fails to remove the person or furnish suitable and sufficient personnel for proper prosecution of the work, the Engineer may withhold all monies that are or may become due the Contractor and may suspend the work until the Contractor has complied with the Engineer's directive.

Please provide a copy of this information to attendees of your training classes and impress upon them the seriousness of applying what you have taught them once they have adequately passed the examination and begun their duties as Basic, Intermediate, or Advance Work Zone Traffic Control trained personnel.

Advanced
Work Zone Traffic Control Training
April 2015

1

* Welcome

* Instructor:
  * Billy Green
* *StraightPath Consulting*
* In work zones since 1974
* Attendance:
  - Sign in VDOT attendance roster
  - Spelling
  - Middle Initial

2

* Expectations - Participants

- Participate
- Listen to one another
- Respect one another
- Learn from others
- Ask questions
- Have fun!

3

Advanced Work Zone Traffic Control Training

April 2015

Module 1 - AWZTCT

1

* Welcome

*Instructor:
  *Billy Green
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*In work zones since 1974
*Attendance:
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  - Middle Initial

Module 1 - AWZTCT

2

* Expectations - Participants

- Participate
- Listen to one another
- Respect one another
- Learn from others
- Ask questions
- Have fun!

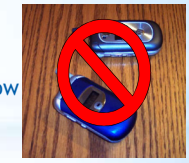
Module 1 - AWZTCT

3

* House Rules

- Please turn off your Cell Phones,
- Breaks
- Facilities
- Lunch (1/2 hour)
- 4:30 today
- Take exam by 2:30 tomorrow

*



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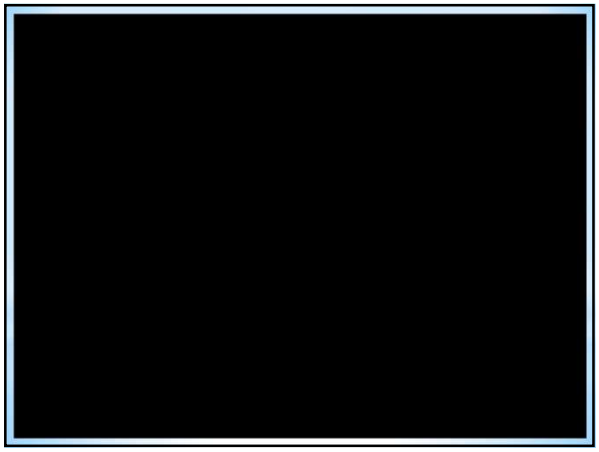


5

* History of WZTCT

*Sept 2004 - FHWA Final Rule on WZS and Mobility

*Code of Federal Regulations - Section 23 CFR 630 Subpart J (d)

*"Training - shall require that personnel involved in 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."

*2007 VDOT Policy
*2008 Work Zone Traffic Control Training
*2011 Second Version WZTCT
*2015 Third Version WZTCT

6

* Course Goals

*Upon completion of this course, you will be able to determine and correctly apply the traffic control devices needed to safely and effectively protect workers and motorists in a work zone application using standard references.

*

Module 1 - AWZTCT

7

8

* What are the roles each of us in the Construction Family play?

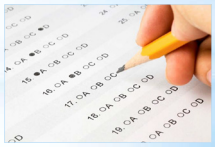
* Contractor Plans, Applies Standards, Installs & Maintains
* Owner's Representative Plans , Applies Standards & Verifies
* Designer Plans and Applies Standards
*
* WHAT ARE THE COMMON THREADS?
* **How can I help you over the next 2 Days?**

9

* Making the Grade

*To successfully complete this course you must…

- Participate in class
- Complete the course evaluation
- Pass the open book test
  - **40 Questions**
  - **1 hour time limit**
  - **Score 80 or above to pass**



Module 1 - AWTCT

10

* Topics We'll Cover First Day

*Module 1 – Introduction
*Module 2 – Temporary Traffic Control
* Standards, Manual and References
*Module 3 – Fundamental Principles
*Module 4 – Human Factors

Module 1 - AWZTCT

11

* Topics We'll Cover First Day

*Module 5 – Component Parts of Temporary
* Traffic Control
*Module 6 – Types of Temporary Traffic
* Control Applications
*Module 7 – Design Considerations

Module 1 - AWZTCT

12

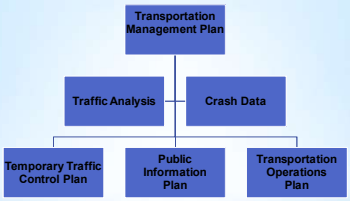
* Topics We'll Cover Second Day

- *Module 8 - Temporary Traffic Control Devices
- *Module 9 - Temporary Traffic Control Plans
- *Module 10 - Night-time Work Zones
- *Module 11 - Urban and Other Considerations
- *Review of Course Material

Module 1 - AWZTCT

13

* What is a Transportation Management Plan?



This training will provide you with the skills needed to produce effective, efficient and safe Temporary Traffic Control Plans.

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14

* What is Temporary Traffic Control?

- *The planning, design, and preparation of contract documents necessary to control traffic temporarily during:
  - *Construction
  - *Highway maintenance
  - *Incident management
  - *Utility operations
  - *Special events

Module 1 - AWZTCT

15

* Why do we need Temporary Traffic Control Plans?

- Work zone are dangerous areas for all who enter
- We have a tendency to overlook safety issues
- Training will reinforce safety compliance
- The traveling public and workers will be able to
* return home at the end of the day.

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16

* Virginia Work Zone Crashes 2018

2,666 Crashes

12,118 per day!

2,862 average per year

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17

* Virginia Work Zone Annual Averages

1,167 WZ Injuries

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18

* Virginia Work Zone Fatalities in 2018

Last 5 years we have experienced between 12 & 15 per year
Last Year ------

9

19

*Acronyms Used in this Course

• MASH	Manual for Accessing Safety Hardware
• MUTCD	Manual on Uniform Traffic Control Devices
• WAPM	Work Area Protection Manual
• PG	Pocket Guide
• TTC	Temporary Traffic Control
• TCD	Traffic Control Devices
• WZ	Work Zone
• WZTC	Work Zone Traffic Control
• TE	Traffic Engineering
• TMA	Truck Mounted Attenuator
• PCMS	Portable Changeable Message Sign
• ATSSA	American Traffic Safety Service Association
• NCHRP Program	National Cooperative Highway Research

20

* 6 Reasons for Work Zones Crashes

- More highway maintenance and improvement projects
- More vehicle-miles driven
- Users unfamiliar with work zones
- More distracted drivers
- More aggressive drivers
- Improper Temporary Traffic Control designs

21

* Conflicting goals?

- Maintain traffic flow
- Keep costs down

Maximum levels of safety

Module 1 - AWZTCT

22

* Work Zone Costs

- Direct costs
  - Labor and materials
- Indirect costs (societal)
  - Crashes, injuries, fatalities
  - Property damage
  - Travel delays
  - Vehicle operation & fuel consumption
  - Business losses

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23

- Critical to work zone safety
- Assess and consider ALL factors that may impact the safety of all people within the work zone
  - Motorists
  - Pedestrians
  - Cyclists
  - *Workers*
  - **Primary considerations**
    - ***Needs of the drivers***
    - ***Other road users***

* The Des

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24

The Designer's Role

* Consider:
  - ALL factors involved
  - ALL users
* AND apply engineering judgment to develop the BEST possible Temporary Traffic Control Plan

Module 1 - AWZTCT

25

* Engineering Judgment

* *The evaluation of available pertinent information, and the application of appropriate principles, Standards, Guidance, and practices as contained in the Virginia Work Area Protection Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device.*

* *Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer.*

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26

* Work Zone Definition

* "An area of a roadway with construction, maintenance, or utility work activities of various durations. A work zone extends from the first warning sign or rotating/flashing light on a vehicle to the "End Road Work" sign or last TCD. Work Zones may or may not involve workers or equipment on or near the road."

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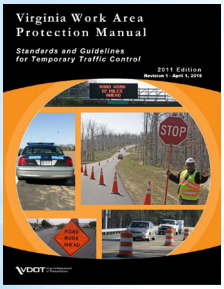
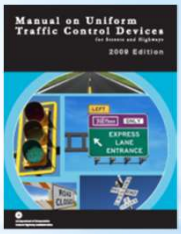
27

* State Standards are based on National Standards (MUTCD)



VA WAPM



MUTCD Part 6 – Temporary Traffic Control

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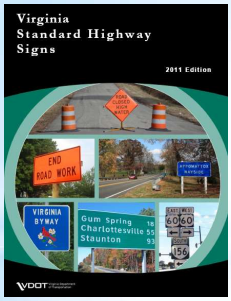
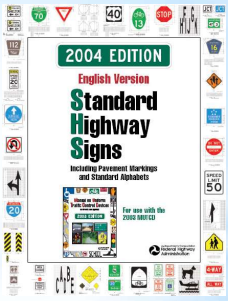
28

* Standard Highway Sign Manuals Uniformity



VA Standard Highway Signs



MUTCD Standard Highway Signs

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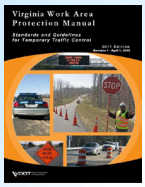
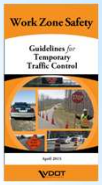
29

* Work Area Protection Manual & Pocket Guide



Standards



Supplement

- Standard for WZs in Virginia
- References used to develop this training
- Details *MINIMUM* typical application *diagrams*

* requirement for WZTC for designers and field personnel; inspectors, maintenance, utilities

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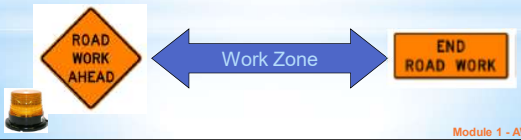
30

* Work Zone Definition

*"A work zone is an area on or above a highway, roadway, pedestrian facility or shared-use path with construction, maintenance, permit or utility work activities."



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31

32

* Tort Liability

* What Is It?

A tort is any civil wrong or injury to a person or to property due to the violation of a duty owed to the injured party.

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33

* Four Elements of Tort Liability

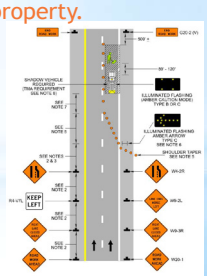
*Most lawsuits involving VDOT and contractors are based on the theory of negligence. In order to succeed in a tort claim, a plaintiff must prove four elements:

- Duty
- Breach of duty
- Proximate Cause
- Damages

34

* 4 elements of tort liability

- Duty
  - *An obligation to exercise the standard of care necessary to reasonably protect the safety of persons and property.



35

* Four Elements of Tort Liability

- Breach of Duty
  - *Through his/her actions, or failure to act, he/she failed to meet the standard of care required under the circumstances (what's prudent and reasonable). Also known as negligence.

36

* Four Elements of Tort Liability

- Proximate Cause -

An act or an omission that produces an event and without that, the event would not have occurred. Also could be more than (1) proximate cause of an injury. All a plaintiff must prove is that the negligence was one of the contributing causes of plaintiff's injury.

37

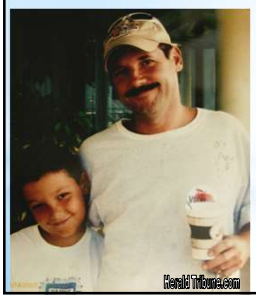
* Four Elements of Tort Liability

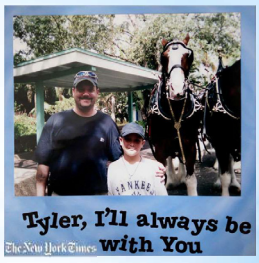
- Damage
  - *Resulting from the negligence causing death, personal injury, consequential damages (lost wages), or property damage.

38

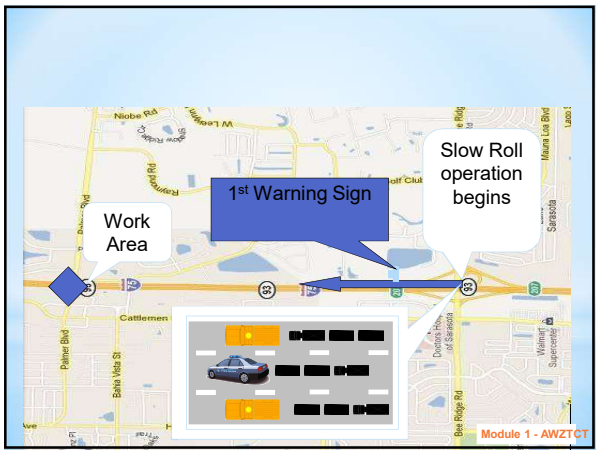
* Meet James Brashear & son Tyler

Tyler's 5th Grade Graduation Picture





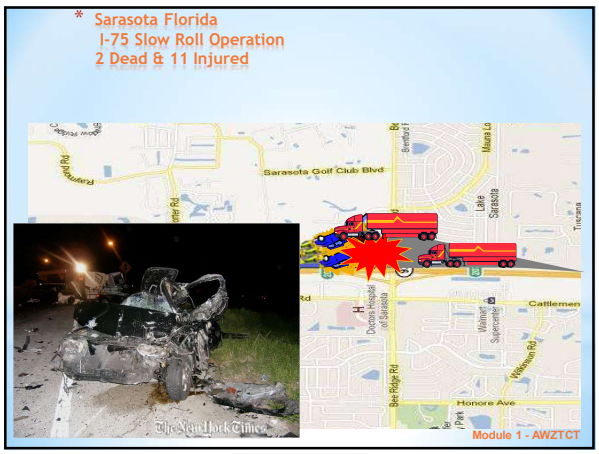
39


Work Area
1st Warning Sign
Slow Roll operation begins
Module 1 - AWZTCT

40

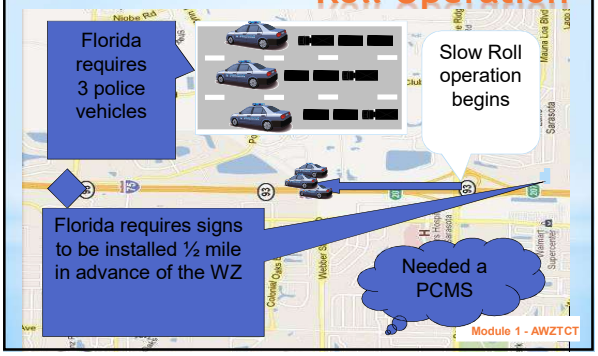

Stopped Traffic
70 MPH
Sarasota Florida
I-75 Slow Roll
Operation
Module 1 - AWZTCT

41


Sarasota Florida
I-75 Slow Roll Operation
2 Dead & 11 Injured
Module 1 - AWZTCT

42

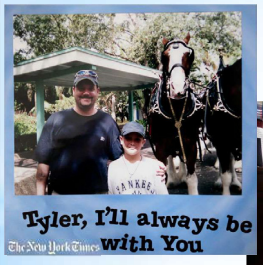
*Faults of I-75 Slow Roll Operation



43

James Brashear & son Tyler

Oct 1, 2007
Stopped in traffic queue; hit by a tractor trailer;
James was killed



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44

James Brashear & son Tyler

- Damage
  - *Resulting from the negligence causing death, personal injury, consequential damages (lost wages), or property
  - *damage.

Headlines:

Jury awards family $4 million for fatal accident
Construction company held responsible for I-75 crash that killed a father

Jury awards $150,000 more in I-75 wreck case
Punitive award follows $4 million awarded by jury

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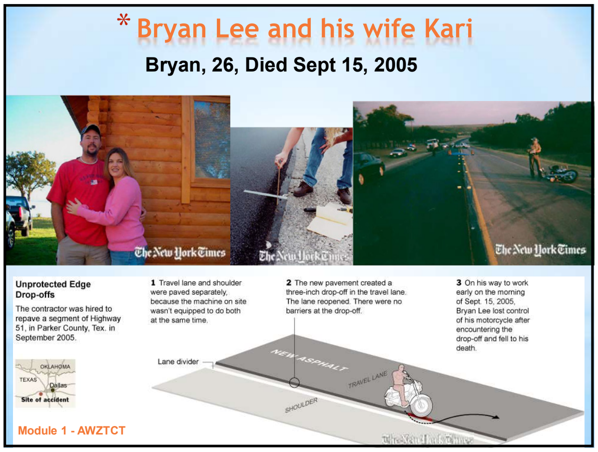
45


* Bryan Lee and his wife Kari
Bryan, 26, Died Sept 15, 2005
The New York Times
The New York Times
The New York Times
Unprotected Edge Drop-offs
The contractor was hired to repave a segment of Highway 51, in Parker County, Tex. in September 2005.
OKLAHOMA
TEXAS
Dallas
Site of accident
1 Travel lane and shoulder were paved separately, because the machine on site wasn't equipped to do both at the same time.
2 The new pavement created a three-inch drop-off in the travel lane. The lane reopened. There were no barriers at the drop-off.
3 On his way to work early on the morning of Sept. 15, 2005, Bryan Lee lost control of his motorcycle after encountering the drop-off and fell to his death.
Lane divider
NEW ASPHALT
TRAVEL LANE
SHOULDER
Module 1 - AWZTCT

46


* Anthony Sepeda, 18
Died April 29, 2008
04/25/2008
The New York Times
The New York Times
The New York Times
04/30/2008
Machinery Left Close To the Roadway
On April 29, 2008, the contractor left a backhoe parked 1.8 feet from the road in a construction site in Pflugerville, Tex. There were no warning signs or barricades.
TEXAS
Dallas
Site of accident
Austin
CONSTRUCTION HOLE
Anthony Sepeda, a high school senior, drifted too close on his motorcycle and fatally crashed into the side of the backhoe.
Module 1 - AWZTCT

47


Meet a Safety Director
for a Highway Construction Co
* Jessie Sepeda
Anthony was his son
04/25/2008
The New York Times
The New York Times
Module 1 - AWZTCT

48

* Tort Liability Awards

- VDOT can be sued for up to *$100,000.*
- A VDOT employee has *no cap limitations - unlimited.*
- VDOT has paid the judgment in the past, unless the employee was found grossly negligent.

Module 1 - AWZTCT

49

* Tort Liability [illegible]

- A contractor has no cap limitations.
- A contractor's employee has no cap limitations.
- As in most tort cases, the prosecutor is looking for the party with the deepest pockets.

Plaintiff

Defendant

Module 1 - AWZTCT

50

* Gross Negligence

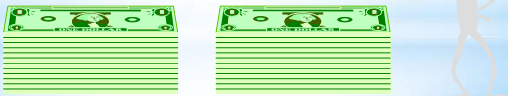
*Gross negligence – utterly disregarding and completely neglecting the safety of another

- Through your actions
- Through failure to act when warranted

Module 1 - AWZTCT

51

How Can I Protect Myself?



Module 1 - AWZTCT

52

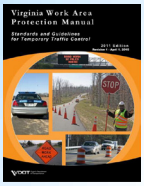
To Avoid Being Negligent

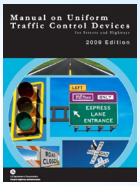
- Correctly perform your job duties
- Do your job the best you can
- Know the rules and regulations
- Speak up when you believe a course of action will lead to charges of negligence
- Document any deviations from the Standards
- Report any situation that, if not addressed, could possibly cause damage
- Don't break the law

Module 1 - AWZTCT

53

* How To Reduce Your Liability Exposure





*Steps to Minimize Liability are found in:
- Virginia Work Area Protection Manual
- The Manual on Uniform Traffic Control Devices
- Departmental Memorandums & Directives

*

Module 1 - AWZTCT

54

* Transportation Management Plan & Temporary Traffic Control Plan Documentation

- The documentation must be:
  - ✓Prepared in a timely, consistent and uniform manner
  - ✓Date (and if applicable sign) document
  - ✓Filed in a manner easy to retrieve
- Use Work Zone checklist as your primary means of documentation. Backups include:
  - ✓Photos
  - ✓Videos

55

* Terms and Definitions

- *A *Standard* statement of:
- Required TCD
- Mandatory TCD
- Specifically prohibitive practices regarding a TCD
- Shall is typically used and its font is bold
- Modified by an Option statement

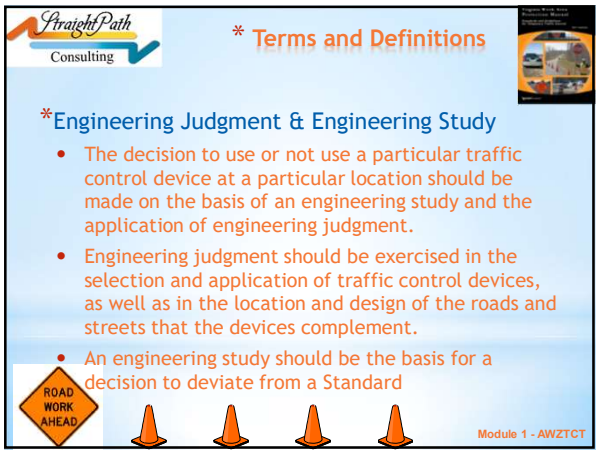
56

* Terms and Definitions

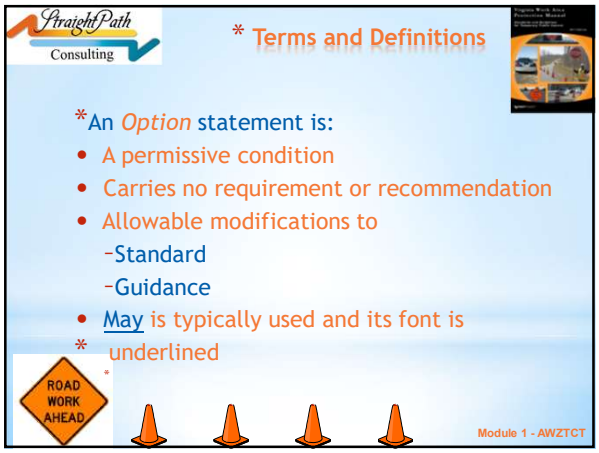
A *Guidance* statement is:

- **Highly recommended practice in typical situations**
- **If you don't use the guidance statement deviations must be supported by**
  - **Engineering judgment**
  - **Engineering study**
  - **Documentation**
  - ***Should* is typically used & its fonts are italicized**

57


StraightPath
Consulting
* Terms and Definitions
*Engineering Judgment & Engineering Study
• The decision to use or not use a particular traffic control device at a particular location should be made on the basis of an engineering study and the application of engineering judgment.
• Engineering judgment should be exercised in the selection and application of traffic control devices, as well as in the location and design of the roads and streets that the devices complement.
• An engineering study should be the basis for a decision to deviate from a Standard
ROAD WORK AHEAD
Module 1 - AWZTCT

58


StraightPath
Consulting
* Terms and Definitions
*An Option statement is:
• A permissive condition
• Carries no requirement or recommendation
• Allowable modifications to
–Standard
–Guidance
• May is typically used and its font is
* underlined
ROAD WORK AHEAD
Module 1 - AWZTCT

59


StraightPath
Consulting
* Terms and Defi
*A Support Statement is
• An informational statement
• Does not convey any
– Degree of mandate
– Recommendation
– Authorization
– Prohibition
– Enforceable condition
ROAD WORK AHEAD
Module 1 - AWZTCT

60

* Standard, Guidance, Options

- **Standard** - Shall be done
- **Guidance** - Should be done
  - * Highly recommended
  - * Deviations allowed
    - * **Engineering Judgment**
    - * **Engineering Study**
    - * **Document, Document, Document**
- **Options** - May be done
  - * Permissive condition
  - * Enhances Standards & Guidelines

Module 1 - AWZTCT

61

Office of the Attorney General

Local Municipalities should adopt the VWAPM or follow the MUTCD

Module 1 - AWZTCT

62

KNOWLEDGE CHECK

Who do we design our MOT plans for?

Drivers ?	***Yes***
Pedestrians ?	***Yes***
Bicyclist ?	**Yes**
Workers ?	***Yes***
Federal Funds ?	I know you want to say No

63

KNOWLEDGE CHECK

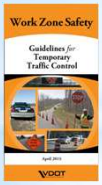
A Standard statement is:

Permissive	NO
Required	YES
Must be documented if changed	YES
Allowed if field staff approves	NO

64

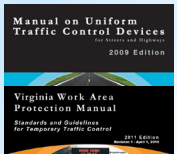
KNOWLEDGE CHECK

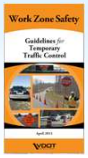
What two sources do we use that give us the layouts for work zones?



65

Manuals & References





VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONA

GENERAL SUBJECT: Work Zone Safety and Mobility	NUMBER:
SPECIFIC SUBJECT: Transportation Management Plan Requirements	DATE: SEP SUPERSEDE
LOCATION AND DESIGN DIVISION APPROVAL: Mohammad Mirshahi, P.E. State Location and Design Engineer Approved September 26, 2007	TRAFFIC EN APPROVAL:

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

GENERAL SUBJECT: Work Zone Safety	NUMBER: TE-350
SPECIFIC SUBJECT: Work Zone Speed Analysis	DATE: July 30 , 2007
DIRECTED TO: District Administrators	SUPERSEDES:
	SIGNATURE: *K. J. Khoury*

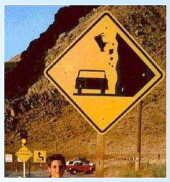
Module 2 - AWZTCT

66

* Why We Need Standards

67

* Why We Need Standards



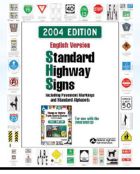
68

* Standards are Important

- They develop uniformity and consistency.
- They ensure basic traffic engineering principles are followed.
- They improve driver expectations and their reactions.

69

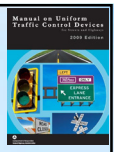
* Why We Need Standards



Module 2 - AWZTCT

70

* National Standards



*Manual on Uniform Traffic Control Devices. (MUTCD, the "bible" of traffic control)

- Provides national standards and guidelines applicable to all streets and highways open to public travel.
- It establishes Federal minimum requirements for traffic control.
- Latest edition issued in December, 2009.

Module 2 - AWZTCT

71

* National Standards

*MUTCD

- Part VI deals with "Temporary Traffic Control" (what we call work zone safety).
- States are required to follow the manual, or develop standards which meet or exceed these minimums.
- Manual promotes uniformity:

Consistency in Function

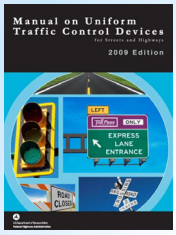
Shape, Size, & Color

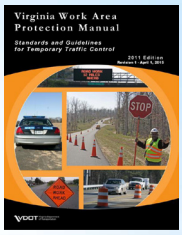
When & How Use Devices

Module 2 - AWZTCT

72

Virginia's Traffic Control Standard





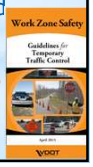
"Shall"	"Should"	"May"	Additional Information
STANDARD	GUIDELINE	OPTION	SUPPORT

Module 2 - AWZTCT

73

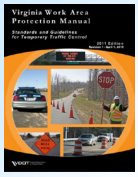
* Virginia Standards

- Virginia's supplement to the MUTCD, the *"Work Area Protection Manual"*.
- Establishes higher standards for work zone traffic control.
- August 2011 Revision 2 dated September 2019 is the latest edition, effective for construction, maintenance, permit, utility and incident management operations.
- 2019 Work Zone Safety Guidelines for Temporary Traffic Control or the Pocket Guide is based on the WAPM

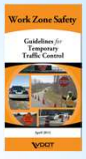


74

* Work Area Protection Manual & Pocket Guide



Standard



Supplement

- Standard for WZs in Virginia
- References used to develop this training
- Details *MINIMUM* typical application *diagrams*

* requirement for WZTC for designers and field personnel; inspectors, maintenance, utilities

Module 2 - AWZTCT

75

*2011 VA WAPM Re Changes/Additi

* • New date at the top of the page (Sept 2019)
* • Content;
  * Gray Shading
  * Superscript 2 following the revision
  * Revised TTC Figures designated by superscript 2
* • Footnote at the bottom of the page noting the revision number and date

September 2019 Page 6D-5

Standard:

All[2] workers and[2] emergency responders (excluding uniformed law enforcement personnel and firefighters)[2], media, towing and recovery personnel and others within the right-of-way who are either exposed to traffic or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel that meets Performance Class 3 requirements of the ANSI/ISEA 107–2010 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11 of the Virginia Supplement to the 2009 MUTCD), or equivalent revisions, and labeled as meeting the ANSI 107-2010 standard performance for Class 3[1] risk exposure, except as provided in Paragraph 8. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.

2: Revision 2 – 9/1/2019

Module 2 - AWZTCT

76

*2011 VA WAP Revisio

* Additions
  * 5 New Definitions

* 41. Queue Management System - a system that warns motorists of potential slowed or stopped traffic. The system can consist of warning signs, queue management vehicles or ITS technology.
* 42. Primary Route - a road that connect cities and towns with each other and with interstates. Primary Routes include all US Routes, Virginia State Routes numbered 599 and below, and Virginia State Route 895 in Chesterfield and Henrico Counties.
* 54. Secondary Crash - a crash which occurs as a result of queued traffic when the roadway capacity is reduced either from a work zone operation or a traffic incident. Secondary crashes which occur outside of the work zone advanced warning area are classified as work zone crashes, regardless if workers are present or not, if the traffic queue occurred due to the presence of the work zone operation. Crashes which occur prior to an incident location are considered Secondary crashes if the traffic queue occurred due to the presence of the incident.
* 55. Secondary Route - local connector or county roads maintained by VDOT, numbered 600 and above. Arlington and Henrico Counties do not contain VDOT-maintained secondary routes, as these jurisdictions maintain their own county roads.
* 73. Traffic Queue - the slowing or stoppage of traffic due to the reduction of roadway capacity either due to a work zone operation or from an incident.

  * 1 New acronyms and abbreviations

* 27. QMS - queue management system

Section 6A.03
Section 6A.04
Module - AWZTCT

77

2011 Work Area Protection Manual Revision 2 & Pocket Guide

*_Work Area Protection Manual_ is Virginia's supplement to the MUTCD's Part 6 Temporary Traffic Control

- WAPM establishes higher standards & provides clarification for work zone traffic control & typical traffic control layouts.
- 2011 Revision 2 Sept. 2019 is the Latest edition of the WAPM.
  - Effective Sept. 1, 2019 for daily operations.
  - Effective for projects/contracts with ad dates on or after Jan 1, 2020.
- Jan. 2020 is the latest Revision of the Pocket Guide

Module 2 - AWZTCT

78

* 2011 VA WAPM Revision 1 Revised April 1, 2015

- 2011 Virginia WAPM Rev. 1 will still apply to projects advertised between Sept. 1, 2019 and December 31, 2019 until their completion.
- 2015 Pocket Guide is a supplement to the 2011 Rev 1 WAPM.

79

* WAPM Introduction

Provides Federal & State Regulations for TTC

* **WAPM:**
  - **It is not feasible to cover every conceivable situation**
  - **Illustrates many of the typical worksites**
  - **Describes many common conditions**
  - **Circumstances occur which are not specifically covered which require modifications**

80

* Term Definitions

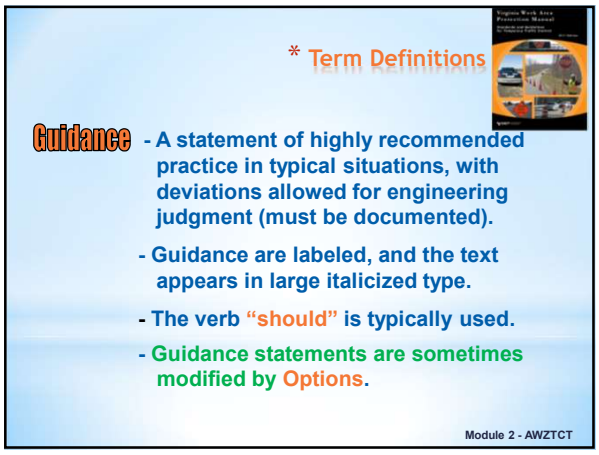
Standards - **A statement of required, mandatory, or specifically prohibitive practice regarding traffic control device(s).**

- Standards are labeled, and the text appears in bold large type.

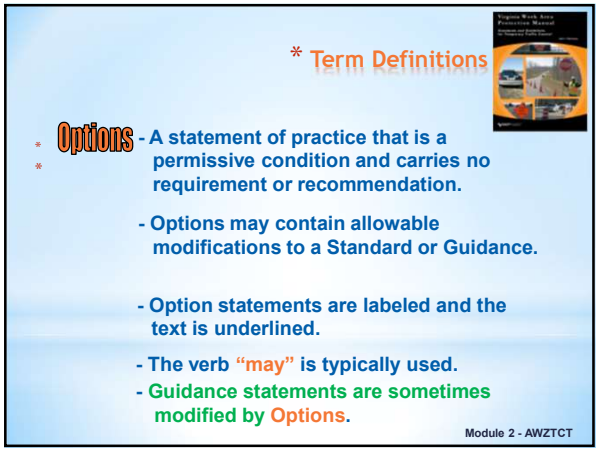
- The verb "shall" is typically used.

- Standards are sometimes modified by Options.

81


* Term Definitions
Guidance
- A statement of highly recommended practice in typical situations, with deviations allowed for engineering judgment (must be documented).
- Guidance are labeled, and the text appears in large italicized type.
- The verb "should" is typically used.
- Guidance statements are sometimes modified by Options.
Module 2 - AWZTCT

82


* Term Definitions
Options
- A statement of practice that is a permissive condition and carries no requirement or recommendation.
- Options may contain allowable modifications to a Standard or Guidance.
- Option statements are labeled and the text is underlined.
- The verb "may" is typically used.
- Guidance statements are sometimes modified by Options.
Module 2 - AWZTCT

83


* Term Definitions
Support
- An informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition.
- Support statements are labeled, and the text appears in small font.
- The verbs shall, should, and may are not used in Support statements.
Module 2 - AWZTCT

84

* Virginia Standards

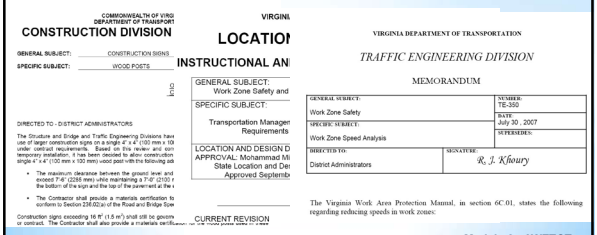
- VDOT's Road and Bridge Standards.
- VDOT's Road and Bridge Specifications.
- VDOT's plans, insertable sheets, contracts, special provisions and copied notes.

Module 2 - AWZTCT

85

* Work Zone Guidelines

- VDOT Policies and Memorandums.
  - Construction Directive Memo's
  - Location & Design IIM's
  - Traffic Engineering Memo's



CONSTRUCTION DIVISION

GENERAL SUBJECT: CONSTRUCTION SIGNS

SPECIFIC SUBJECT: WOOD POSTS

DIRECTED TO - DISTRICT ADMINISTRATORS

LOCATION

INSTRUCTIONAL AN

GENERAL SUBJECT: Work Zone Safety and

SPECIFIC SUBJECT: Transportation Manager Requirements

LOCATION AND DESIGN D
APPROVAL: Mohammad Mi
State Location and Des
Approved Septembe

CURRENT REVISION

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

MEMORANDUM

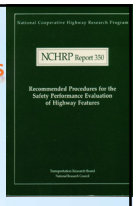
GENERAL SUBJECT:	NUMBER:
Work Zone Safety	TE-350
SPECIFIC SUBJECT:	DATE: July 30 , 2007
Work Zone Speed Analysis	SUPERSEDES:
DIRECTED TO:	SIGNATURE:
District Administrators	*R. J. Khoury*

The Virginia Work Area Protection Manual, in section 6C.01, states the following regarding reducing speeds in work zones:

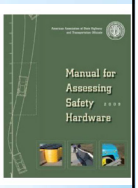
Module 2 - AWZTCT

86

* Work Zone Guidelines



- Federal Reports
  - NCHRP 350
  - MASH 2009
- AASHTO Roadside Design Guide
- OSHA Requirements
  - Adopted the MUTCD Millennium Edition in 2004.
  - Can now site work zone deficiencies under the General Duty clause.



Module 2 - AWZTCT

87

What Would OSHA Say About This?

Module 2 - AWZTCT

88

Transportation Management Plan Requirements

IIM-LD-241/TED-351

Work Zone Safety and Mobility

www.virginiadot.org/business/manuals-default.asp

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: WORK ZONE SAFETY AND MOBILITY	NUMBER: IIM-LD-241.5 TED-351.3
SPECIFIC SUBJECT: TRANSPORTATION MANAGEMENT PLAN REQUIREMENTS	DATE: SEPTEMBER 19, 2011
	SUPERSEDES: IIM-LD-241.4 TED-351.2
LOCATION AND DESIGN DIVISION APPROVAL: Mohammad Mirshahi, P.E. State Location and Design Engineer Approved September 19, 2011	TRAFFIC ENGINEERING DIVISION APPROVAL: Raymond J. Khoury, P.E. State Traffic Engineer Approved August 10, 2011

Module 2 - AWZTCT

89

Transportation Management Plan Requirements

IIM-LD-241/TED-351

Work Zone Safety and Mobility Provides Guidance on:

- **Temporary Traffic Control, Public Information, and Traffic Operations strategies for managing work zone impacts to traffic.**
- **Roles and responsibilities for project teams in developing TMPs during the preliminary engineering and construction phases of a project.**
- **Categorizes projects based on the complexity of the construction.**

Module 2 - AWZTCT

90

* Standards and Guidelines

*Both Standards and Guidelines apply to traffic control in work zones; however . . .

*They cannot take the place of "engineering judgement". Therefore...

"Have a good reason for doing what you are doing out there . . ."

AND DOCUMENT YOUR REASON(S)!!!!

Module 2 - AWZTCT

91

KNOWLEDGE CHECK

Option Statements can modify both Standard and Guidance Statements

True

92

Advanced Work Zone Traffic Control Training

Fundamental Principles

April 2015

Module 3 - AWZTCT

93

* Fundamental Principles of Temporary Traffic Control

*Provide a "guiding philosophy"

*If followed, will assist road users and help protect workers

Module 3 - AWZTCT

94

* Fundamental Principles of Temporary Traffic Control

*The MUTCD Part 6 includes 7 fundamental principles

*Under "GUIDANCE"
  *Steps we *should* take

*They do not establish standards or warrants

"SHOULD"

GUIDELINE

Module 3 - AWZTCT

95

FUNDAMENTAL PRINCIPALS OF TEMPORARY TRAFFIC CONTROL

*

turn in the Work Area Protection Manual to page 6B-1

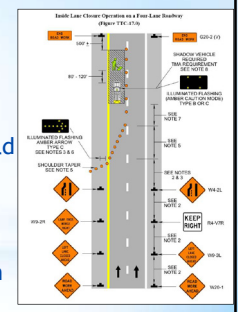
96

* Principle #1
Safety is Integral

*Safety of ALL users is integral

*Same principles that govern the design of permanent roads should also govern Temporary Traffic Control Plan design

*A Temporary Traffic Control Plan should be prepared for all work zones!



Module 3 - AWZTCT

97

* Is this Safe & Proper Traffic Control?

Module 3 - AWZTCT

98

* Principle #2
Mobility
(Inhibit Traffic as Little as Possible)

* Consider:
  - Reduce speeds only if needed based on an engineering study per TE-350 Memorandum
  - Avoid frequent and abrupt changes during travel through the work zone
  - Encourage users to use alternate routes to reduce traffic volumes in the work zone
  - Work during off-peak/night hours
  - Provide safe passage for *ALL* users (motorist, motorcycles, bicyclists, pedestrians, disabled)
  - Get work done as quickly as possible

do not allow lane closures until we need them

Module 3 - AWZTCT

99

* Is This Providing a Safe Passage for Pedestrians?

How do we plan to handle pedestrians?
Where do we put our signs?

100

* Principle #3 Positive Guidance

* ALL users should be guided positively through the work Zone by:
  - Adequate advance warning, delineation and channelization
  - The use of appropriate devices
  - Removing or covering inapplicable devices
  - Using Flaggers only when absolutely necessary

101

* Is This Clear and Positive Guidance?

102

* Is This Clear and Positive Guidance?

Module 3 - AWZTCT

103

* Principle #4 Inspections

* Perform routine day and night inspections:
  - By knowledgeable individuals
  - Provide remedial safety measures
  - Repair or replace devices as necessary using the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features
  - Use good quality devices

Module 3 - AWZTCT

104

* Was This Inspected?

Module 3 - AWZTCT

105

* Proper Quality?

Module 3 - AWZTCT

106

* Proper Coverings?

Module 3 - AWZTCT

107

Straight Path Consulting

* Principle #5
Roadside Maintenance

* Provide an unencumbered recovery area or *"clear zone" by:*
  - Areas for disabled vehicles or emergency situations
  - Proper channelization
  - Storing equipment, materials and work vehicles where they will not be hit by run-off-the-road vehicles

FORGIVING DESIGN!

Clear Zone

Module 3 - AWZTCT

108

* Is This a Good Recovery Area?

109

* Principle #6 Training

Straight Path Consulting

* Everyone shall receive training
  * Maintenance Personnel
  * Construction personnel
  * Designers

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."

110

* Is Training Needed?

111

* Principle #7 Public Relations

- Assess the needs of all users so that appropriate advance notice is given
- Cooperation with the media
- Accommodate property owners, residents and businesses
- Accommodate emergency service providers
- Accommodate railroads, transit and commercial vehicles
- Accommodate commercial vehicles (buses and large trucks)

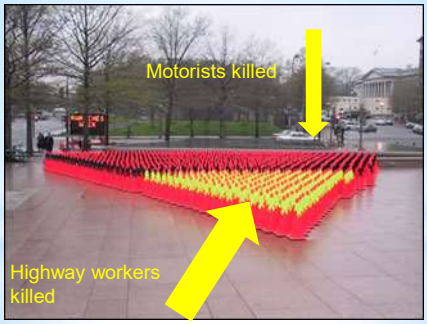
112

113

* Good Public Relations?

114

* Following these principles is Key!
It can save lives!



Module 3 - AWZTCT

115

Straight Path Consulting

Advanced Work Zone Traffic Control Training Human Factors

April 2015

Module 4 - AWZTCT

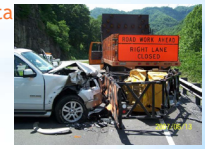
116

Straight Path Consulting

* 2010 Fatal Work Injuries (All types of workers)

*More fatal work (all types of work) injuries result from transportation incidents than any other event.

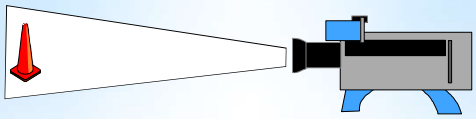
- Highway incident account for more than 1 out of every 5 fatal work injuries
- Other types of fatal transportation injury account for 18% fata work injures



Module 4 - AWZTCT

117

* Work Zone Video



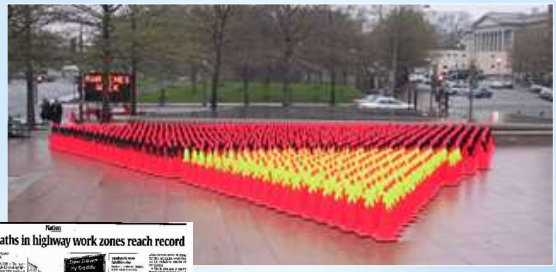
"One Step From Death"

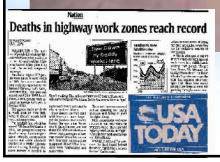
Module 4 - AWZTCT

118

119

Since 2002 over
1000 fatalities a year!





Every 3 out of 4 is a motorist in a fatality

Module 4 - AWZTCT

120

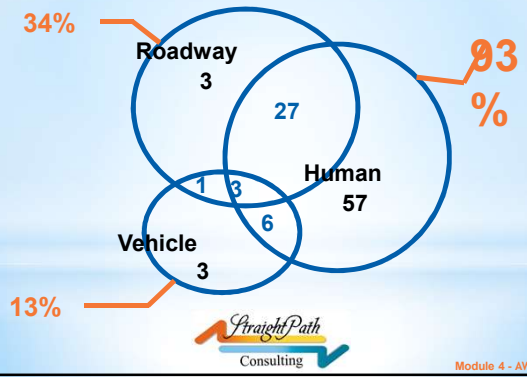
* Contributing Factors to Vehicle Crashes

Human Factors	Vehicle Factors	Roadway Factors
• Age	• Design	• Geometric alignment
• Judgment	• Manufacture	• Cross-section
• Driver Skills	• Maintenance	• Traffic control devices
• Attention		• Surface friction
• Fatigue		• Grade
• Experience		• Signage
• Sobriety		• Weather
		• Visibility

Module 4 - AWZTCT

121

* Contributing Factors to Vehicle Crashes



Module 4 - AWZTCT

122

* Keys to Designing for the Driver

- Be sensitive to users' needs and desires
- Allow adequate time for decision and response
- Provide "Positive Guidance"
- Minimize congestion

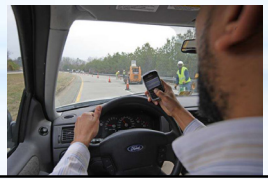
We will discuss each one in more detail!

Module 4 - AWZTCT

123

Our Biggest Challenge

Motorist!



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124

2011 National Work Zone Awareness Facts

- 85% of WZ fatalities are drivers and their passengers
- 15% of WZ fatalities are pedestrians which include workers and bicyclists
- 25% of all traffic crashes are caused by distracted drivers

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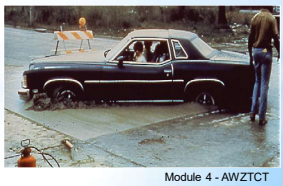
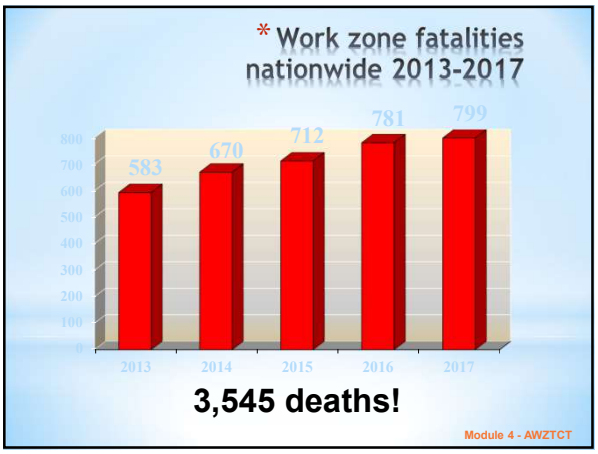
125

Each Motorist Is Different

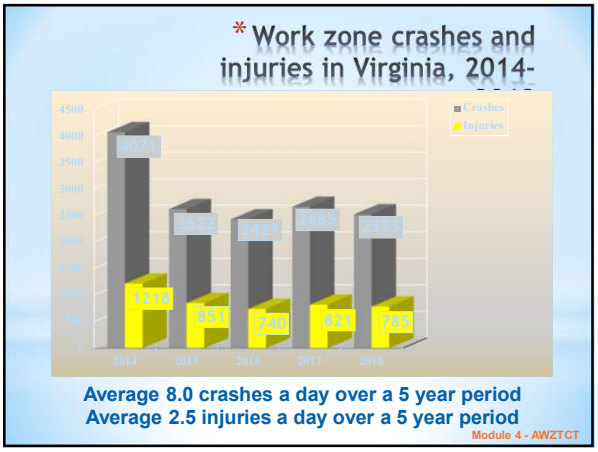


Module 4 - AWZTCT

126


* Work zone fatalities nationwide 2013-2017
583
670
712
781
799
2013
2014
2015
2016
2017
3,545 deaths!
Module 4 - AWZTCT

127


* Work zone crashes and injuries in Virginia, 2014-
Crashes
Injuries
4071
2622
2427
2665
2523
1318
854
740
821
765
2014
2015
2016
2017
2018
Average 8.0 crashes a day over a 5 year period
Average 2.5 injuries a day over a 5 year period
Module 4 - AWZTCT

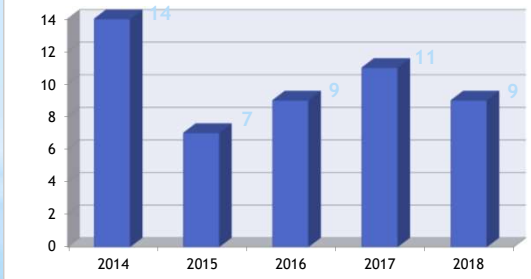
128


* Work Zone Fatalities on ALL State Roadways from 2006-2013
15
14
14
15
11
7
12
11
13
21
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Module 4 - AWZTCT

129

* Work Zone Fatalities on ALL Virginia State Roadways from 2014-2018

50 Killed



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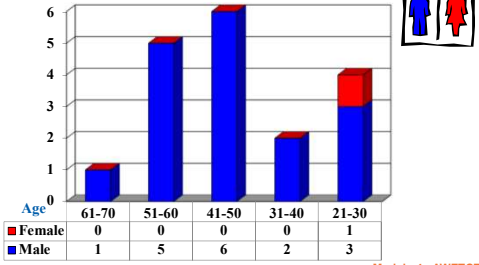
130

Fatalities by Gender & Age
VDOT Maintained Roads

WZ Crashes by Gender and Age Group



Age	61-70	51-60	41-50	31-40	21-30
Female	0	0	0	0	1
Male	1	5	6	2	3

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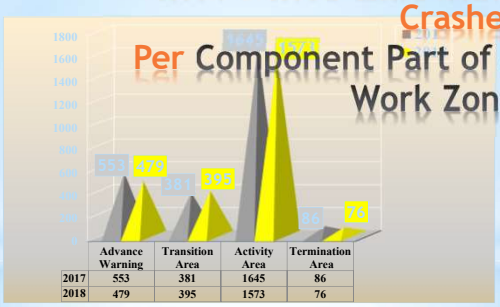
131

*2017 - 2018 Work Zone Crashes Per Component Part of A Work Zone



	Advance Warning	Transition Area	Activity Area	Termination Area
2017	553	381	1645	86
2018	479	395	1573	76

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132

* Be Sensitive to Users' Needs and Ex

- Anticipate their actions and reactions
- Meet their expectations
- Design for the actual user population, considering:
  - Age
  - Experience
  - Perceptual abilities

133

* Understanding the Driver

What are their needs?
What are their perceptual abilities?
Who is our design driver?

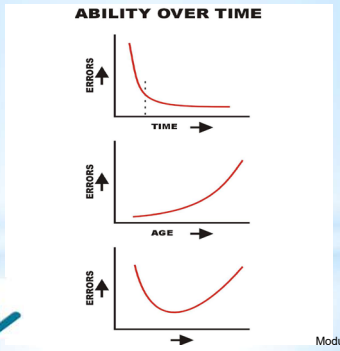
134

* Designing for Which Driver?

* Average?
* Worst?
* Normal?
* Typical?

135

Designing for Which Driver?



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136

* Perceptual Ability

* Drivers acquire *most* of their driving information by *sight*

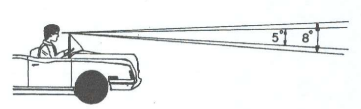
Clear and Positive Guidance

Module 4 - AWZTCT

137

* Sight: Cones

* *Peripheral* vision = 120°- 160°
* *Satisfactory* vision = 20°
* *Clear* vision = 10°
* *Best* vision = 3°



Module 4 - AWZTCT

138

* Visibility vs. Age

*As we age we need *more light* to see things with the same clarity as when we were younger!!

*Sign identification:
  *20-year old = 575 feet
  *60-year old = 280 feet

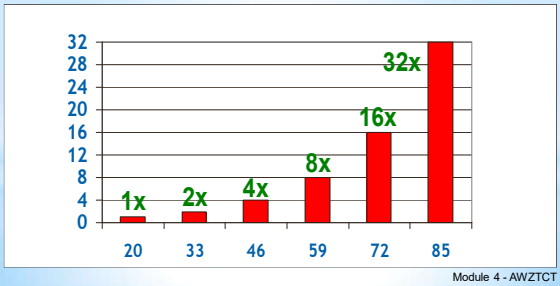
139

* Age 20 vs. Age 60

140

* Vision Deteriorates with Age

*After age 20, the amount of light needed to see doubles every 13 years



141

* Design Actions that Affect Driver's Ability

- Alertness
- Concentration ability
- Distractions
- Day versus night vision
- Age and experience

Module 4 - AWZTCT

142

* Expectations of Drivers

- Safe conditions
- Minimum delay
- Visible devices
- Current information
- Unstressed travel
- Minimized construction time
- Work being done

Module 4 - AWZTCT

143

* Second

Allow adequate time for decisions and responses

*Be sensitive to users' needs

*What is "*adequate time*"?

Module 4 - AWZTCT

144

* Providing "Adequate" Time

- How much time is needed to perceive, analyze and execute a decision?
- How does that time relate to distance?

Module 4 - AWZTCT

145

* Perception/Reaction (P/R) Cycle

- *Perception (Situation detected)
- *Intellection (Situation identified and analyzed)
- *Emotion (Decision on action made)
- *Volition (Action executed)

Module 4 - AWZTCT

146

* Time for Driver Decision an

- *Perception and reaction time (PRT) is 2.5 seconds (per AASHTO)

2.5 sec.!

- *Average PRT in work zone situation is 5-7 seconds

5 sec.!

Module 4 - AWZTCT

147

* Converting mph to fps

*Multiply the speed in miles per hours by *1.47* to obtain the number of feet a vehicle travels is one second

Example:
60 mph = (60)(1.47) = 88 fps
55 mph = 55 x 1.47 = 81 fps

148

Feet Traveled in One Second

Speed (mph)	Speed (fps)
25	37
35	51
45	66
55	81
60	88
65	96
75	110

149

* Distance Traveled (in Feet) During the Perception/Reaction Time

Speed (mph)	in 2.5 sec.	in 5.0 sec.
25	92	**36.75 x 5 = 184**
35	129	257
45	165	**66.16 x 5 = 331**
55	202	404
60	220	**88.2 x 5= 441**
65	239	478
75	276	110.25 x 5 = 551

150

Provide "Positiv

- Use standard devices
- Clearly indicate options
- Provide clear directions
- Clearly indicate the desired path
- Consider the visibility of devices
  - Day
  - Night

151

Minimize Congestion

*"Work Zone Impact Assessment"

*Reducing "*driver frustration*" allows drivers to make better decisions!

152

* Minimizing Congestion

*Public relations are key!

*Anticipate when congestion may be a problem and plan appropriate action

153

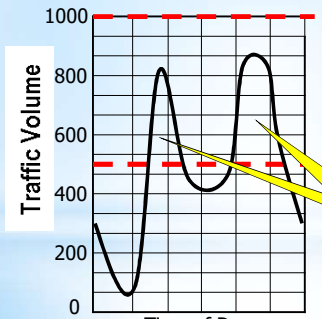
* Capaci…

- Traffic volumes
  - Vehicles per hour
  - Average daily traffic (ADT)
- Traffic movements
- Hourly variations

Module 4 - AWZTCT

154

* Know the Impact of Reduced Capacity



Cap.=1,000 vph

Cap.=500 vph

Congestion periods!

Module 4 - AWZTCT

155

* Traffic Impact Ass… Analysis Tools

- Sketch-Planning
  - QuickZone
  - QUEWZ-98
- Travel Demand
  - IDAS
- Analytical/Deterministic (HCM Methodologies)
  - Highway Capacity Software (HCS)
- Traffic Optimization
  - Synchro
- Traffic simulation
  - CORSIM
  - VISSIM

Module 4 - AWZTCT

156

* Major Crash Factors of VA Maintained Roads

1. Run-off the road
   a. Embankment
   b. Fixed objective
   c. Roll over
2. Rear in crash due to stop traffic
3. Intoxicated driver
4. Failure to Yield Right of Way
5. Excessive speed
6. Drivers Ejected
7. Vehicle Fire
8. Driver inattention

157

* Driver Expectations

*Drivers make their own decisions

*Decisions are based upon information on hand and past experiences.

*Traffic control must be designed and installed to obtain the desired response.

*Penalties alone have little affect in forcing driver responses.

StraightPath Consulting

158

* Driver Exp

StraightPath Consulting

*When *expectancies are met* and reinforced they aid the driving task and performance tends to be error-free.

*When *expectancies are violated*, drivers need more time to respond, performance is poorer, and they may commit errors.

?

159

* Are Expectations Violated Here?

160

* Are Expectations Violated Here?

161

* Driver Behavior

The following steps must be performed for a motorist to avoid a hazard:

1. Hazard becomes visible
2. Hazard is detected
3. Hazard is recognized

Detection and Recognition

4. Driver decides on action
5. Driver begins response
6. Maneuver is completed

Decision and Response

5 to 7 Seconds

162

* Driver Behavio

The following steps must be performed for a motorist to avoid a hazard:

1. Hazard becomes visible
2. Hazard is detected
3. Hazard is recognized
4. Driver decides on action
5. Driver begins response
6. Maneuver is completed

163

KNOWLEDGE CHECK

How far will you travel in 5 seconds at 75 mph?

75 X 1.47 = 110.25’

110.25 X 5 = 551.75’

164

KNOWLEDGE CHECK

As designers, what is the factor that is the most variable and we have the least control over?

Decisions made by humans

165

KNOWLEDGE CHECK

What percent of accidents have a human factor involved in it?

10%

25%

93%

67%

166

KNOWLEDGE CHECK

What is PRT numerical value?

5 TO 7 seconds

167

KNOWLEDGE CHECK

What is our main goal as a designer rework zones?

Design the least expensive project possible

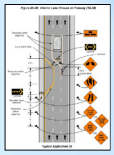
Design a work zone that provides clear and positive guidance

168

Do we get paid extra to trick the driver????

169

* Advanced
Work Zone Traffic Control
Training
Component Parts of
Temporary Traffic Control
April 2015



Module 5 - AWZTCT

170

* In this module we will cover:

- How work zone types are determined
- The six categories of work duration
- The five component parts of a TTC Zone and discuss each.

Module 5 - AWZTCT

171

* Work Zone Types are determined by:

- Work location
- Type of work operation & equipment needs
- Work duration/timeframe
- Highway type

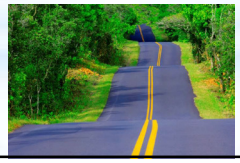
Module 5 - AWZTCT

172

* Work Zone Types are determined by:

*Work Location – in relation to traffic:

- **Outside the shoulder**
- **On the shoulder w/ no encroachment**
- **On the shoulder with encroachment**
- **Within the median, and**
- **Within the traveled way.**



Section 6G.01 (01)

Module 5 - AWZTCT

173

* Work Zone Types are determined by:

* Work Location - Geometrics:

- **Vertical and horizontal alignment**
- **Intersections**
- **Interchanges**
- **Signals**
- **Driveways**
- **Business entrances**
- **Schools**
- **Emergency Services**
- **Evidence of Pedestrians**

Module 5 - AWZTCT

174

* Work Zone Types are determined by:

* Work Operation:
  - Equipment needs
  - Type of materials needed
  - Quick fix or long term repair
  - Compact work area or
  - Extended work area
  - Work in an intersection
  - Work in a roundabout
  - Temporary Traffic Control Devices

Section 6G.01 (01)

Module 5 - AWZTCT

175

* Work Zone Types are determined by:

* Work Operation:
  - Equipment needs
  - Shoulder Closure
  - Stationary Lane Closure
  - Flagging Operation
  - Mobile Operation
  - Working in an intersection
  - Working in a roundabout
  - TTC Devices needs

Module 5 - AWZTCT

176

* Work Zone Types are determined by:

* Work Duration timeframes:
  - Mobile Operation
  - Short Duration
  - Short-term Stationary
  - Intermediate-term Stationary
  - Long-term Stationary
  - Nighttime Activities

Page 6G-1 in the VWAPM

Module 5 - AWZTCT

177

* Work Zone Types are determined by:

* Highway Type Factors:
  - **Road user speeds**
  - **Road Classification**
  - **Road user volumes**
  - **Road vehicle mix**
    - **Buses (School, Commercial)**
    - **Trucks**
    - **Cars**
    - **Motorcycles**
    - **Pedestrians – sidewalk of visual evidence**

Module 5 - AWZTCT

178

*The posted speed limit has an effect on the installation of TTC devices:

- Distance between signs
- Length of transitions; merging, shifting or shoulder tapers
- Spacing of channelizing devices
- Buffer spacing
- Use of TMA
- Clear zone values
- Barrier flare rate

* Posted Speed Limit

Module 5 - AWZTCT

179

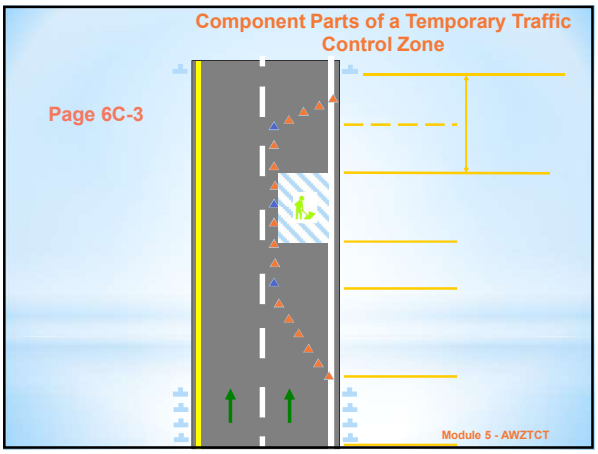
*We will discuss:

- Figure 6C-1, Component Parts of TTC Zone
- Table 6C-1, Spacing of Advance Warning Signs
  - We will use Table 6H-5 for discussion purposes
- Table 6F-2, Spacing of Channelizing Devices
- Table 6C-3, Taper Length Criteria for TTC Zones
- Table 6C-4, Taper Length Chart
- Table 6C-2, Length of the Longitudinal Buffer Space

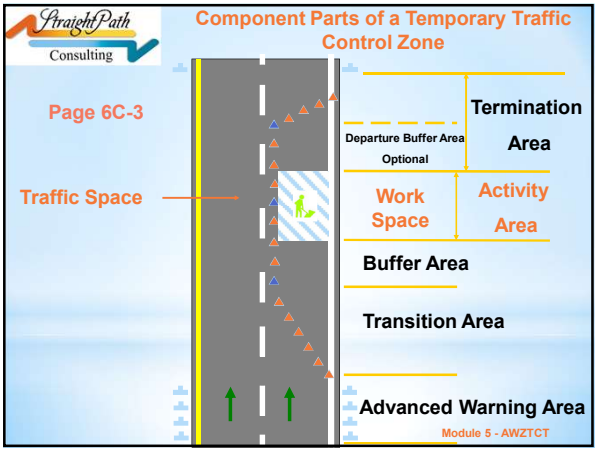
* Virginia Work Area Protection Manual References

Module 5 - AWZTCT

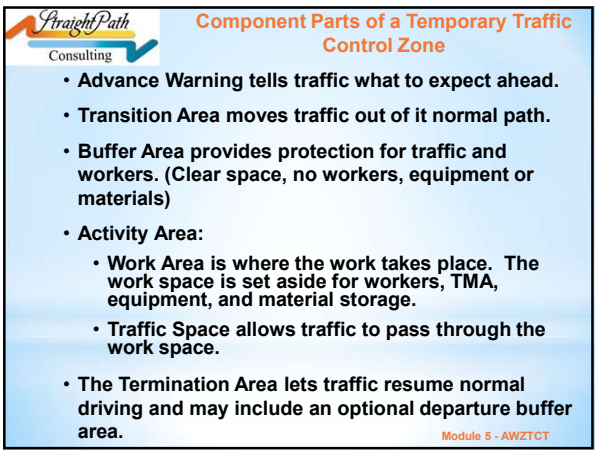
180


Component Parts of a Temporary Traffic Control Zone
Page 6C-3
Module 5 - AWZTCT

181


Component Parts of a Temporary Traffic Control Zone
Page 6C-3
Traffic Space
Termination Area
Departure Buffer Area Optional
Work Space
Activity Area
Buffer Area
Transition Area
Advanced Warning Area
Module 5 - AWZTCT

182


Component Parts of a Temporary Traffic Control Zone
• Advance Warning tells traffic what to expect ahead.
• Transition Area moves traffic out of it normal path.
• Buffer Area provides protection for traffic and workers. (Clear space, no workers, equipment or materials)
• Activity Area:
• Work Area is where the work takes place. The work space is set aside for workers, TMA, equipment, and material storage.
• Traffic Space allows traffic to pass through the work space.
• The Termination Area lets traffic resume normal driving and may include an optional departure buffer area.
Module 5 - AWZTCT

183

* Virginia Work Area Protection Manual References

*Spacing for Advance Warning Signs?
*Page 6C-3 or Page 6H-6 and page 6 in the PG

Table 6H-5, Advance Warning Sign Spacing

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

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

Note: For urban conditions, it is generally better to place all advanced warning signs within a one block area versus spreading out the signs over several blocks, however, motorist must have time to recognize and react to each warning sign see Section 6G.11.

Module 5 - AWZTCT

184

* Virginia Work Area Protection Manual References

*Channelizing Device Spacing?

* Page 6F-58 and page 10 in the PG

Table 6F-2, Spacing of Channelizing Devices

Work Zone Location	Posted Speed Limit (mph)	Spacing of Devices (Feet)
In Tapers and Curves	35 mph or less	20
Parallel to the Travel way	35 mph or less	40
Spot Construction Access *	35 mph or less	80
In Tapers and Curves	Greater than 35 mph	40
Parallel to the Travel way	Greater than 35 mph	80
Spot Construction Access *	Greater than 35 mph	120

*For easier access by construction vehicles into the work area, spacing of devices may be increased to this distance, but shall not exceed one access per 0.25 mile unless approved by the engineer and documented.

Module 5 - AWZTCT

185

* Taper Length (L)

*Taper lengths?

* Page 6C-7 or Page 6H-5

Table 6C-4, Taper Length Chart

Posted Speed Limit (mph)	Taper Length (L) Width of Offset (Feet) 9	10	11	12	Remarks
≤ 25	95	105	115	125	$L = S^2W/60$
30	135	150	165	180	"
35	185	205	225	245	"
40	240	270[1]	295[1]	320	"
45	405	450	495	540	L=SW
50	450	500	550	600	"
55	495	550	605	660	"
60	540	600	660	720	"
65	585	650	715	780	"
70	630	700	770	840	"

* Limited Access highways shall use a 1000' merging taper regardless of the posted speed.

Shifting Tapers - full lane width shifts on Limited Access Highways shall use a 750' shifting taper for posted speeds less than 65 mph and a 1000' shifting taper for posted speeds equal to or greater than 65 mph. For all other roadways ½ L should be used.[2]

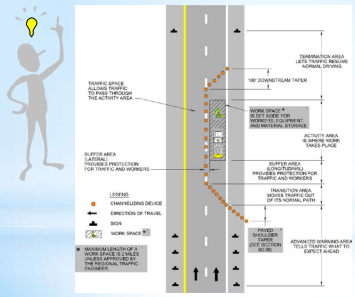
Module 5 - AWZTCT

186

*Types of Tapers & Buffer Spaces

Page 6C-9

Figure 6C-2, Examples of Types of Tapers and Buffer Spaces



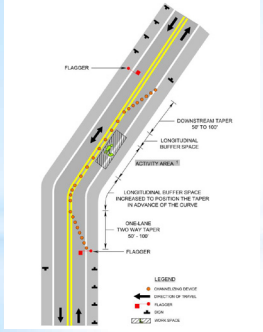
- Merging taper takes away a lane
- Shoulder tapers are require in advance of a WZ or shoulder closure
- Shifting taper moves traffic laterally right or left
- Downstream taper moves traffic back to its normal path

187

*Types of Tapers & Buffer Spaces

Page 6C-10

Figure 6C-3, Example of a One-Lane, Two-Way Taper



- One-lane, two-way taper controls traffic movement alternately around the work space
- Downstream taper moves traffic back to its normal path

188

* Virginia Work Area Protection Manual References

*Taper lengths?

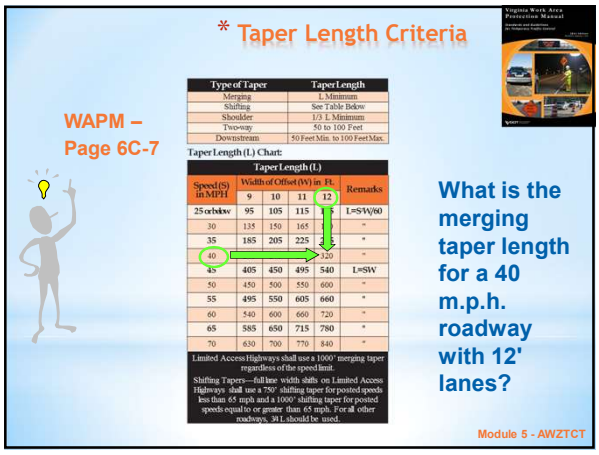
* Page 6C-7

Table 6C-4, Taper Length Chart

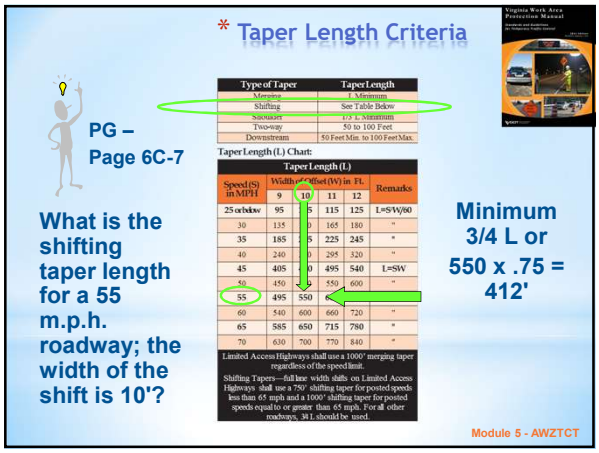
Posted Speed Limit (mph)	Taper Length (L) Width of Offset (Feet) 9	10	11	12	Remarks
≤ 25	95	105	115	125	L= S²W/60
30	135	150	165	180	"
35	185	205	225	245	"
40	240	270[1]	295[1]	320	"
45	405	450	495	540	L=SW
50	450	500	550	600	"
55	495	550	605	660	"
60	540	600	660	720	"
65	585	650	715	780	"
70<	630	700	770	840	"

Limited Access highway merging taper length (L) shall be 1000 feet regardless of the posted speed and SW=L is desired for the shifting taper length with ½L being the minimum.

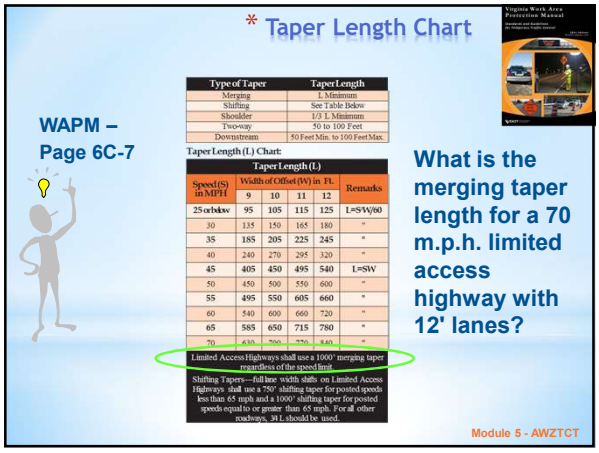
189


* Taper Length Criteria
WAPM – Page 6C-7
What is the merging taper length for a 40 m.p.h. roadway with 12' lanes?
Module 5 - AWZTCT

190


* Taper Length Criteria
PG – Page 6C-7
What is the shifting taper length for a 55 m.p.h. roadway; the width of the shift is 10'?
Minimum 3/4 L or 550 x .75 = 412'
Module 5 - AWZTCT

191


* Taper Length Chart
WAPM – Page 6C-7
What is the merging taper length for a 70 m.p.h. limited access highway with 12' lanes?
Module 5 - AWZTCT

192

* Why use a buffer space

"Buffer" dictionary definition:

- To protect something against impact or reduce the shock of an impact
- Intervening shield reducing interaction of two parts
- A thing that shield or protects against harm

WAPM – A longitudinal buffer space should be place in advance of a work zone. A clear space, no workers, equipment or materials

Module 5 - AWZTCT

193

* Buffer Space Length Chart

WAPM – Page 6C-5

Table 6C-2, Length of the Longitudinal Buffer Space

Posted Speed Limit (mph)	Distance (Feet)
≤ 20	115 – 120
25	155 – 165[1]
30	200 – 210
35	250 – 260
40	305 – 325[1]
45	360 – 380
50	425 – 445
55	500 – 530[1]
60	570 – 600[1]
65	645 – 675
70	730 – 760
75	820 – 850

What is the buffer space length for 70 m.p.h.?

Module 5 - AWZTCT

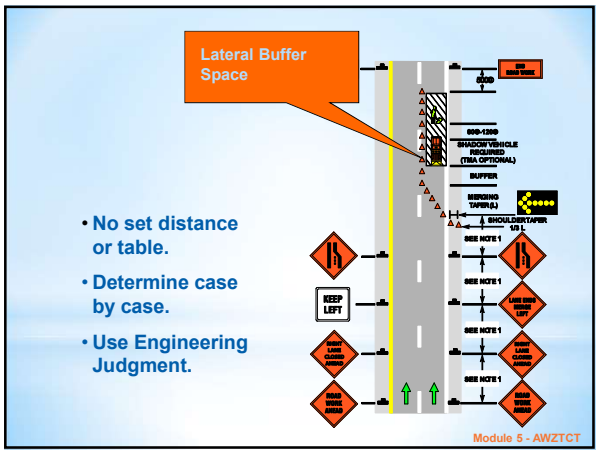
194

* Activity Area

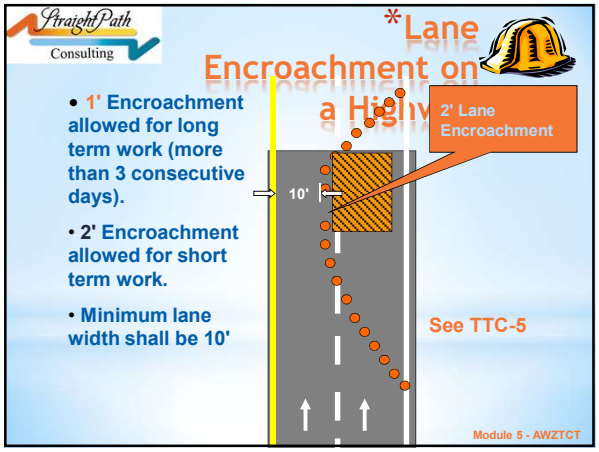
- Where the work takes place
  - Workers
  - Equipment
  - Materials
  - Shadow vehicle
- May be stationary or may move as work progresses
- Maximum length of the work space should not exceed 2 miles unless approved by RTE

Module 5 - AWZTCT

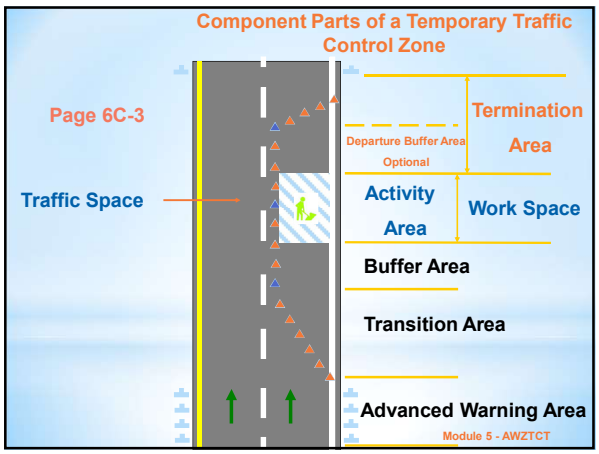
195


Lateral Buffer Space
• No set distance or table.
• Determine case by case.
• Use Engineering Judgment.
Module 5 - AWZTCT

196


Consulting
*Lane Encroachment on a Highway
• 1' Encroachment allowed for long term work (more than 3 consecutive days).
• 2' Encroachment allowed for short term work.
• Minimum lane width shall be 10'
2' Lane Encroachment
10'
See TTC-5
Module 5 - AWZTCT

197


Component Parts of a Temporary Traffic Control Zone
Page 6C-3
Traffic Space
Termination Area
Departure Buffer Area Optional
Activity Area
Work Space
Buffer Area
Transition Area
Advanced Warning Area
Module 5 - AWZTCT

198

*Termination Area

- Traffic returns to normal path.
- "END ROAD WORK" sign approximately 500' beyond the end of the work.
- A longitudinal buffer space may be used between the end of the work area and beginning of the downstream taper.

END
ROAD WORK

199

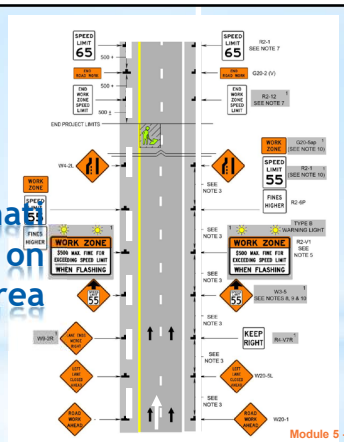
*Termination Area

- A 100' minimum downstream taper is now recommended for better motorist guidance.
- If speed limit was reduced due to work, the original speed limit sign must be placed 500' past the last sign.

END
ROAD WORK

200

*Termination Area



201

* Measuring Distance

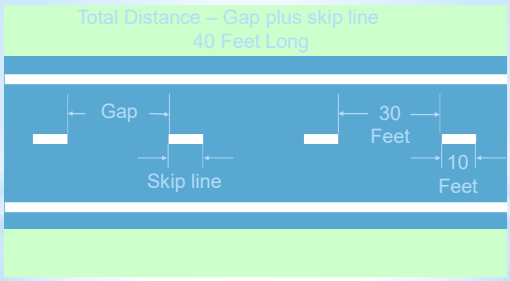
*Methods used to estimate distance:

- Measuring wheel
- Odometer
- Pacing
- Guardrail
- Equipment length
- Distance Measuring Instrument (DMI)
- Pavement marking – skip marks and gaps

Module 5 - AWZTCT

202

* Skip Marks and Gaps



Module 5 - AWZTCT

203

KNOWLEDGE CHECK

StraightPath Consulting

*What is the sign spacing for an urban road 45 mph?

350 - 500

204

KNOWLEDGE CHECK

*What do you do if you do not have enough room within a block to meet the sign spacing?

Put all signs within the same block regardless of spacing

Use elements of TTC 67

205

KNOWLEDGE CHECK

*What is the buffer space on a limited access highway at 65 mph?

645 – 675’

206

KNOWLEDGE CHECK

*What is the channelizing device spacing on a 55 mph roadway?

80’ in tangent

40’ in taper

207

KNOWLEDGE CHECK

*What is the taper length on a 2-lane road with a speed limit of 55 mph?

50 – 100 feet

208

KNOWLEDGE CHECK

Page 6G-1

*Which of the following is a Short-term stationary operation?

Occupies a location more than 3 days

More than one daylight period up to 3 days

More than 1 hour within a single daylight period

Occupies a location up to 1 hour

209

KNOWLEDGE CHECK

Section 6F.90 – page 6F-68

*Where will you find information on Temporary Raised Pavement Markers?

210

KNOWLEDGE CHECK

StraightPath Consulting

*Name some of the special characteristics of an design area we have to give special consideration to re wz's

211

KNOWLEDGE CHECK

StraightPath Consulting

*What is the taper on a roadway with a speed limit of 60 mph and a 12 foot lane?

720 feet

212

KNOWLEDGE CHECK

StraightPath Consulting

*What is the taper length on a limited access highway at 65 mph and a 12-foot lane?

1,000 feet

213

* Advanced
Work Zone Traffic Control
Training
Types of Typical Traffic Control
April 2015

214

* Work Zone Applications

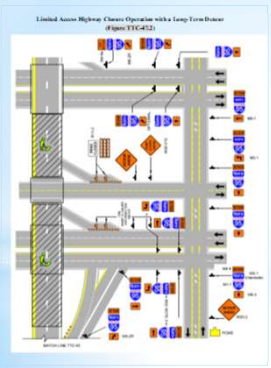
1. Detour
2. Lane constriction
3. Lane closure
4. Shared right-of-way
5. Diversion
6. Intermittent closure
7. Crossover
8. Shoulder use

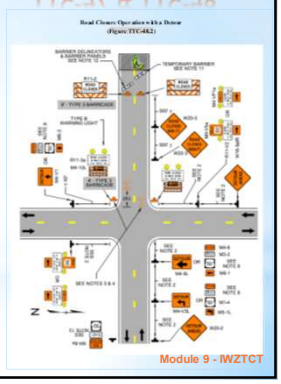
215

- Involves total closure of the roadway.
- Traffic is rerouted to an adjacent street or highway.

216

* 1. Detours TTC-47 & TTC-48





Module 9 - IWZTCT

217

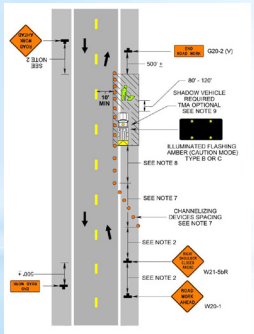
* 2. Lane Cons[illegible]

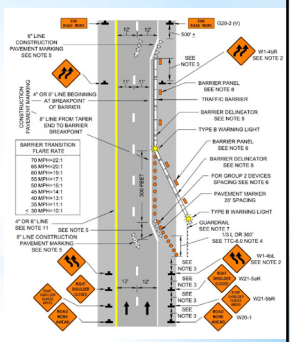
- All lanes retain their normal number of lanes and general alignment
- One or more of the traffic lanes have reduced widths to provide the necessary separation from the work zones
- Causes the least disruption to traffic

Module 6 - AWZTCT

218

* 2. Lane Constriction





Module 6 - AWZTCT

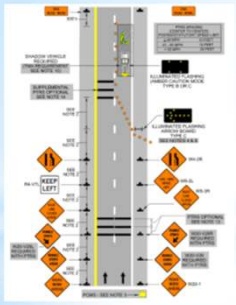
219

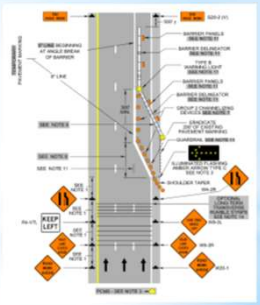
* 3. Lane Closure

- One or more of the traffic lanes are closed
- A capacity analysis is necessary to determine the extent of congestion that might result

220

* 3. Lane Closure TTC-16 & TTC-20





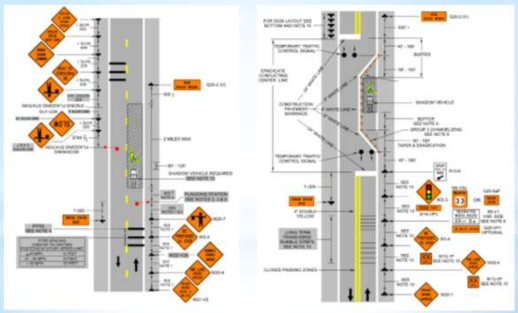
221

* 4. Shared Right-of-Way

- Involves using one lane for both directions of traffic
- Flaggers or temporary traffic signals are normally used to control the alternation of traffic movement

222

* 4. Shared Right-of-Way TTC-24 & TTC-25



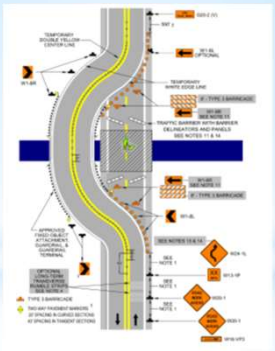
223

* 5. Diversion

- Involves total closure of one or both directions of travel on the roadway
- Traffic is routed to a temporary bypass constructed within the highway's right-of-way

224

* 5. Diversion TTC-43



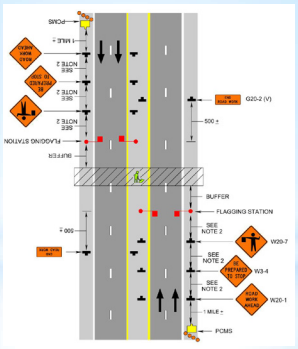
225

* 6. Intermittent Closure

- Involves stopping all traffic in both directions for a relatively short time to allow the work to proceed.
- After certain amount of time, driven by the traffic volume, the roadway is reopened.

226

* 6. Intermittent Closure



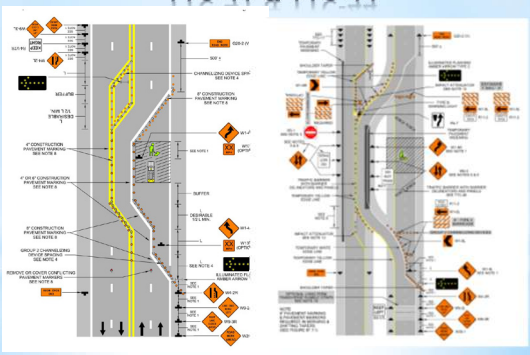
227

* 7. Crossover

- Routing the traffic from one direction onto a portion of the median and roadway of the opposing traffic.
- May also incorporate lane constrictions.
- On higher speed roadways, Traffic barrier Service Concrete (TBSC) is used to separate the two directions of traffic.

228

* 7. Crossover TTC-41 & TTC-44



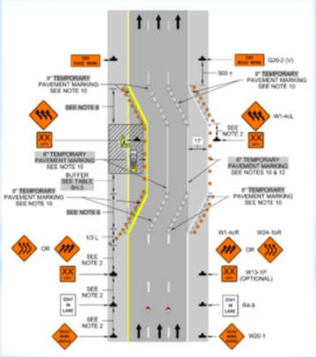
229

* 8. Shoulder Use

- The traffic lanes are routed onto the shoulder
- The structural capacity of the shoulder must first be analyzed to determine its ability to carry the proposed traffic.

230

* 8. Shoulder Use TTC-40



231

Three Types of Work Zones

* The type of temporary traffic control is determined by:

1. Duration of Work
2. Location of Work
3. Type of Roadway

Module 6 - AWZTCT

232

* Five Categories of Work Duration

- Long-term Stationary: This is an activity that occupies a location more than 3 consecutive days.
- Intermediate-term Stationary: This is an activity that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than *1 hour*.
- Short-term Stationary: This is a daytime activity that occupies a location for more than 1 hour, but less than 12 hours.

233

* Five Categories of Work Duration

- Short duration: This is an activity that occupies a location from *15 minutes up to 1 hour.*
- Mobile: This is an activity that moves intermittently (*0-15 minutes*) or continuously.

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234

* Five Categories of Work Duration

Nearly all work zones start out as a mobile operation while installing the TCD's

Module 6 - AWZTCT

235

* Five Locations of Work Activity

- Outside the Shoulder - Traffic control may be minimal and consist of a general warning only.
- On the Shoulder - Motorists must be warned that work is near moving traffic, and the shoulder may not be available for emergency use.
- On the Shoulder with minor encroachment - Traffic control encroaching upon the open travel lane must provide a minimum 11' lane width or 10' lane width on low volume roadways.

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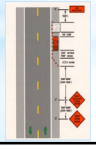
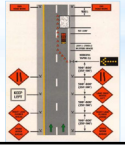
236

* Five Locations of Work Activity

- *In the Median of a Divided Highway* - Traffic control in both directions should be used and protection for workers may be necessary.
- *On the Traveled Way* - Optimum protection of workers and maximum advance warning for drivers is essential.





237

* Types of Roadways

- Limited Access Highway – High speed, high traffic volume roadway, usually with multiple travel lanes and peak travel periods.
- Multilane Non-Limited Access Roadway – May or may not be divided. Multiple travel directions to contend with, as well as geometrics (hills and curves).
- Two-Lane Roadway – Traffic control must control the remaining lane, usually through flagging or temporary signals.

238

* Other Considerations

- Urban Street – Low speed, high traffic volume during morning/evening peak travel periods, many entrances and business. Pedestrian traffic control may be required.
- Intersection – May or may not be signalized. Multiple travel directions to contend with requiring coordinated traffic control.
- Total Roadway Closure – Safest, quickest for performing work activities, requires approval, planning, and detour traffic control.

239

Advanced Work Zone Traffic Control Training
Design Considerations
April 2015

Module 7 - AWZTCT

240

* Temporary Traffic Control Design Strategies

- The basic scheme to handle traffic
- Each with advantages and disadvantages
- Its selection is a difficult task, particularly in large projects

241

* Topics in this

- Planning considerations
- Design considerations
- Intelligent Transportation Systems
- Enforcement strategies

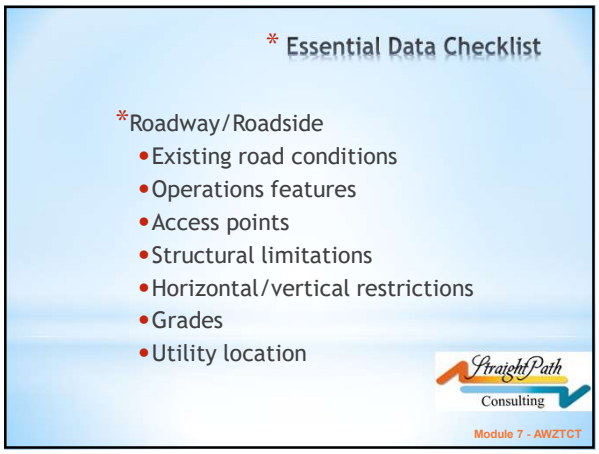
242

* Planning Considerations

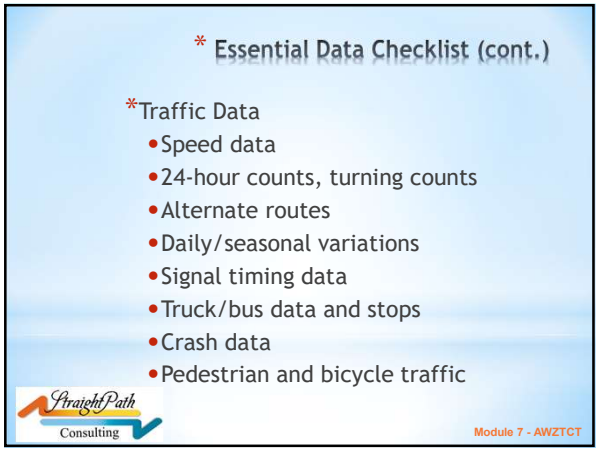
- Gather available data
- Assess roadway characteristics
- Identify all agencies that may have jurisdiction
- Coordinate with local officials

A COMPREHENSIVE TMP CHECKLIST CAN BE FOUND AT
http://www.virginiadot.org/business/trafficeng-WZS.asp

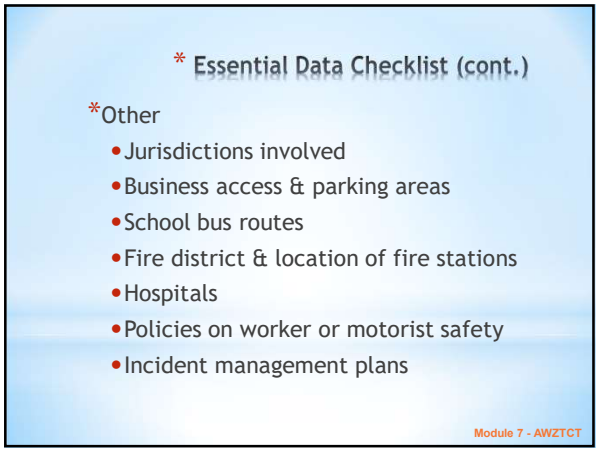
243


* Essential Data Checklist
*Roadway/Roadside
•Existing road conditions
•Operations features
•Access points
•Structural limitations
•Horizontal/vertical restrictions
•Grades
•Utility location
StraightPath Consulting
Module 7 - AWZTCT

244


* Essential Data Checklist (cont.)
*Traffic Data
•Speed data
•24-hour counts, turning counts
•Alternate routes
•Daily/seasonal variations
•Signal timing data
•Truck/bus data and stops
•Crash data
•Pedestrian and bicycle traffic
StraightPath Consulting
Module 7 - AWZTCT

245


* Essential Data Checklist (cont.)
*Other
•Jurisdictions involved
•Business access & parking areas
•School bus routes
•Fire district & location of fire stations
•Hospitals
•Policies on worker or motorist safety
•Incident management plans
Module 7 - AWZTCT

246

* Essential Data Checklist (cont.)

*Other (cont.)
- Possibility of inclement weather
- Start and end of construction season
- Holiday and recreational activities
- Environmental impacts
- Public/Property owners concerns
- Wetlands
- Archeological studies
- Special Events

247

* Other Factors Design: How to Best Control Traffic

*Based upon:

- Traffic factors
- Duration of work
- Location of work
- Type of work
- Other factors
  - Channelizing devices/Barriers
  - ITS
  - Law Enforcement

248

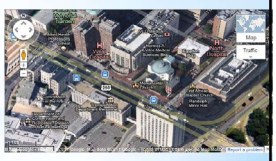
* Traffic Factors

- Traffic volumes
- Traffic characteristics
- Traffic controls
- Urban features
  - -Driveways
  - -Parking
  - -Pedestrians
  - -Bicycles
  - -Etc.

249

* Traffic Factors

* Traffic generators
  - Tourist attractions
  - Residences
  - Retirement homes – senior citizens
  - Schools
  - Shopping
  - Business
  - Industry
  - Medical Facilities
  - Cultural and sporting events



250

* Location Factors

- Type of road
- Traffic conditions
- The closer the work is to users, the greater the number of TTC devices needed

251

* Use of Barrier/Channelizing Devices

Because barrier itself is a hazard; prior to including positive protection in a traffic control plan (TCP), careful consideration must be given to alternatives which would avoid or minimize exposure for workers and road users.

252

Barrier/Channelizing Devices

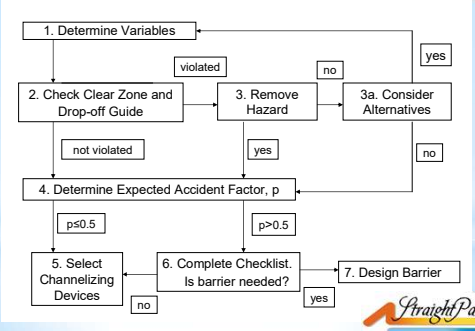
Strategies to avoid barrier use:

- **Removal of the hazard**
- **Scheduling or sequencing phases of work**
- **Full road closure/ramp closure with traffic detoured**
- **Designing a road or lane closure with onsite diversion**
- **Closing additional travel lanes to perform certain activities**
- **Performing work during non-peak travel periods**
- **Using a slope wedge in lieu of open trenching**

Module 7 - AWZTCT

253

Channelizing Device/Barrier Selection Process



254

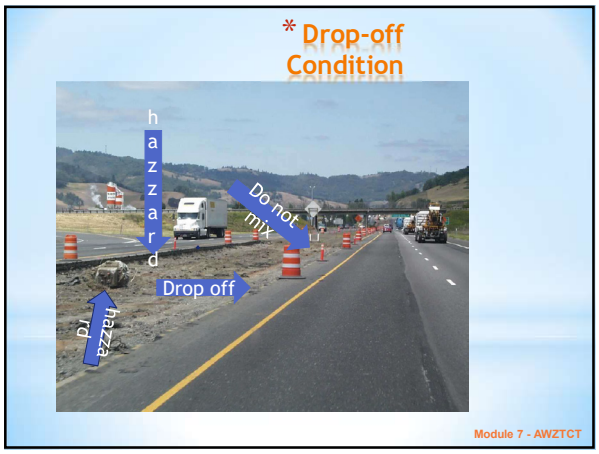
Drop-off Definition

*A drop-in elevation, parallel to the adjacent travel lanes, with slopes steeper than 4:1.

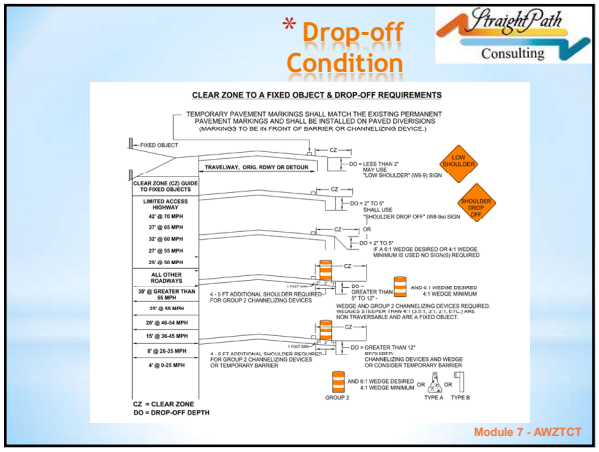
*"NON RECOVERABLE"

*If drop-off occurs within the clear zone due to construction and maintenance, warning signs, wedges, and/or protection devices are required!

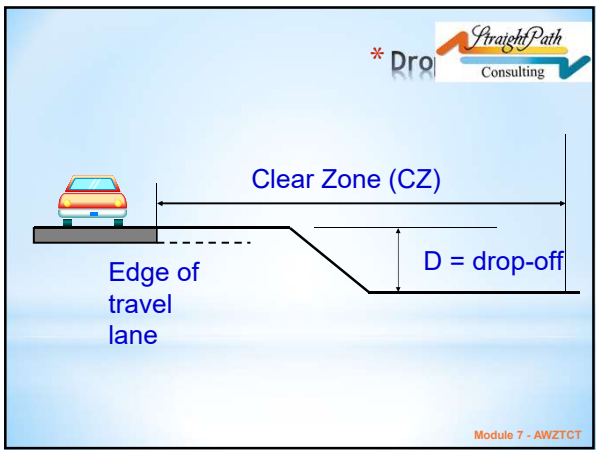
255


* Drop-off Condition
hazard
Do not mix
Drop off
hazard
Module 7 - AWZTCT

256


* Drop-off Condition
Straight Path Consulting
CLEAR ZONE TO A FIXED OBJECT & DROP-OFF REQUIREMENTS
Module 7 - AWZTCT

257


* Dro
Straight Path Consulting
Clear Zone (CZ)
Edge of travel lane
D = drop-off
Module 7 - AWZTCT

258

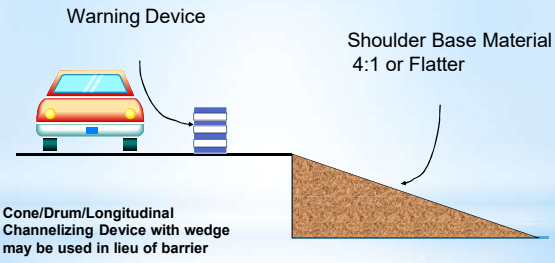
* Shoulder Treatment

* Contractor may use shoulder treatment in lieu of barrier

* Warning devices are required

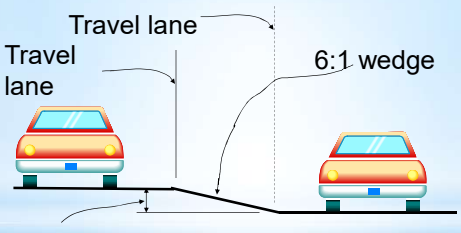
259

* Shoulder Treatment



260

* Travel Lane Treatment for Resurfacing



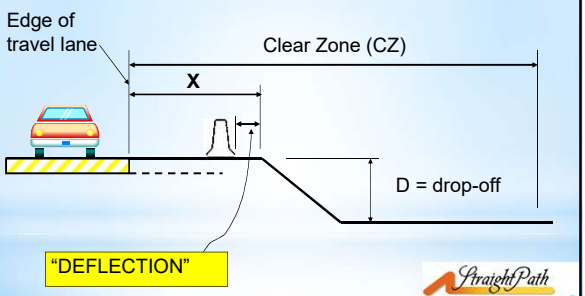
261

* Drop-off

*A drop-off condition created and restored within the same work period is usually not subject to the use of barriers, however, warning devices are required.

262

* Drop-offs in Work Zones



263

* Determining Expected Accident Factor "p"

Step 4 in the Channelizing Device/Barrier Selection Process Flow Chart

Example:

Rural Primary highway – 1 lane each direction
ADT=10,000 (for both directions)
Length Of Construction (L) area = 0.5 miles
Construction duration (T): .4 year
55 MPH Work Zone Speed Limit

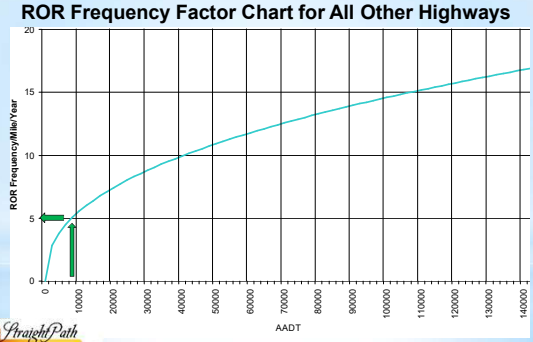
1. **From ROR frequency factor chart, ADT 10,000 indicates about a 5 ROR encroachments/mile/year (f)**
2. **Expected Accident Frequency Factor:**

p = f x L x T
5 x 0.5 x 0.4 = 1.0
Accident Frequency Factor greater than 0.5, proceed to Table 1, Barrier-Channelizing Device chart.

264

* ROR Frequency Factor Charts

ROR Frequency Factor Chart for All Other Highways



Module 7 - AWZTCT

265

* Selecting Barriers, Barricades and Channelizing Devices

Channelizing Device - Barrier Chart

Existing Traffic ADT	Posted Speed Limit (mph)				
	0-25	26-35	36-45	46-54	55*
0-750	1,2	1,2	1,2	1,2	1,2 B
751-5500	1,2	1,2	1,2 B	B	B A
5501-15000	1,2	1,2 B	B	B A	A
Above 15000	1,2	1,2	B	A	A

LESS POSITIVE

MORE POSITIVE

A more positive type of barrier can be substituted for values shown.

266

* Acceptable Warning (Channelizing) Devices

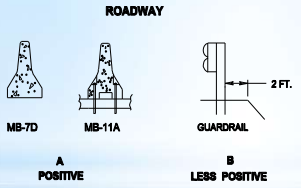
GROUP 1
TUBULAR MARKER & CONE

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

Module 7 - AWZTCT

267

* Acceptable Barriers



268

* Work Zone Channelization/Barrier Analysis (Checklist)

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

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

SECTION B – ENGINEERING INVESTIGATION RESULTS

Reviewer(s): Channelization/Barrier Device Selected (Check all that apply): Cones Drums Temporary Asphalt Median Guardrail Traffic Barrier Service Concrete	
Decision Justification (What was decided and why):	
	(Office) (Office Location) (Title)

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

269

* Use of Intelligent Transportation Systems (ITS) in Work Zones

*An applicable strategy to:

- Manage the work zone traffic in real-time
- Informs motorists of work zone activities to avoid delays by utilizing alternate routes
- Provides guidance and creates safer operation for the motorists and workers

270

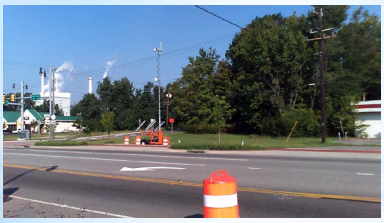
* Use of Intelligent Transportation Systems (ITS) in Work Zones

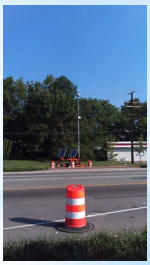
*Triggers to use ITS:

- Long duration projects
- Presence of or proposed ITS deployment
- High expectations of long delays/queues
- Existing and potential high incident (crash) locations

271

* Use of Intelligent Transportation Systems (ITS) in Work Zones





272

* Regulatory Traffic Control Strategies

- Strategies that rely on regulatory signing with law enforcement.
- The messages conveyed on regulatory signs can be enforced
- Refer to IIM-LD-93 and agreement with the Virginia State Police.

273

* Use of State Police in Work Zones

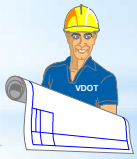
- Enforcement
- Speed control

StraightPath Consulting

274

* Use Of Virginia State Police In Work Zones

- Guidelines for the effective use of the VSP in work zones have been developed
- Provide VSP as much advance notice as possible.
- Establish open communication

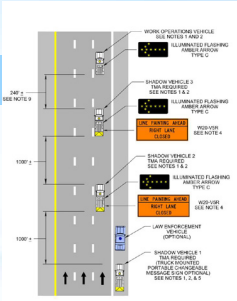


StraightPath Consulting

275

* The Trooper's Location:

- The police vehicle should not block an open travel lane unless protected by a TMA.
- In closed lane 500'-1000' in advance or first crew for free flowing traffic
- On the shoulder, in advance of backup for traffic queues
- On shoulder 500'-800' in advance of operation for mobile operations



Module 7 - AWZTCT

276

* Procedures for Using VSP In Work Zones

*For law enforcement to be effective, Designers need to provide a safe area to cite violators outside of the lane closure to avoid interference with construction activities.

277

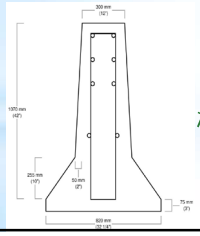
* Typical Conditions for Reducing the Speed Limit in a Work Zone

- Reduced stopping sight distance
- Proximity to traffic barriers
- Severe roadway geometrics
- Extremely narrow lanes

A reduction in the speed limit can *only* be made upon the completion of an engineering study and with the approval of the Regional Traffic Engineer!

278

Page A4 – barrier
ADT x exposure x length



A16 – barrier transition flair rate
TTC -7

279

* Advanced Work Zone Traffic Control Training Traffic Control Devices

September 2019


Module 8 - AWZTCT

280

* Traffic Control Devices

Purpose of Traffic Control Devices (TCD's):

Ensure highway safety by providing for the ***orderly*** and ***predictable*** movement of traffic and provide the ***guidance*** and ***warning*** necessary for road users to get through the work zone safely.



Module 8 - AWZTCT

281

* Traffic Control Devices

To be effective, all traffic control devices should meet the following 5 Basic Requirements:

1. Fulfill a need
2. Command attention
3. Convey a clear, simple meaning
4. Command respect
5. Give adequate time for response

remember

282

*Portable Changeable Message Signs

283

Typical application to use a PCMS:

1. Speed expected to drop substantially
2. Significant queuing and delays are expected
3. Adverse environment conditions are present
4. Changes in alignment or surface conditions
5. Advance notice of ramp, lane or road closure
6. Crash or incident management
7. Changes in road user pattern

* PCMS

284

The PCMS message :

- No more than
  - Two phases (two screens displayed) 2 – 4 seconds per screen
  - 3 lines of text
- Each screen understood by itself
- Message centered
- Messages specific to the type of traffic control are published in Appendix D

* PCMS

285

* PCMS

The PCMS message should brief and convey:

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

286

* Does PCMS Use Meet Guidelines?

*PCMS's shall

- displace only traffic operational, regulatory, warning and guidance information
- be used as a supplement to and not a replacement for static signs and pavement markings.

287

* PCMS Messages

Table D-1, Portable Changeable Messages for Temporary Traffic Control Applications[1]

TTC Number	PHASE 1	PHASE 2	PHASE 3 or Additional PCMS may be used
Example	Line 1 / Line 2 / Line 3	Line 1 / Line 2 / Line 3	Line 1 / Line 2 / Line 3
TTC-1	RIGHT / SHOULDER / WORK		
TTC-2	FLAGGER / AHEAD	PREPARE / TO / STOP	
TTC-3	SLOW / MOVING / WORK	RIGHT / SHOULDER / CLOSED	
TTC-4	RIGHT / SHOULDER / CLOSED		
TTC-5	RIGHT / SHOULDER / CLOSED	RIGHT / LANE / NARROWS	
TTC-6	RIGHT / SHOULDER / CLOSED		
	*RIGHT / SHOULDER / CLOSED	TRUCKS / USE / RT LANE	
TTC-7	LANE(S) / SHIFT / RIGHT	RIGHT / SHOULDER / CLOSED	
	*LANE(S) / SHIFT / RIGHT	TRUCKS / USE / RT LANE	
TTC-8	BOTH / SHOULDER / CLOSED	RIGHT / PULL OFF / AHEAD	
	*BOTH / SHOULDER / CLOSED	TRUCKS / USE / RT LANE	
TTC-9	SLOW / MOVING / WORK	PREPARE / TO / STOP	
TTC-10	LFT LANE / CLOSED / AHEAD	SLOW / MOVING / WORK	
TTC-11	RT LANE / CLOSED / AHEAD	SLOW / MOVING / WORK	
TTC-12	2 RT LANE / CLOSED / AHEAD	SLOW / MOVING / WORK	
TTC-13	RT LANE / CLOSED / AHEAD	SLOW / MOVING / WORK	
TTC-14	SLOW / MOVING / WORK	DO / NOT / PASS	
	*SLOW / MOVING / WORK	PREPARE / TO / STOP	DO / NOT / PASS
TTC-15	LEFT / LANE / CLOSED	MERGE / INTO / RT LANE	
	*HEAVY / TRAFFIC / AHEAD	EXPECT / DELAYS	
	*HEAVY / TRAFFIC / AHEAD	PREPARE / TO / STOP	
TTC-16	RIGHT / LANE / CLOSED	MERGE / INTO / LFT LANE	
	*RT LANE / CLOSED / MM123	MERGE / INTO / LFT LANE	
	*HEAVY / TRAFFIC / AHEAD	EXPECT / DELAYS	
	*HEAVY / TRAFFIC / AHEAD	PREPARE / TO / STOP	
TTC-17	LEFT / LANE / CLOSED	MERGE / INTO / RT LANE	
	*LFT LANE / CLOSED / MM123	MERGE / INTO / RT LANE	
	*HEAVY / TRAFFIC / AHEAD	EXPECT / DELAYS	
	*HEAVY / TRAFFIC / AHEAD	PREPARE / TO / STOP	
TTC-18	2 LEFT / LANES / CLOSED	MERGE / INTO / RT LANE	
	*2 LFT LN / CLOSED / MM 123	MERGE / INTO / RT LANE	
	*HEAVY / TRAFFIC / AHEAD	EXPECT / DELAYS	
	*HEAVY / TRAFFIC / AHEAD	PREPARE / TO / STOP	
TTC-19	LEFT / LANE / CLOSED	MERGE / INTO / RT LANE	
	*LFT LANE / CLOSED / MM 123	MERGE / INTO / RT LANE	
	*HEAVY / TRAFFIC / AHEAD	EXPECT / DELAYS	
	*HEAVY / TRAFFIC / AHEAD	PREPARE / TO / STOP	

* Optional PCMS messages or additional PCMS(s) based on field conditions and work zone signage.

Table D-2, Portable Changeable Messages for Advance Closures or Road Work[1]

?? ST / CLOSED / 7/1-8/31
RT 50 / CLOSED / MON-FRI
EXIT 123 / CLOSED / JUL14-18
RD WORK / CLOSED / MON-FRI

Table D-3, Unacceptable Portable Changeable Messages[1]

BEAWARE, BEWARE
BE ALERT (any form or combination of BE ALERT messages)
CARE (any form or combination of CARE messages)
USE CARE
CAUTION (any form or combination of CAUTION messages)
USE CAUTION
NOTICE (messages)
WARNING, WARN (any form or combination of WARN messages)

Table D-4,[1] Abbreviations That Shall be Used Only on Portable Changeable Messages Signs

Work Message	Standard Abbreviation	Prompt Word That Should Precede the Abbreviation	Prompt Word That Should Follow the Abbreviation
Access	ACCS	—	Road
Ahead	AHD	Fog	—
Blocked	BLKD	Lane	—
Bridge	BR*	(Name)	—
Cannot	CANT	—	—
Center	CNTR	—	LANE
Chemical	CHEM	—	SPILL
Condition	COND	Traffic	—
Congestion	CONG	Traffic	—
Construction	CONST	—	Ahead
Crossing	XING	—	—
Do Not	DONT	—	—
Downtown	DWNTN	—	Traffic
Eastbound	E-BND	—	—
Emergency	EMER	—	—
Entrance, Enter	ENT	—	—
Exit	EX	Next	—
Express	EXP	—	Lane

Module 8 - AWZTCT

288

* PCMS Placement

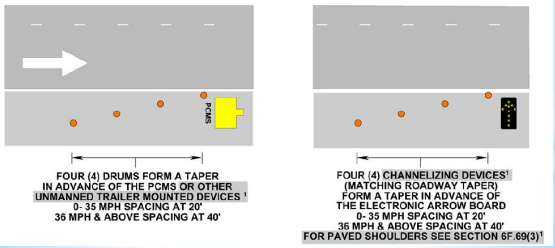
If multiple PCMS's are required, they should be separated a minimum of *1000'.*

289

* PCMS & Arrow Board Delineatio

Page 6F-49

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



290

*Traffic Control Device

291

* Traffic Control Device - Signs

Signs provide a good deal of information to motorists through their:

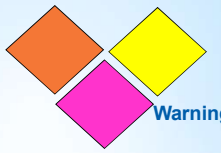
- Colors
- Shapes
- Words
- Symbols

Module 8 - AWZTCT

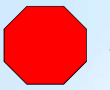
292

Traffic Control Device - Signs

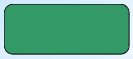
Sign shapes:



Warning Signs



STOP Sign



Guide Signs

Regulatory Signs

YIELD Sign

Warning Signs

Module 8 - AWZTCT

293

Traffic Control Device - Signs

Sign shapes:

Railroad Sign

Warning Signs

Grade Crossing

School

School
Pedestrian
Bicycle

Module 8 - AWZTCT

294

Traffic Control Device - Signs

Classification of Signs:

- Regulatory
- Warning
  - Construction
  - Incident Management
- Guide
  - Recreational and Cultural Interest Areas

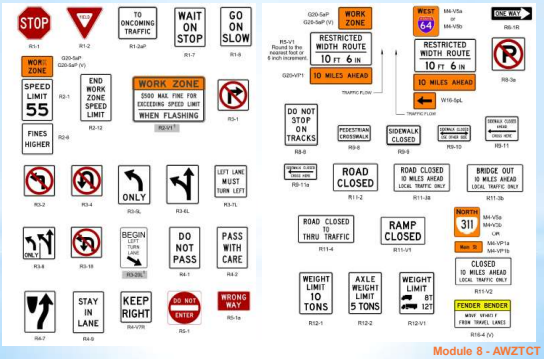
295

Regulatory Signs

- Traffic Laws and regulations
- Must be authorized by proper authority (Regional Traffic Engineer or the jurisdiction's responsible charge)
- Design Colors: Black & White, Red & White

296

Regulatory Signs



297

Guide Signs

- Give road users information that will help them in the most simple, direct manner possible.
- Examples: Route destinations, destinations , direction, distances, services, points of interest or other geographical, recreational or cultural info.
- Design: Rectangular, white on green, or black on orange.

298

Guide Signs

299

Warning Signs Are Used To:

WARN

ADVISE

DIRECT

300

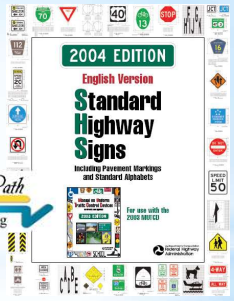
TCD – Warning Signs

- Used to warn of general or specific conditions on or near the road.
- Placed in advance of the warning.
- Design: Diamond shape, Black on Yellow or Black on Orange, Black on Fluorescent Pink, Black on Fluorescent Yellow-Green.


301

* Standard Highway Sign Manuals Fabrication Requirements

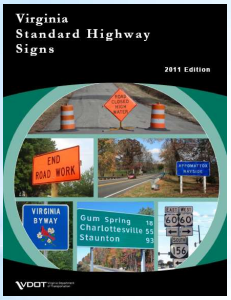
VA Standard Highway Signs



MUTCD
Standard Highway Signs

302

* Sign Book Provides Fabrication Requirements



VA Standard Highway Signs

303

* Why Fabrication Requirements?

Uniformity, Legible & Standardization

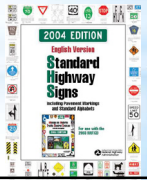
StraightPath Consulting

304

* New Signs

Signs not found in either of these two Manual:

- Shop drawings shall be submitted to the State Traffic Engineer
- VDOT – forwards to FHWA for approval
- Why? Uniformity



StraightPath Consulting

305

*Sign Characteristics & Table 6F-1 TTC Signs &

* Section 6F.02 General Characteristics of Signs
- Orange rows are VA specific signs
- Pink rows VA Incident Management signs
- White and grey rows MUTCD signs
- Example of VA sign designations; W21-V1
- Example of VA sign designation which modifies an MUTCD sign; W20-8 (V)

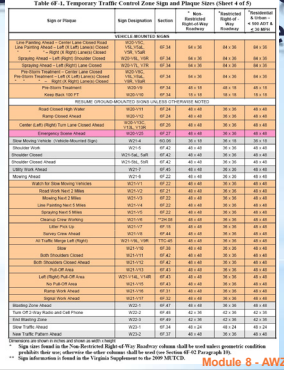


Table 6F-1, Temporary Traffic Control Zone Sign and Plaque Sizes (sheet 4 of 5)

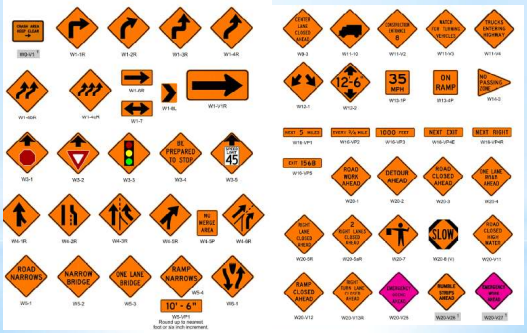
Sign or Plaque	Sign Designation	Section	* Non-Restricted Right-of-Way Roadway	*Restricted Right-of-Way Roadway	*Residential & Urban < 100 ADT & < 25 MPH
VEHICLE MOUNTED SIGNS					
Line Painting Ahead – Center Lane Closed Road Line Painting Ahead – Left (R Left) Lane(s) Closed *– Right (R Right) Lane(s) Closed	W20-7(V), V1L, V1aL, V1R, V1aR	6F.34	54 x 36	54 x 36	54 x 36
Spraying Ahead – Left (Right) Shoulder Closed	W20-V1L, V1R	6F.34	54 x 36	54 x 36	54 x 36
Spraying Ahead – Left (Right) Lane Closed	W20-V1, V1R	6F.34	54 x 36	54 x 36	54 x 36
Line Painting Ahead – Left (R Left) Lane(s) Closed Pre-Storm Treatment – Left (R Left) Lane(s) Closed *– Right (R Right) Lane(s) Closed	W20-7(V), V1L, V1aL, V1R, V1aR	6F.34	54 x 36	54 x 36	54 x 36
Pre-Storm Treatment	W20-V6	6F.34	48 x 18	48 x 18	48 x 18
Knee Back 100 FT	W20-V6	6F.34	18 x 18	18 x 18	18 x 18
REGULAR GROUND-MOUNTED SIGNS UNLESS OTHERWISE NOTED					
Road Closed High Water	W20-V11	6F.24	48 x 48	36 x 36	48 x 48
Ramp Closed Ahead	W20-V12	6F.24	48 x 48	36 x 36	48 x 48
Center (Left) (Right) Turn Lane Closed Ahead	W20-V13(), W20-V14()	6F.25	48 x 48	36 x 36	48 x 48
Emergency Scene Ahead	W20-V20	6F.27	48 x 48	36 x 36	48 x 48
Slow Moving Vehicle (Vehicle-Mounted Sign)	W21-4	6G.05	36 x 18	36 x 18	36 x 18
Shoulder Work	W21-5	6F.42	48 x 48	36 x 36	48 x 48
Shoulder Closed	W21-5a(), 5aR	6F.42	48 x 48	36 x 36	48 x 48
Shoulder Closed Ahead	W21-5b(), 5bR	6F.42	48 x 48	36 x 36	48 x 48
Utility Work Ahead	W21-7	6F.45	48 x 48	36 x 36	48 x 48
Mowing Ahead	W21-8	6F.22	48 x 48	36 x 36	48 x 48
Watch for Slow Moving Vehicles	W21-11	6F.22	48 x 48	36 x 36	48 x 48
Road Work Next 2 Miles	W21-12	6F.22	48 x 48	36 x 36	48 x 48
Mowing Next 2 Miles	W21-12	6F.22	48 x 48	36 x 36	48 x 48
Line Painting Next 5 Miles	W21-14	6F.22	48 x 48	36 x 36	48 x 48
Spraying Next 5 Miles	W21-15	6F.22	48 x 48	36 x 36	48 x 48
Cleanup Crew Working	W21-16	**24.08	48 x 48	36 x 36	48 x 48
Litter Pick Up	W21-17	6F.16	48 x 48	36 x 36	48 x 48
Survey Crew Ahead	W21-18	6F.44	48 x 48	36 x 36	48 x 48
All Traffic Merge Left (Right)	W21-19L, 19R	TTC-46	48 x 48	36 x 36	48 x 48
Slow	W21-V10	6F.26	48 x 48	36 x 36	48 x 48
Both Shoulders Closed	W21-V11	6F.42	48 x 48	36 x 36	48 x 48
Both Shoulders Closed Ahead	W21-V12	6F.42	48 x 48	36 x 36	48 x 48
Pull-Off Area	W21-V13	6F.43	48 x 48	36 x 36	48 x 48
Left (Right) Pull-Off Area	W21-V14, V14R	6F.43	48 x 48	36 x 36	48 x 48
No Pull-Off Area	W21-V15	6F.43	48 x 48	36 x 36	48 x 48
Ramp Work Ahead	W21-V16	6F.33	48 x 48	36 x 36	48 x 48
Signal Work Ahead	W21-V17	6F.32	48 x 48	36 x 36	48 x 48
Blasting Zone Ahead	W22-1	6F.47	48 x 48	36 x 36	48 x 48
Turn Off 2-Way Radio and Cell Phone	W22-2	6F.48	42 x 36	42 x 36	42 x 36
End Blasting Zone	W22-3	6F.49	42 x 36	42 x 36	42 x 36
Slow Traffic Ahead	W22-1	6F.24	48 x 24	48 x 24	48 x 24
New Traffic Pattern Ahead	W23-2	6F.37	48 x 48	36 x 36	48 x 48

Dimensions are shown in inches and shown as width x height.
* Sign sizes found in the Non-Restricted Right-of-Way Roadway column shall be used unless geometric condition prohibits their use; otherwise the other columns shall be used (see Section 6F.02 Paragraph 10).
** Sign information is found in the Virginia Supplement to the 2009 MUTCD.

Module 8 - AWZTCT

306

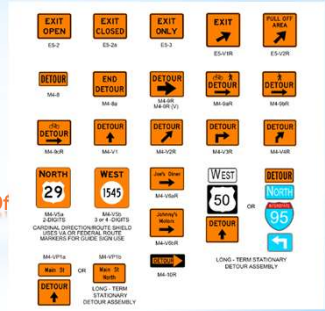
* TTC Device - Warning Signs



307

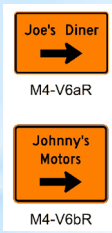
New:
Pull Off Area signs
VA Detour sign – larger
Route shield
Detour w/ route shields
Business signs

* Exit, Pull Of



308

Business Entrance Signs



- The Business Entrance (M4-V6a and M4-V6b) signs may be used in urban areas where the original entrance will be relocated for more than 3 months during construction
- The Business Entrance sign shall be used to identify the business entrance and shall not contain the business logo
- If the Business Entrance sign is attached to a Group 2 channelizing device, it shall be crashworthy

309

* Warning Signs

Sign layouts typically include some type of graphic sign to assist motorists in making maneuvers.

310

* Sign Sheeting Angularity

Signs must be as perpendicular to traffic as possible to reflect light back to the source (motorist).

311

* Required Sheeting for Signs

- Fluorescent Orange Prismatic (high observation angle) Lens Sheeting

Minimum Coefficient of Retroreflection R_A
(R_A =Candelas per foot-candle per square foot)

Observation Angle (°)	Entrance Angle (°)	Fluorescent Orange
0.2	–4	140
0.2	+30	90
0.2	+40	24
0.5	–4	90
0.5	+30	50
0.5	+40	15
1.0	–4	10
1.0	+30	5
1.0	+40	3

For rigid signs

312

* Minimum Sign Dimensions

- Unless restricted by right-of-way or pedestrians, the normal dimension for warning signs is *48" x 48"*.

Standard

Greater emphasis larger signs should be used

Right-of-way constraints 36" x 36" may be used

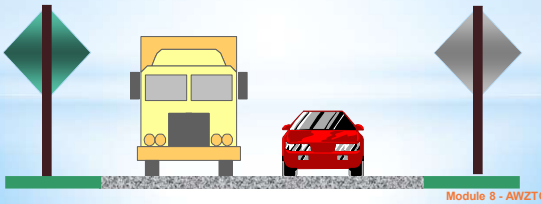
Straight Path Consulting

313

* Sign P

Straight Path Consulting

- Signs are generally placed on the right-hand side of the roadway.
- Divided roadways with a median of *8'* or greater require signs placed on both sides of the roadway.



Module 8 - AWZTCT

314

* Sign Placement

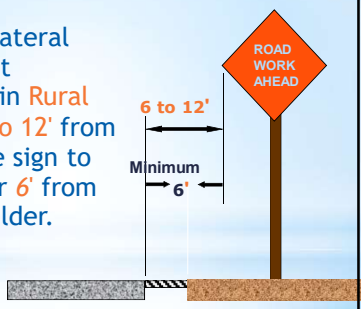
- Smaller signs may be used in the median to provide left sign assemblies on a multilane roadway

Module 8 - AWZTCT

315

* Sign Lateral Requirement

- The minimum lateral distance of post mounted signs in Rural locations is 6' to 12' from the edge of the sign to the roadway, or 6' from the paved shoulder.

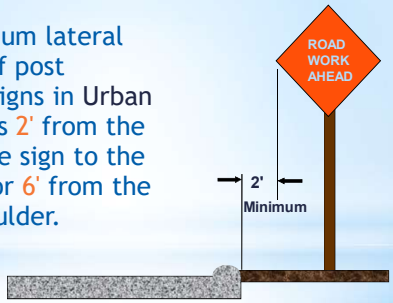


Module 8 - AWZTCT

316

* Sign Lateral Requirement

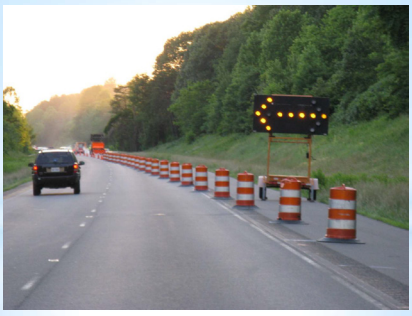
- The minimum lateral distance of post mounted signs in Urban locations is 2' from the edge of the sign to the roadway, or 6' from the paved shoulder.



Module 8 - AWZTCT

317

* Arrow Board



Module 8 - AWZTCT

318

* Arrow Board

*Our most effective traffic control device *when used correctly!*

319

Arrow Boards are used:

- in lane closure operations
- on shadow (protection) vehicles
- on vehicles in mobile operations

* Arrow Board

Module 8 - AWZTCT

320

* Arrow Board

- 1 arrow board shall be used for each travel lane closed.
- Four-corner caution mode
  - Shadow vehicle in advance of stationary work crew
  - Shoulder closures

321

* Arrow Board Specifications

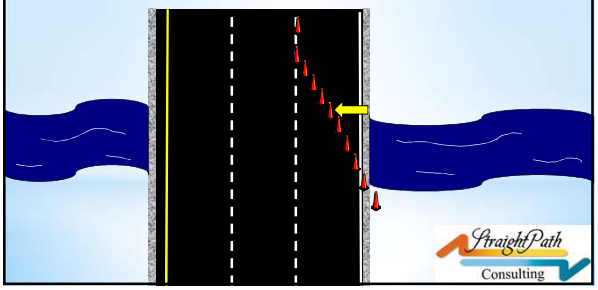
- Arrow Board should be located on the shoulder at the beginning of the merging taper

Module 8 - AWZTCT

322

* Arrow Board Proper Placement

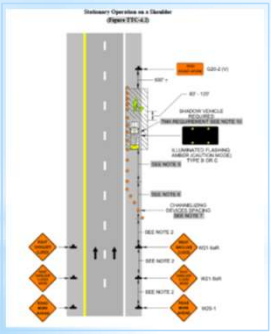
- For narrow shoulders, place inside taper
- close to the beginning of the taper as possible
- but behind the channelizing devices.

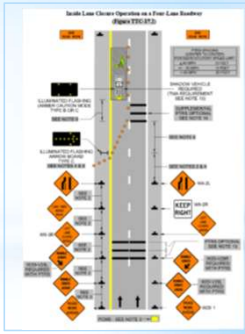


323

* Arrow Board Location

Verify TTC notes & layouts for requirements





Module 8 - AWZTCT

324

*Channelizing Devices

Module 8 - AWZTCT

325

* Channelizing Devices Serve To:

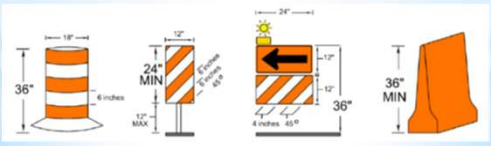
- Delineate work areas
- Protect workers
- Guide motorist & pedestrians safely
- Provide smooth & gradual traffic movement from one lane to another
- Reduce width of travel way

326

* Types of Channelizing Devices

* Group I - Tubular Marker & Cone

Group 2 – Drum, Vertical Panel, Directional Indicator Barricade, Longitudinal Channelizing Device



Module 8 - AWZTCT

327

* Types of Channelizing Device

*Cones & Tubular Markers

Used in manned WZ
Shall be retroreflective at night

Module 8 - AWZTCT

328

* Types of Channelizing Devices:

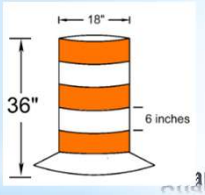
*Tubular markers should be used where space restrictions.

- Less visible
- Should be stabilized
  - Use weighted bases
  - Sandbag rings

Module 8 - AWZTCT

329

Drums



- Taper on Limited Access highway at night
- Unmanned work zones
- Delineates hazards
- Fluorescent 6" alternating stripes
- Close top

330

Vertical Panel

RTE approval required for Vertical Panel use.

Vertical panels are typically used:

- when space is limited
- to divide opposing lanes
- to replace barricades

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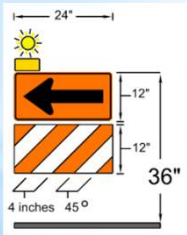
331

* Channelizing Devices: Group 2

Direction Indicator Barricade



- Crashworthy
- Shall consist of a One-Direction Large Arrow sign mounted above a fluorescent 4" alternating orange & white stripe rail.
- Specific directional guidance
- May replace drums in tapers on Limited Access Highways

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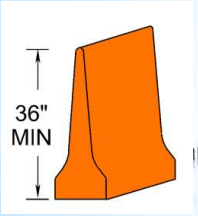
332

Longitudinal Channelizing Device



- Used for pedestrian guidance or to channelize vehicular traffic at night,
- Shall be interlocked and supplemented with retroreflective material or delineation for
- Shall interlock to delineate or channelize pedestrians

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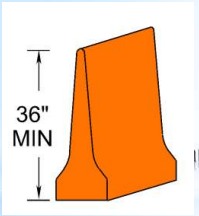
333

Longitudinal Channelizing Device



- Channelizing device not a traffic barrier
- May be used instead of cones, drums, & barricades
- May be hollow or filled with water as ballast
- Must be crashworthy

Channelizing Devices: Group 2

Module 8 - AWZTCT

334

* Type 3 B

- Type 3 Barricades shall be crashworthy; NCHRP-350 or MASH approved
- Used to close or partially close a road.
- Used to closed construction entrances.

Module 8 - AWZTCT

335

Crashworthy Design

Module 8 - AWZTCT

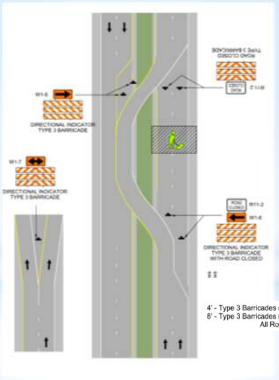
336

* Type 3 Barricades

- Signs shall not cover more than the top rail
- Signs shall not affect crashworthiness.

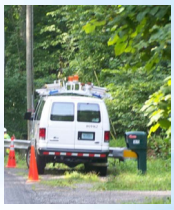
337

* Figure 6F-8, Type 3 Barricade Placement Guidelines



338

*Shadow Vehicles



339

- A vehicle used to protect workers or work equipment from errant vehicle
- Equipped with flashing arrow, CMS or vehicle warning lights
- Parked 80 – 120 feet in advance of the first work crew
- Shadow vehicle may be equipped with TMA or TMA trailer

* Shadow

340

* Shadow Vehicle with a

The TMA shall be used:

- When closing a lane on a four or more lane roadway with a posted speed of 45 mph or greater
- On shoulders, ramps and loops of interstate and Limited Access highways

341

* Shadow Vehicle with a TMA

A TMA shall not be used to protect a fixed object

342

Nighttime Illumination:
- Flagger Stations
- Work areas
- Equipment
- Equipment crossings

Negative impact – glare

* Floodlights
  - After installation conduct a drive through in all directions to ensure lights are not blinding motorists

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343

- Air-filled lights should be considered if light glare cannot be eliminated
- Conversion units are available for light towers

* Eliminate Floodlight Glare

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344

* Traffic Barriers

Module 8 - AWZTCT

345

* Traffic Barrier Service

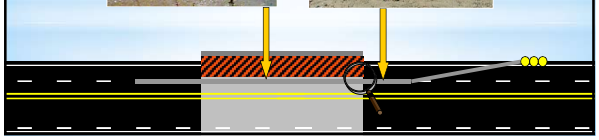
The 4 primary functions of temporary traffic barriers are:

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

346

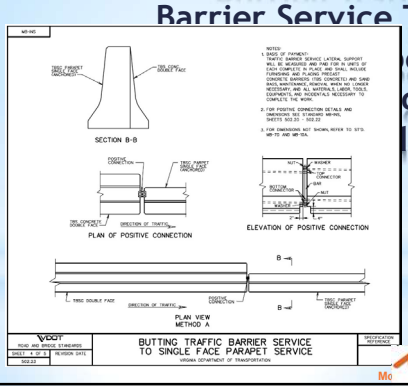
* Matching Different Barrier Types

A Lateral Support – "Method B" is used to match different types of barriers.

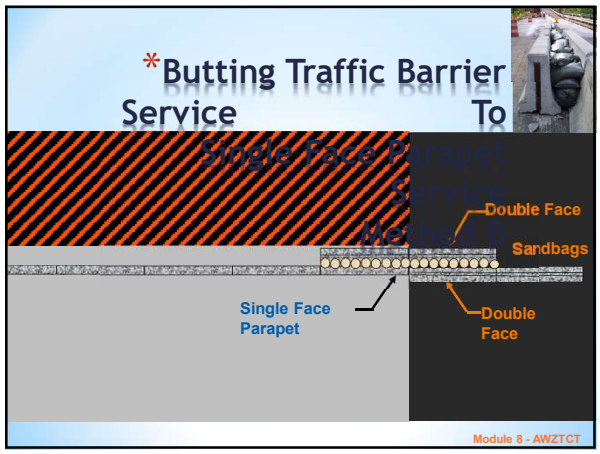


347

*Butting Traffic Barrier Service To



348



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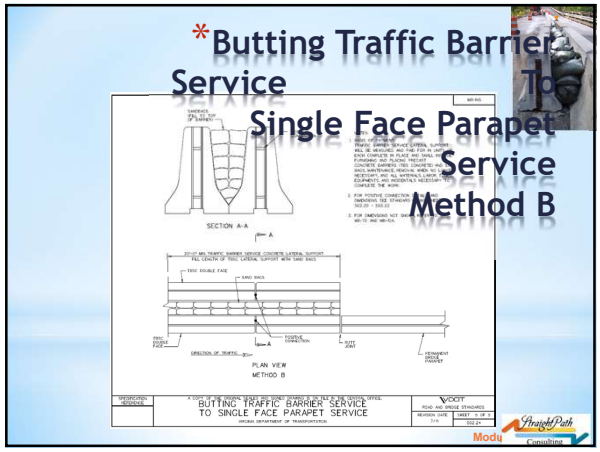
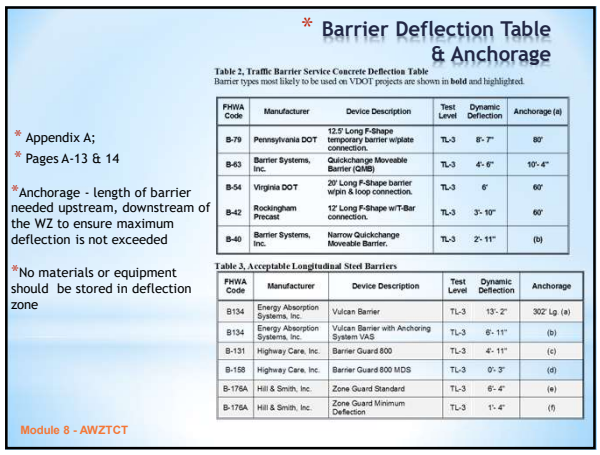


350

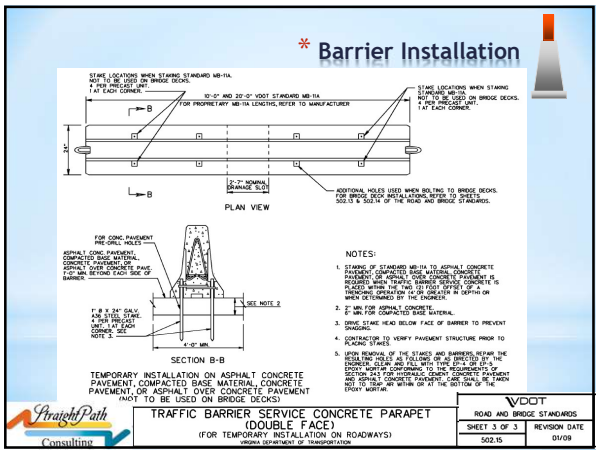


FHWA Code	Manufacturer	Device Description	Test Level	Dynamic Deflection	Anchorage (a)
B-79	Pennsylvania DOT	12.5' Long F-Shape temporary barrier w/plate connection.	TL-3	8'- 7"	80'
B-63	Barrier Systems, Inc.	Quickchange Moveable Barrier (QMB)	TL-3	4'- 6"	10'- 4"
B-54	Virginia DOT	20' Long F-Shape barrier w/pin & loop connection.	TL-3	6'	60'
B-42	Rockingham Precast	12' Long F-Shape w/T-Bar connection.	TL-3	3'- 10"	60'
B-40	Barrier Systems, Inc.	Narrow Quickchange Moveable Barrier.	TL-3	2'- 11"	(b)

FHWA Code	Manufacturer	Device Description	Test Level	Dynamic Deflection	Anchorage
B134	Energy Absorption Systems, Inc.	Vulcan Barrier	TL-3	13'- 2"	302' Lg. (a)
B134	Energy Absorption Systems, Inc.	Vulcan Barrier with Anchoring System VAS	TL-3	6'- 11"	(b)
B-131	Highway Care, Inc.	Barrier Guard 800	TL-3	4'- 11"	(c)
B-158	Highway Care, Inc.	Barrier Guard 800 MDS	TL-3	0'- 3"	(d)
B-176A	Hill & Smith, Inc.	Zone Guard Standard	TL-3	6'- 4"	(e)
B-176A	Hill & Smith, Inc.	Zone Guard Minimum Deflection	TL-3	1'- 4"	(f)

351

* Barrier Installation



352

* Barrier Installation

Page A-16 & TTC-7

BARRIER TRANSITION FLARE RATE

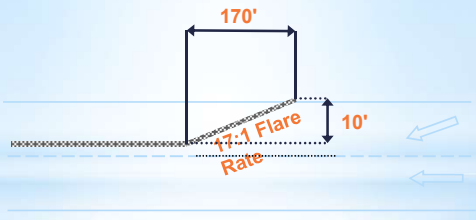
70 MPH	=	22:1
65 MPH	=	20:1
60 MPH	=	19:1
55 MPH	=	17:1
50 MPH	=	16:1
45 MPH	=	14:1
40 MPH	=	13:1
35 MPH	=	11.1
30 MPH & BELOW	=	10:1

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

353

* Barrier Installation

*Barrier Transitions Flare Rate; Appendix A Page A-16



354

* Barrier Installation

*Blunt End Protection:

- Attach to GR w/Fixed Object Attachment
- Bury into a cut slope
- Extend barrier out of the Clear Zone
- Protect with Impact Attenuator

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355

* Blunt End Protection

* Approved end treatments
  - Three types of attenuators
  - L&D Standards/Special Design approval required
* Ornadge

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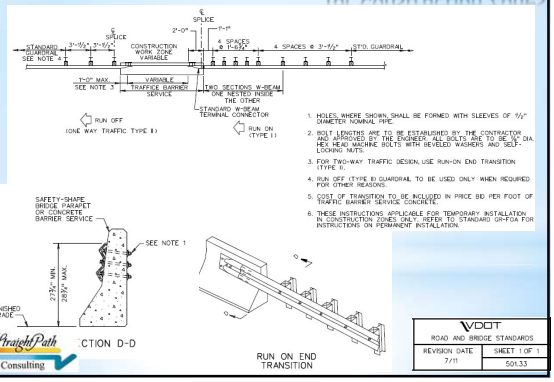
356

* FOA attachment for Construction Zones



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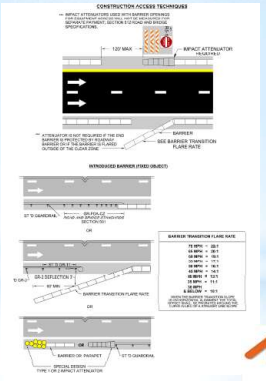
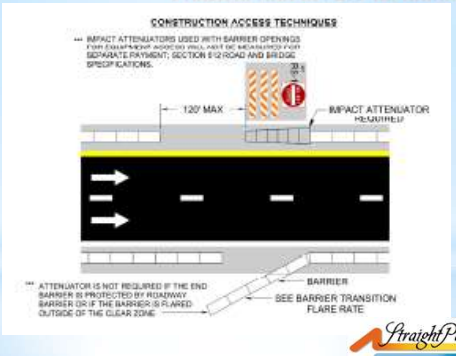
* Introduced Barrier (Fixed Object)



358

* Barrier
Construction Access Techniques



359

* Barrier Deflection

- Movable Barrier has the least amount of barrier deflection when struck.

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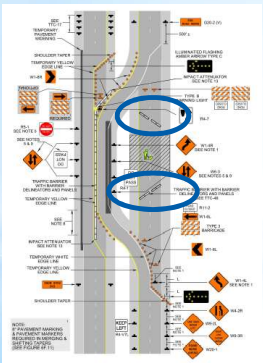
360

* Barrier for Road Closure

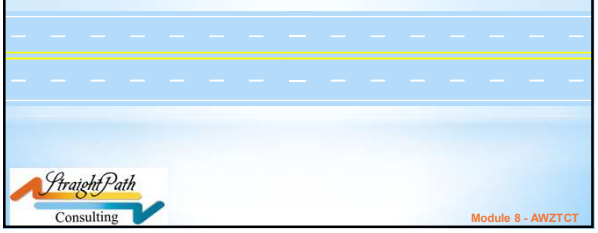


Barrier required when on long term road closures:

- when a grade differential of one foot or greater
- Barrier placed at 45° angle to the travel way
- Placed behind Type 3 Barricade but before the work space
- Placed to allow equipment access to WZ .

361

*Eradication and Temporary Pavement Markings & Markers



362

* Pavement Marking & Eradication

- Pavement Markings and markers are the primary source of delineation for motorist at night.
- Lack of markings, or improper eradication of existing markings, are one of the areas most sited in work zone litigation.
- The following questions should be asked for every construction project . . .

363

* Pavement Marking Eradication

- Are all conflicting pavement markings removed?

364

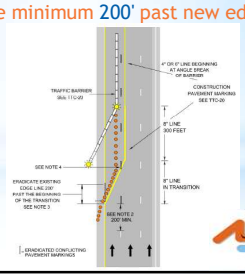
* Pavement Marking Eradication

- Tapers and lane shifts are most important
- 100% removal required.

365

* Pavement Marking & Eradication

- *TTC-55
- *Eradication of Pavement Markings in a Work Zone
  - All skip lines a minimum of 200' in advance of taper.
  - Existing edge line minimum 200' past new edge line.



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* Pavement Marking & Eradication

*TTC-55

*Eradication of Pavement Markings in a Work Zone

- For lane shifts, all skip lines not delineated by Group II's within 6' of new edge line.
- Remove reflective element from markers conflicting with new markings.

Module 8 - AWZTCT

367

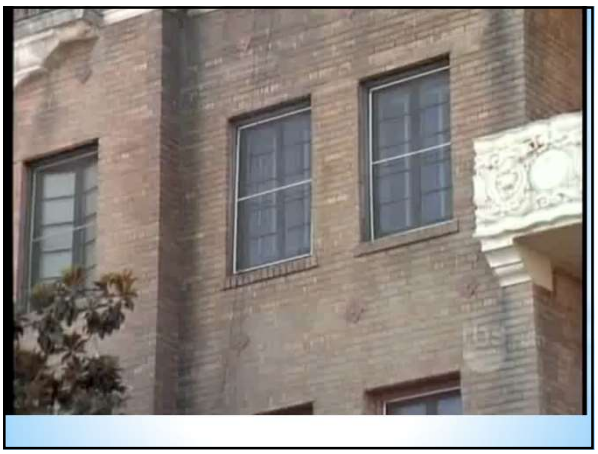
* Pavement Marking Eradication

*Type E – Non-reflective removable black construction pavement marking

- shall be applied in accordance with the manufacturer's recommendations
- Suggest to be used no longer than 120 days

Module 8 - AWZTCT

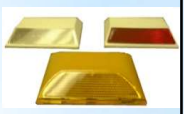
368



369

* Construction Pavement Markers

- Shall be installed with hot-applied bitumen adhesive
- Epoxy may be used on hydraulic cement concrete roadway & not final surfaces of asphalt concrete.



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* Construction Pavement Markers

Installed on:

- **20' centers in lane shift in Transition Area**
- **40' centers in all other areas**

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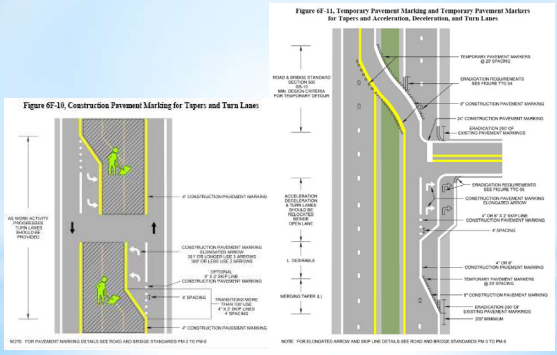
371

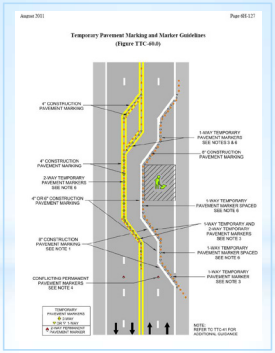
* New Figures - Markings & Markers



Module 8 - AWZTCT

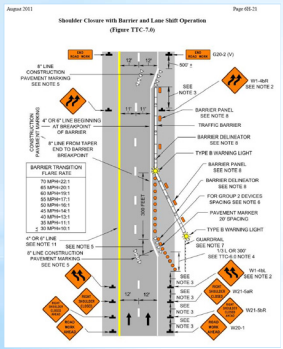
372

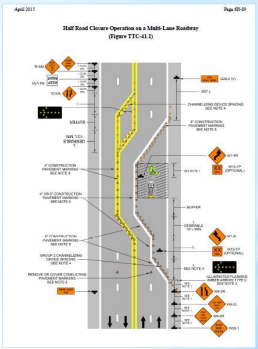
* Figures With Markings & Markers



373

* Figures With Markings & Markers





374

Advanced Work Zone Traffic Control Training
Traffic Control Plans

April 2015

ROAD WORK AHEAD

375

* What is a Traffic Control Plan?

- Based on a Transportation Management Plan (TMP)
- A plan that details the traffic control for a specific project
- Consistent with the complexity of the project
- Adjusted to field condition

The TCP is the culmination of everything we have learned in this course!

376

* Transportation Management Plan Require

IIM-LD-241/TED-351

Work Zone Safety and Mobility

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

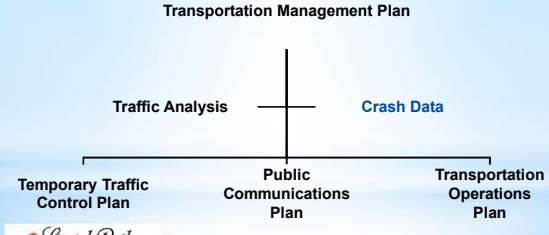
INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: WORK ZONE SAFETY AND MOBILITY	NUMBER: IIM-LD-241.5 TED-351.3
SPECIFIC SUBJECT: TRANSPORTATION MANAGEMENT PLAN REQUIREMENTS	DATE: SEPTEMBER 19, 2011
	SUPERSEDES: IIM-LD-241.4 TED-351.2
LOCATION AND DESIGN DIVISION APPROVAL: Mohammad Mirshahi, P.E. State Location and Design Engineer Approved September 19, 2011	TRAFFIC ENGINEERING DIVISION APPROVAL: Raymond J. Khoury, P.E. State Traffic Engineer Approved August 10, 2011

Module 9 - AWZTCT

377

* What is a Project Level Transportation Management Plan?



Module 9 - AWZTCT

378

*Transportation Management Plan Requirements

IIM-LD-241/TED-351
Work Zone Safety and Mobility Provides Guidance on:

- Effective on all work zone activities within state right of way and on all streets and highways that have been accepted into the State Highway Systems.
- Temporary Traffic Control, Public Information, and Traffic Operations strategies for managing work zone impacts to traffic.
- Roles and responsibilities for project teams in developing TMPs during the preliminary engineering and construction phases of a project.
- Categorizes projects based on the complexity of the construction.

379

*Transportation Management Plan Requirements

IIM-LD-241/TED-351
Work Zone Safety and Mobility

Three Categories of Projects:

- Type A – Typically maintenance projects with traffic maintained at all times. Flagging and lane closures typically will comply with published regional lane closure polices.
- Type B – Typical roadway construction project with traffic impact limited to the area containing the work zone. Requires a traffic impact analysis proportional to the complexity of the construction and type/duration of the work zone(s).
- Type C – Large scale multi-phase multi-year construction projects on Interstate, freeway and primary arterial roadways and/or a series of projects within a TMA. Requires a detailed traffic analysis for the work zone and all adjacent roadways.

380

* *Transportation Management Plan Requirements Type A Projects*

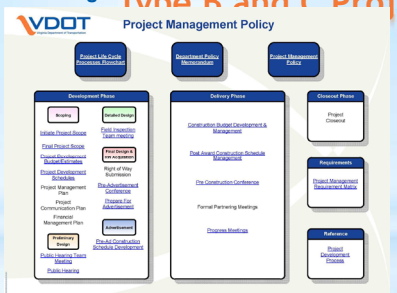
VDOT's
Maintenance, Permit and Utility
Processes

- VDOT Contract Administrator/Manager, Private Contractor/Developer, or Utility develops and submits plan to the appropriate VDOT work group
- Submitted plan is reviewed by the VDOT work group with assistance, as needed, by the Regional Traffic Engineering and Operations staff

381

*Transportation Management Plan Requirements

VDOT's Project Management Process

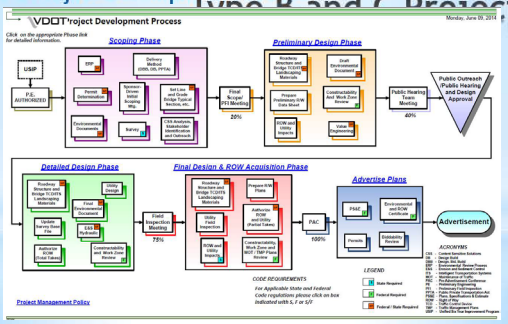


http://www.virginiadot.org/business/resources/Project_Management_Online_Guide.pdf

382

*Transportation Management Plan Requirements

VDOT's Project Development Process



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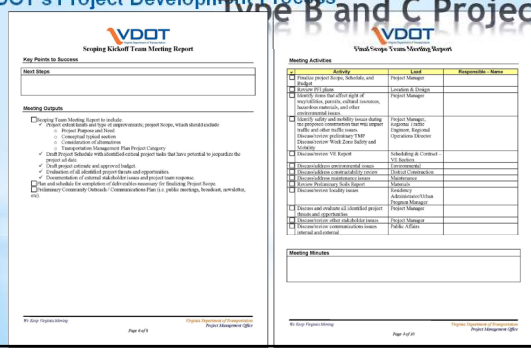
*Transportation Management Plan Requirements

VDOT's Project Development Process



384

*Transportation Management Plan Requirements Type A Projects

VDOT's Project Development Process

MOT planning review (road to remain open during construction).
A detour route has been identified by the Residency to be used if required.
We will need to extend the length of the mast arms and this may (or may not) require additional right of way in the NW quadrant and/or the SE quadrant. Also, due to the additional lane and median designs being proposed, the existing median noses may have to be cut back all the way around in order to accommodate left-turn movements running concurrently.
Proposed Lane Widths - Due to the existing truck traffic, we recommend 12' lanes for the final design.
Existing Median Noses – The median noses all the way around the intersection must be checked with Autoturn to determine if they will need to be cut back in order to allow Dual Left Turn-Lanes to run consecutively for optimum capacity.
Right-of Way and Traffic Signal Modifications – It is not known yet whether of not R/W will be required to install the new traffic signal poles.
Turn-Lane Storage and Taper Lengths – The traffic data (Turning Movements) must be gathered and used to determine the proper storage and taper lengths required to manage the traffic demand. Since this is a signalized intersection, once this traffic data is made available, the Project Manager can request that we (CR-TE) perform an Intersection Capacity Analysis and recommend storage and taper lengths.
Existing Right Turn-Lane – It appears that the exiting right turn-lane on the west side of the intersection at the 7-11 will be taken by this project. Do we know if the developer paid for the installation of that turn-lane? If they did, this could be an issue for them that we need to resolve during design development.
Proposed Painted Median - It is not clear as to why a painted median is being proposed on the east side of the intersection. Is this intended to channel traffic or fill in a void?
TMP Category of Complexity = Category I
Night Work – For this volume and type of traffic there are no feasible detour routes in the area. Therefore we recommend all night work with no lane closures during the day. If the existing median is MS-1 (with existing pavement below it) then this should not be a problem. If it is MS-2 then the Constructability folks must be consulted as to how we will treat or fill in the void once the median is removed so as not to have a drop-off exposed to traffic during the say hours.
TMP Team Meeting at PFI Stage – With all night work and basic lane closures at night, at this point we do not see the need for a separate TMP Team Meeting for this project.
Temporary Lane Widths – Given the existing truck traffic we recommend minimum 11' temporary lane widths.
Additional Traffic Counts for Area-Wide Analysis – Given a Category I project with proposed Night Work with basic lane closures at night, we see no need for additional traffic counts.

Page 6 of 11

Module 9 - AWZTCT

385

*Transportation Management Plan Requirements Type A Projects

VDOT's Project Development Process

Sample

TRAFFIC MANAGEMENT PLAN

Project Number : 0005-047-118, M-501

INTRODUCTION

The Hampton Roads District Location and Design Office proposes a right turn lane project at the intersection of Route 615 and Route 5 in James City County. This project will include pavement planning (Milling) of existing asphalt pavements, construction of asphalt concrete pavement as well as asphalt concrete overlays, installation of drainage structures, removal of existing curb and gutter, construction of curb and gutter (CG-7), removal of existing signal pole, placement of temporary signal pole, and installation of pavement marking. Work is to be done using flagger operations with no work beginning before 9:00 am.

TEMPORARY TRAFFIC CONTROL PLAN

General Notes

- The project location is at the intersection of Route 615 and Route 5 in James City County. The length of the project is 734.46 feet.
- The work zone shall be maintained according to the "Limitations of Operation and Maintenance of Traffic" document in the contract. The following traffic control specifications from the Virginia Work Area Protection Manual will be used: TTC-18, TTC-36 as required.
- Route 5 is an urban minor arterial route, which intersects Route 615. The volume of traffic is approximately 10800 vehicles in 2006 on Route 5 and 9950 vehicles in 2005 on Route 615. Types of traffic include trucks, commuters, travelers and residents.
- There are no identified areas within the right of way for the contractor to store equipment and materials. The contractor must make arrangements for these areas according to VDOT policies.

Special Details

There are no special details for this project that are not addressed in the plan assembly or the "Limitations of Operation and Maintenance Traffic" document and the Virginia Work Area Protection Manual.

PUBLIC COMMUNICATIONS PLAN

- Project staff is to coordinate with the Hampton Roads District Public Affairs office to publish announcements regarding work activities for the project. Each activity will be governed by the times established by the Regional Traffic Engineer and the Smart Traffic Center. Please provide Public Relations lane closure information two weeks in advance of work so it can be published.

Sheet 1 of 2

Module 9 - AWZTCT

386

*Transportation Management Plan Requirements

IIM-LD-241/TED-351

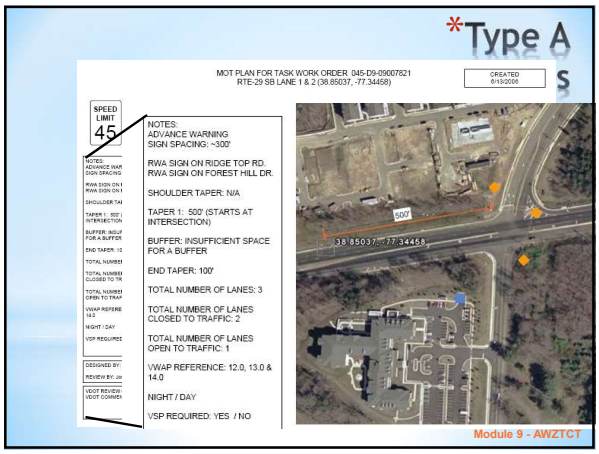
Work Zone Safety and Mobility

Type A Projects

- **Typically simple single phase projects**
- **Comply with Region's lane closure policy**
- **Requires a Temporary Traffic Control Plan in a narrative format with sketches noting:**
  - Work zone location, width & length
  - Number of affected lanes
  - Hours the work zone will be active
  - Applicable TTC Figure from the Work Area Protection Manual
- **Recommends a Public Communications Plan & a Transportation Operations Plan**

Modu

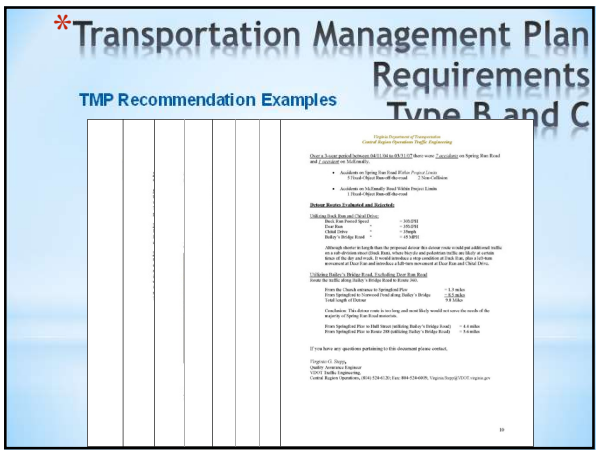
387


*Type A
s
MOT PLAN FOR TASK WORK ORDER 045-D9-09007821
RTE-29 SB LANE 1 & 2 (38.85037, -77.34458)
CREATED
6/13/2006
SPEED LIMIT
45
NOTES:
ADVANCE WARNING SIGN SPACING: ~300'
RWA SIGN ON RIDGE TOP RD.
RWA SIGN ON FOREST HILL DR.
SHOULDER TAPER: N/A
TAPER 1: 500' (STARTS AT INTERSECTION)
BUFFER: INSUFFICIENT SPACE FOR A BUFFER
END TAPER: 100'
TOTAL NUMBER OF LANES: 3
TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 2
TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 1
VWAP REFERENCE: 12.0, 13.0 & 14.0
NIGHT / DAY
VSP REQUIRED: YES / NO
500'
38.85037, -77.34458
Module 9 - AWZTCT

388


MOT PLAN FOR TASK WORK ORDER 037-D5-0504050
RTE-173 EB (37.17025, -76.47883)
CREATED
6/13/2006
SPEED LIMIT
55
NOTES:
ADVANCE WARNING SIGN SPACING:
500' EB DIRECTION
~300' WB DIRECTION
WB TRAFFIC MOVING SLOWER SO SIGN SPACING DISTANCES HAVE BEEN REDUCED.
TAPER 1: 100'
FLAGGER DISTANCE FROM WORK AREA: 500' WB
END TAPER: 100'
TOTAL NUMBER OF LANES: 2
TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 1
TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 1
VWAP REFERENCE: 18.0
NIGHT / DAY
VSP REQUIRED: YES / NO
DESIGNED BY: David Neeman
REVIEW BY: Jon Cope
VDOT REVIEW COMPLETED BY:
VDOT COMMENTS:
Field deviations shall be documented and included with final inspection package!
Module 9 - AWZTCT

389


*Transportation Management Plan Requirements
Type B and C
TMP Recommendation Examples

390

*Transportation Management Plan Requirements

IIM-LD-241/TED-351

Work Zone Safety and Mobility

Type B Projects

- Complex projects consisting of lane closures, traffic shifts and /or detours
- Requires a traffic impact assessment
- Requires a Temporary Traffic Control Plan with Detail Plans, Typical Sections and/or special details
- Requires a Public Communications Plan for high volume roadways and a Transportation Operations Plan for work zones greater than ½ mile in length

391

* Type B and C TCP Should Address...

1. The location of all advance warning signs and lighting units
2. Temporary pavement markings
3. Location of temporary barriers and attenuators
4. Temporary drainage design
5. Channelizing devices at special locations
6. Location of special devices

392

* Type B and C TCP Should Address...

7. PCMS messages for each phase
8. Signal timing for each phase, including method of temporary actuation, if needed.
9. Location and geometry transitions, detours and diversions
10. Typical sections for each phase of work
11. The proposed regulatory speed(s) for each phase

393

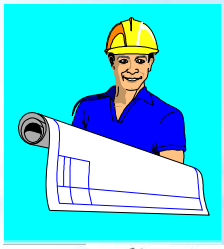
* Type B and C TCP Should...

- Resolve any conflicts between permanent signing and markings and work zone signing and markings
- Key strategies such as service patrol, police, public service announcements, Highway Advisory Radio (HAR), night work, ITS, etc.

394

* Type B and C TCP Should...

- Have good plan notes
- Address the need for maintaining existing roadway safety and mobility
- Work area access plan



395

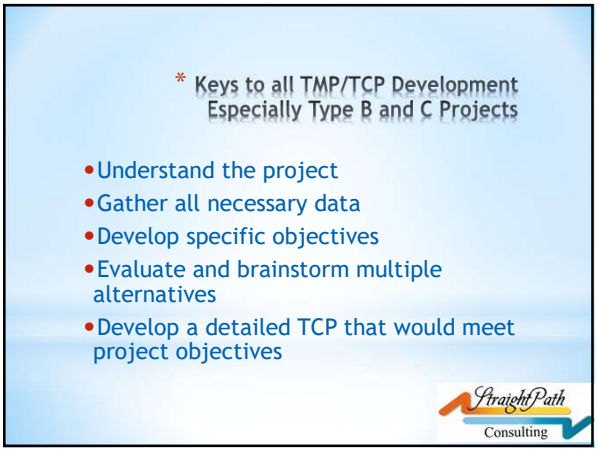
* Type B and C Other TCP Considerations

- Must allow room for equipment to properly perform its function
- May use flaggers, diversions, etc. to allow for a safe operation
- May impose an "operational limit" for a piece of equipment
- Must avoid conflicts with other equipment/utilities

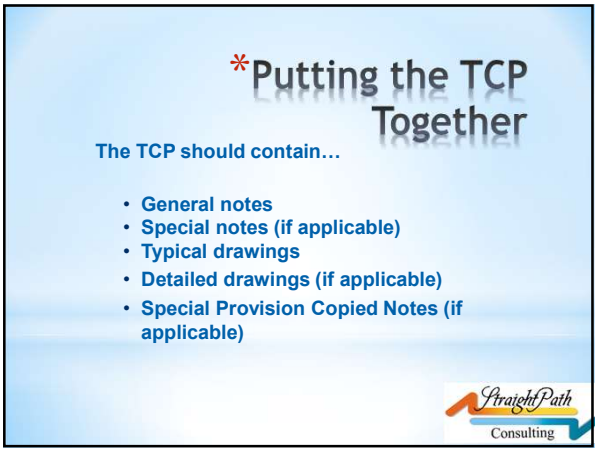
396


* A Type B and C
TCP Should Address...
Everything!
For Each Phase!
StraightPath
Consulting

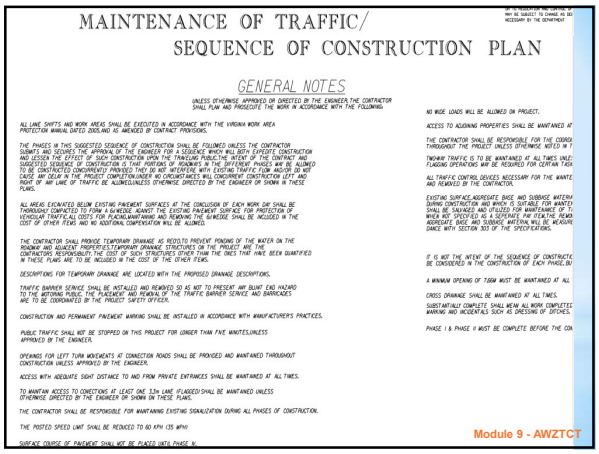
397


* Keys to all TMP/TCP Development
Especially Type B and C Projects
• Understand the project
• Gather all necessary data
• Develop specific objectives
• Evaluate and brainstorm multiple alternatives
• Develop a detailed TCP that would meet project objectives
StraightPath
Consulting

398


*Putting the TCP Together
The TCP should contain…
• General notes
• Special notes (if applicable)
• Typical drawings
• Detailed drawings (if applicable)
• Special Provision Copied Notes (if applicable)
StraightPath
Consulting

399


MAINTENANCE OF TRAFFIC/
SEQUENCE OF CONSTRUCTION PLAN

GENERAL NOTES

UNLESS OTHERWISE APPROVED OR DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL PLAN AND PROSECUTE THE WORK IN ACCORDANCE WITH THE FOLLOWING:

ALL LANE SHIFTS AND WORK AREAS SHALL BE EXECUTED IN ACCORDANCE WITH THE VIRGINIA WORK AREA PROTECTION MANUAL DATED 2005 AND AS AMENDED BY CONTRACT PROVISIONS.

THE PHASES IN THIS SUGGESTED SEQUENCE OF CONSTRUCTION SHALL BE FOLLOWED UNLESS THE CONTRACTOR SUBMITS AND SECURES THE APPROVAL OF THE ENGINEER FOR A SEQUENCE WHICH WILL BOTH EXPEDITE CONSTRUCTION AND LESSEN THE EFFECT OF SUCH CONSTRUCTION UPON THE TRAVELING PUBLIC. THE INTENT OF THE CONTRACT AND SUGGESTED SEQUENCE OF CONSTRUCTION IS THAT PORTIONS OF ROADWAYS IN THE DIFFERENT PHASES MAY BE ALLOWED TO BE CONSTRUCTED CONCURRENTLY PROVIDED THEY DO NOT INTERFERE WITH EXISTING TRAFFIC FLOW AND/OR DO NOT CAUSE ANY DELAY IN THE PROJECT COMPLETION. UNDER NO CIRCUMSTANCES WILL CONCURRENT CONSTRUCTION LEFT AND RIGHT OF ANY LINE OF TRAFFIC BE ALLOWED UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR SHOWN IN THESE PLANS.

ALL AREAS EXCAVATED BELOW EXISTING PAVEMENT SURFACES AT THE CONCLUSION OF EACH WORK DAY SHALL BE THOROUGHLY COMPACTED TO FORM A GRADE AGAINST THE EXISTING PAVEMENT SURFACE FOR PROTECTION OF VEHICULAR TRAFFIC. ALL COSTS FOR PLACING, MAINTAINING AND REMOVING THE GRADE SHALL BE INCLUDED IN THE COST OF OTHER ITEMS AND NO ADDITIONAL COMPENSATION WILL BE ALLOWED.

THE CONTRACTOR SHALL PROVIDE TEMPORARY DRAINAGE AS NEEDED TO PREVENT PONDING OF THE WATER ON THE ROADWAY AND ADJACENT PROPERTIES. TEMPORARY DRAINAGE STRUCTURES ON THE PROJECT ARE THE CONTRACTOR'S RESPONSIBILITY. THE COST OF SUCH STRUCTURES OTHER THAN THE ONES THAT HAVE BEEN QUANTIFIED IN THESE PLANS ARE TO BE INCLUDED IN THE COST OF THE OTHER ITEMS.

DESCRIPTIONS FOR TEMPORARY DRAINAGE ARE LOCATED WITH THE PROPOSED DRAINAGE DESCRIPTIONS.

TRAFFIC BARRIER SERVICE SHALL BE INSTALLED AND REMOVED SO AS NOT TO PRESENT ANY BLUNT END HAZARD TO THE MOTORING PUBLIC. THE PLACEMENT AND REMOVAL OF THE TRAFFIC BARRIER SERVICE AND BARRICADES ARE TO BE COORDINATED BY THE PROJECT SAFETY OFFICER.

CONSTRUCTION AND PERMANENT PAVEMENT MARKING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S PRACTICES.

PUBLIC TRAFFIC SHALL NOT BE STOPPED ON THIS PROJECT FOR LONGER THAN FIVE MINUTES, UNLESS APPROVED BY THE ENGINEER.

OPENINGS FOR LEFT TURN MOVEMENTS AT CONNECTION ROADS SHALL BE PROVIDED AND MAINTAINED THROUGHOUT CONSTRUCTION UNLESS APPROVED BY THE ENGINEER.

ACCESS WITH ADEQUATE SIGHT DISTANCE TO AND FROM PRIVATE ENTRANCES SHALL BE MAINTAINED AT ALL TIMES.

TO MAINTAIN ACCESS TO CEMETERIES AT LEAST ONE 3.3m LANE, FLAGGED, SHALL BE MAINTAINED UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR SHOWN ON THESE PLANS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EXISTING SIGNALIZATION DURING ALL PHASES OF CONSTRUCTION.

THE POSTED SPEED LIMIT SHALL BE REDUCED TO 60 KPH (35 MPH)

SURFACE COURSE OF PAVEMENT SHALL NOT BE PLACED UNTIL PHASE IV.

NO WIDE LOADS WILL BE ALLOWED ON PROJECT.

ACCESS TO ADJOINING PROPERTIES SHALL BE MAINTAINED AT

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORD THROUGHOUT THE PROJECT UNLESS OTHERWISE NOTED IN T

TWOWAY TRAFFIC IS TO BE MAINTAINED AT ALL TIMES UNLE FLAGGING OPERATIONS MAY BE REQUIRED FOR CERTAIN TASK

ALL TRAFFIC CONTROL DEVICES NECESSARY FOR THE MAINTE AND REMOVED BY THE CONTRACTOR.

EXISTING SURFACE, AGGREGATE BASE AND SUBBASE MATERIA DURING CONSTRUCTION AND WHICH IS SUITABLE FOR MAINTE SHALL BE SALVAGED AND UTILIZED FOR MAINTENANCE OF TR WHEN NOT SPECIFIED AS A SEPARATE PAY ITEM, THE REMO AGGREGATE BASE AND SUBBASE MATERIAL WILL BE MEASURE DANCE WITH SECTION 303 OF THE SPECIFICATIONS.

IT IS NOT THE INTENT OF THE SEQUENCE OF CONSTRUCTI BE CONSIDERED IN THE CONSTRUCTION OF EACH PHASE, BU

A MINIMUM OPENING OF 7.60M MUST BE MAINTAINED AT ALL

CROSS DRAINAGE SHALL BE MAINTAINED AT ALL TIMES.

SUBSTANTIALLY COMPLETE SHALL MEAN ALL WORK COMPLETE WORKING AND INCIDENTALS SUCH AS DRESSING OF DITCHES.

PHASE I & PHASE II MUST BE COMPLETE BEFORE THE CO

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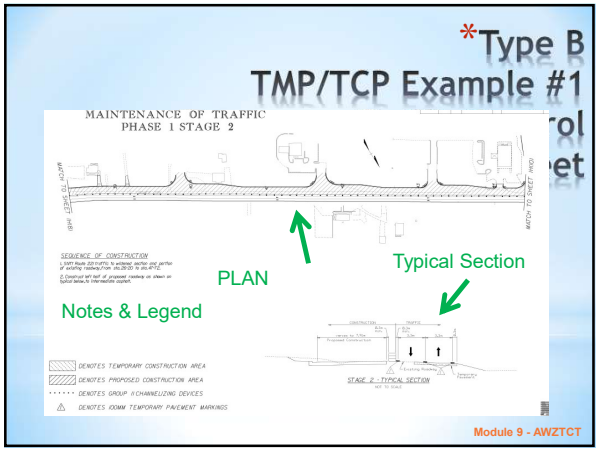
400



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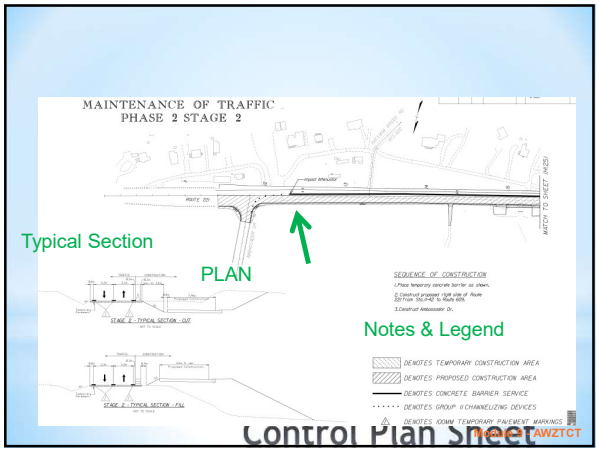

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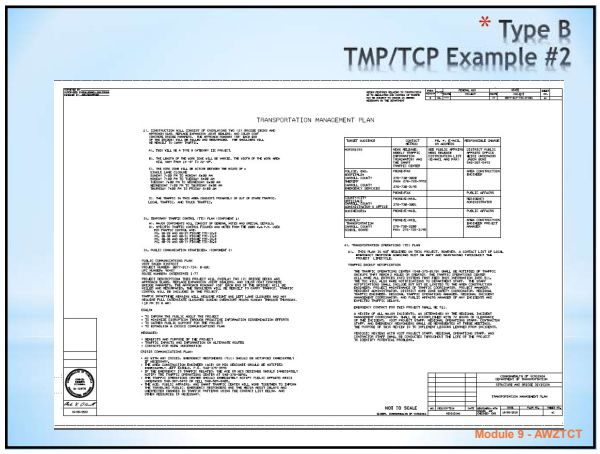
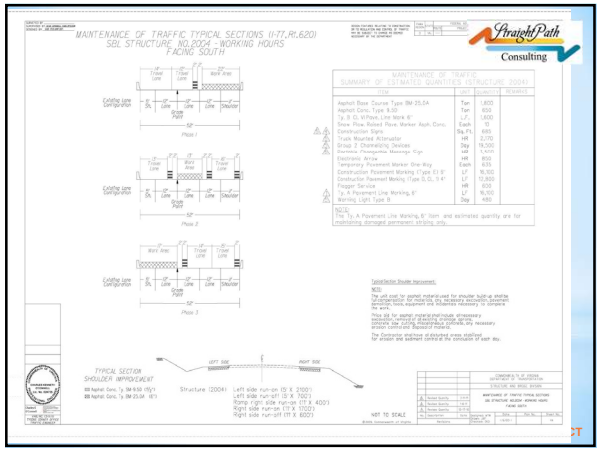
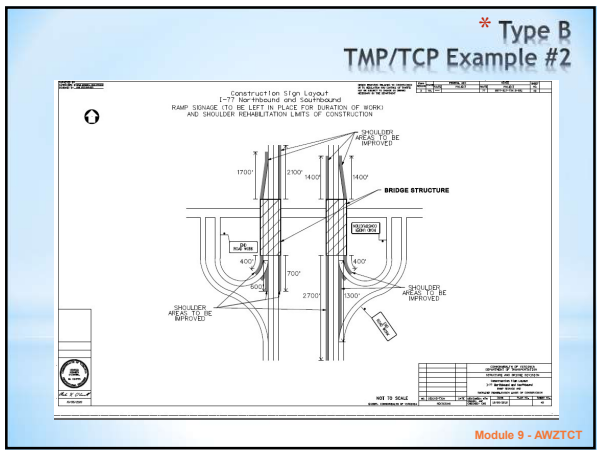

* Type B
TMP/TCP Example #2
TRANSPORTATION MANAGEMENT PLAN
Module 9 - AWZTCT

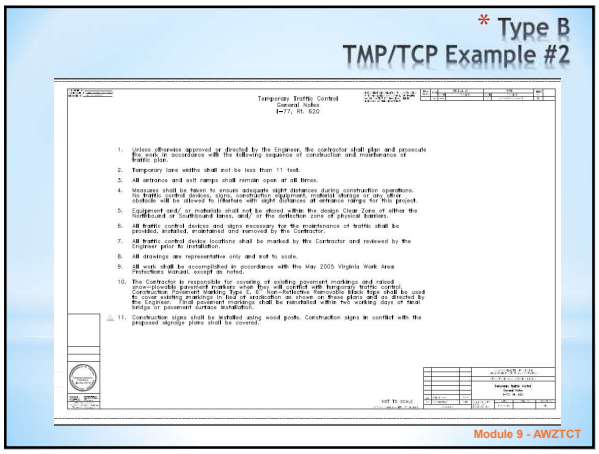
403


MAINTENANCE OF TRAFFIC TYPICAL SECTIONS (I-77,Rt.620)
SBL STRUCTURE NO.2004 - WORKING HOURS
FACING SOUTH
StraightPath
Consulting
TYPICAL SECTION
SHOULDER IMPROVEMENT

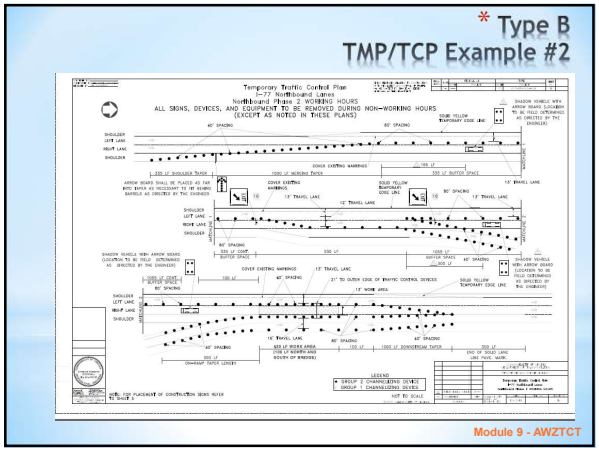
404


* Type B
TMP/TCP Example #2
Construction Sign Layout
I-77 Northbound and Southbound
RAMP SIGNAGE (TO BE LEFT IN PLACE FOR DURATION OF WORK)
AND SHOULDER REHABILITATION LIMITS OF CONSTRUCTION
SHOULDER AREAS TO BE IMPROVED
BRIDGE STRUCTURE
Module 9 - AWZTCT

405


* Type B
TMP/TCP Example #2
Module 9 - AWZTCT

406


* Type B
TMP/TCP Example #2
Module 9 - AWZTCT

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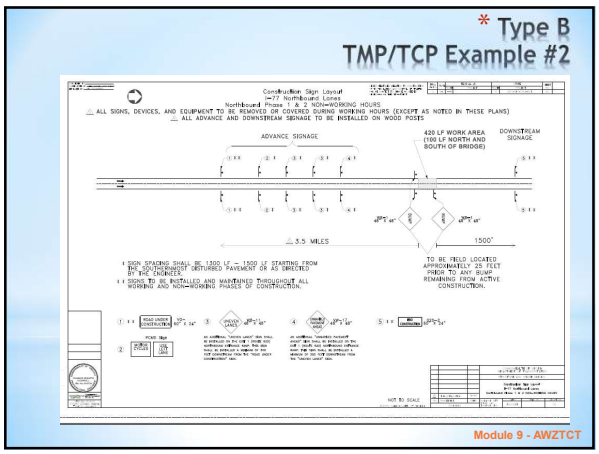
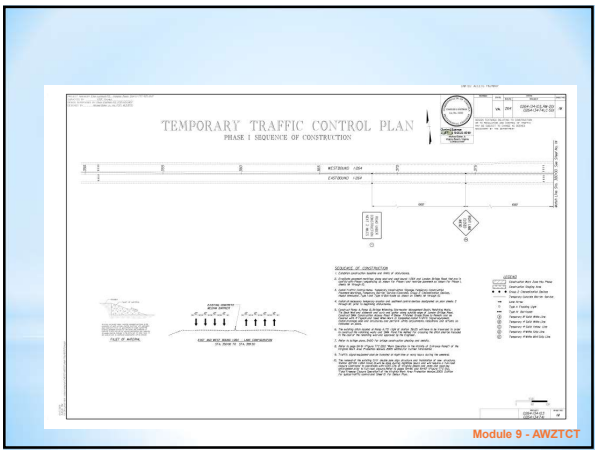

* Type B
TMP/TCP Example #2
Module 9 - AWZTCT

408



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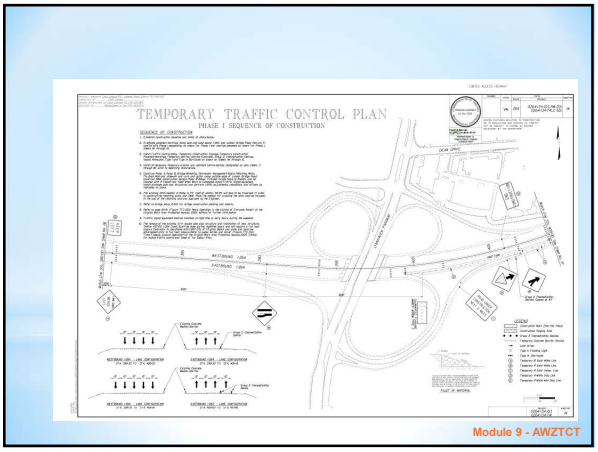


410

*Transportation Management Plan Requirements

IIM-LD-241/TED-351

Work Zone Safety and Mobility

Type C Projects

- Large scale multi-phase multi-year construction projects on Interstate, freeway and primary arterial roadways and/or a series of projects within a TMA.
- Requires a detailed traffic impact assessment
- Requires a Temporary Traffic Control Plan with Detail Plans, Typical Sections and/or special details, a Public Communications Plan and a Transportation Operations Plan.

Module 9 - AWZTCT

411

*Transportation Management Plan Requirements

Type C Projects

Module 9 - AWZTCT

412

* In R... TCP Should ...

- The location of all advance warning signs and channelizing devices
- Temporary pavement markings
- Location of temporary barriers and attenuators
- PCMS messages
- Typical sections
- Regulatory speed limits
- All additional information required to safely implement the plan

Module 9 - AWZTCT

413

Traffic Control Plans – only projects in the Commonwealth's Highway system
IIM – LD241.5

414

Advanced Work Zone
Traffic Control Training
Night-time Traffic Control
April 2015

Module 10 - AWZTCT

415

* Night-time Traffic Control

*Becoming more common due to:

- Daytime congestion
- Reduced business impact
- Reduced community impact

416

* Objectives of Ni Temporary Traffic Control

- Provide high levels of safety for workers and the public
- Minimize congestion and community impact
- Provide adequate access to the roadway

Remember the fundamental principles of TTC?

Module 10 - AWZTCT

417

* Conditions for Night-time Work

- Reduced traffic volumes
- Easy setup and removal of the traffic control on a nightly basis

StraightPath Consulting

418

* Other Factors That Impact the Suitability of Night-time Work Zone

- Traffic
- Construction
- Social
- Economic
- Environmental
- Other

StraightPath Consulting

419

* Technological Advancements to Improve Night-time Safety

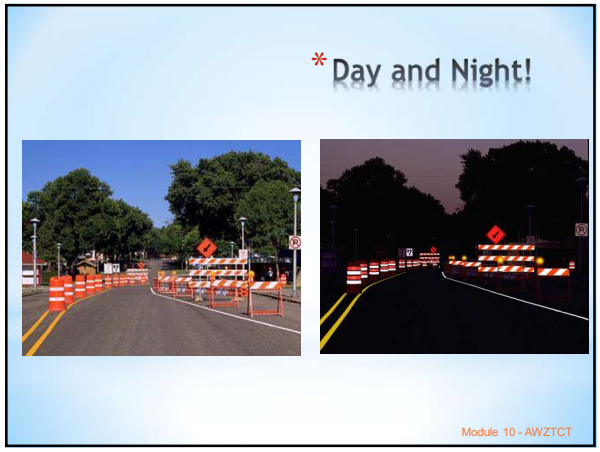
- Better sign retroreflectivity
- Better channelizing devices
- Better lighting equipment
- Better impact attenuators
- Intrusion alarms
- Driver information systems
- NCHRP 350 requirements

StraightPath Consulting

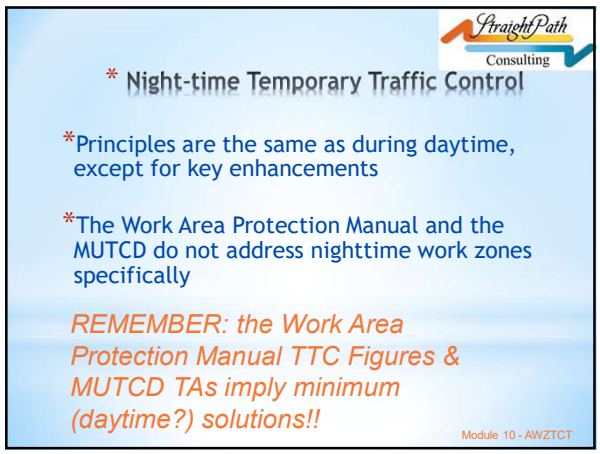
420


TO
NORTH EAST SOUTH
15 7 15
NORTH EAST SOUTH
15 15
Retroref
•Required for nighttime work
•Enhance visibility dramatically
StraightPath
Consulting

421


* Day and Night!
Module 10 - AWZTCT

422


StraightPath
Consulting
* Night-time Temporary Traffic Control
*Principles are the same as during daytime, except for key enhancements
*The Work Area Protection Manual and the MUTCD do not address nighttime work zones specifically
REMEMBER: the Work Area Protection Manual TTC Figures & MUTCD TAs imply minimum (daytime?) solutions!!
Module 10 - AWZTCT

423

* Key to Night-time Work

*Analyze the component parts of the work zone and make the necessary adjustments for nighttime conditions.

Module 10 - AWZTCT

424

* If the Needed Illuminance for Each Task is Known…

*It will be possible to select the appropriate:

- Lighting fixtures
- Location
- Arrangement
- Spacing

Anyone responsible for designing a lighting plan for Night-time Work Zone should be aware of these visibility requirements.

Module 10 - AWZTCT

425

* Illuminance

- The amount of light *falling* on an object
- Can be measured with a light meter
- Measured in lux or footcandles with an "illuminance meter"

Module 10 - AWZTCT

426

* Illumination Requirements by Task

- Each work area has specific illumination requirements
- The TCP may specify the required "illuminance levels" for the type and location of work

427

* Illuminance Levels

- Depend on the type and location of the work
- Three levels are defined:
  - Level I
  - Level II
  - Level III

428

* Level I Illuminance

- General illumination of all work operations including:
  - Layout and measurement ahead of the actual work

429

* Level I Illuminance

- Needed where crew movement may take place within the work zone
- Limited to tasks requiring:
  - Low accuracy
  - Slow-moving equipment
  - Large objects
  - Setup and removal of closures

430

* Level II Illuminance

- Recommended for areas on or around construction equipment
- Suggested for tasks requiring:
  - A higher level of visual performance
  - A higher level of difficulty or accuracy

431

*Recommended Minimum Illuminanc

LEVEL	Minimum Illuminance Level Foot-Candles (lux)	Area of Illumination	Examples of Activities
1	5 (54)	General Activities	Flagging, excavation, sweeping & clean-up, movement area (equipment or work tasks)
2	10 (108)	Activities around equipment	Paving, milling, concrete work
3	20 (216)	Illuminance on task	Crack filling, pothole patching, tasks requiring extreme precision and care

432

*Remote Area Illuminated at Level I

433

*Level I and II Illuminance

434

* Glare

- Interference with the visual perception cause by an uncomfortably bright light source
- May create
  - Discomfort
  - Disabling vision

435

* Factors Affecting Glare

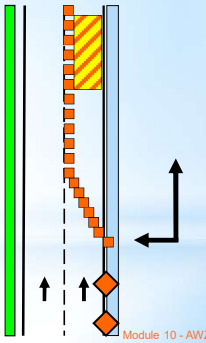
- Distance between driver and the luminaire
- Height of the luminaire
- Direction the luminaire is aimed

Adjusting these factors controls glare!

436

* Controlling Glare

*Tower-mounted luminaires should be aimed either parallel or perpendicular to the roadway



437

* Supplemental Floodlight

438

* Supplemental Floodlight

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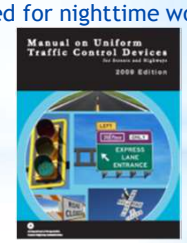
439

* Work Area Protection Manual and MUTCD "Typicals"

- Do not provide for nighttime work
- Imply minimum ideal (daytime) conditions
- Should be enhanced for nighttime work



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Advanced Work Zone Traffic Control Training
Other Considerations
April 2015

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441

* Urban Ar

- **May be problematic for work zones due to unique conditions and restricted spaces**

442

* What is an "Urban Area"?

*An area normally characterized by:

- Relatively low speeds
- Wider range of traffic volumes
- Narrow lanes
- Frequent intersections & driveways
- Significant pedestrian and bicycle traffic
- More businesses & houses

443

* Problems with Urban Work Zones

- Restricted spaces
- Heavy traffic
- Signals
- Restricted sight distance
- Parking
- Conflicts with pedestrians
- Conflicts with "other" vehicles
  - Bicycles, buses
  - Delivery trucks, utility

444

* Utility Operations

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445

* Significant Volumes of Traffic

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446

* Restricted Sight Distances

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447

* Restricted Sight Distance

448

* Restricted Sight Distance

449

* Restricted Sight Distance

450

* Restricted Spaces

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451

* Restricted Spaces

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452

* Restricted Spaces

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453

* Limited Worker Visibility

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454

* Pedestrian Access

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455

* Pedestrian Access

Module 11 - AWZTCT

456

* ADA Issues

Module 11 - AWZTCT

457

* Pedestrian Accessibility

Module 11 - AWZTCT

458

* Reduced Capacity

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459

* Reduced Capacity/Limited Space

460

Taper?

461

* Restricted Space

462

* Work Affects More Than One City Block

463

* What does the MUTCD say about "Urban Work Zones"?

- "Applying these guidelines to actual situations and adjusting to field conditions requires judgment"
- "Fewer devices may be used based on field conditions"

464

* What does the Work Area Protection Manual say about "Urban Work Zones"?

- "… the reduced number of devices in utility work zones should be offset by the use of high visibility devices…"
- Figures TTC-21, TTC-23, and TTC-26 through TTC-36 are examples of typical applications.

465

- How do we adjust to field conditions?
- What adjustments should be made?
- Are these adjustments still within the MUTCD Work Area Protection manuals' standards & guidelines?
- Do these manuals address urban work zones adequately?
- How can we protect against lawsuits?

466

* The A

- Develop the design from the driver's and pedestrians' perspective
- Do the best you can within the site conditions with the priority on the safety of all users
- Always comply with the Work Area Protection Manual
- If you cannot comply with the Work Area Protection Manual, have a DOCUMENTED REASON in the project's file!

467

* Possible Enhancements for Urban Areas

- Additional devices
  - Special message signs
  - Temporary delineators
- Decreased spacing of channelizing devices

468

* Possible Enhancements for Urban Areas

- Upgraded devices
- Improved layouts
  - Adjusted for sight distance
  - Higher portable sign supports

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* Possible Enhancements for Urban Areas

- Work closely with the public
  - Business owners
  - City officials
  - Emergency response units
- Maintain all entrances and accesses

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* Pedestrian Considerations:

- They should not be led into direct conflicts with work vehicles, equipment, or operations.
- They should not be led into direct conflicts with traffic moving through or around the work site.
- They should be provided with a safe, convenient travel path.

471

October 2011 Media Report on a Project noting:

- **Lack of Sidewalk Access**
- **Lack of Handicap Access**

Need for
essibility
rk Zones

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Consulting

472

for
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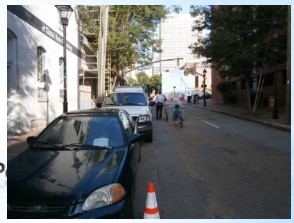
473



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474

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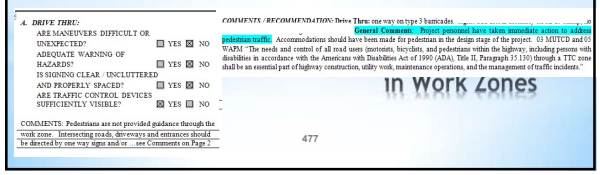
476

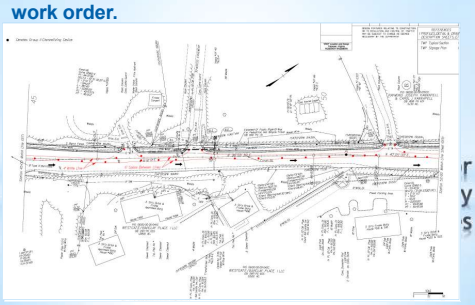
During a Project Work Zone Review it was noted:

- In the TTC Plan that a pedestrian path was to be provided during construction but no specific details were provided
- No alternate path was provided for pedestrians



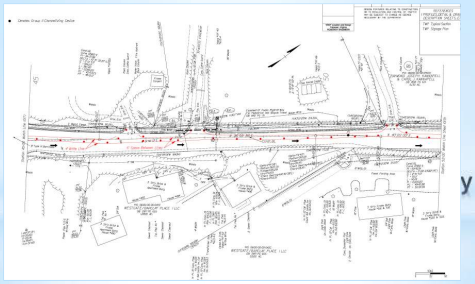
477

The alternate path that was provided for pedestrians by work order.



478

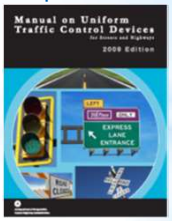
The alternate path that was provided for pedestrians by work order.



479

* Pedestrian Control

- The latest edition of the Work Area Protection Manual as well as the MUTCD have increased traffic control requirements for Pedestrians and takes into account ADA requirements as well.



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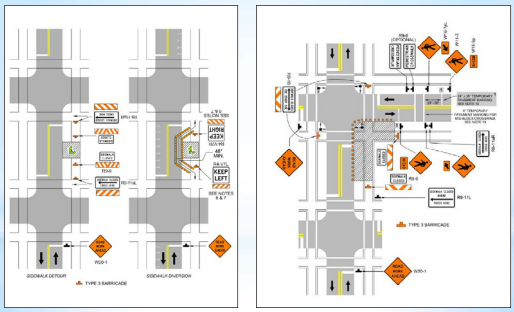
* Sidewalk Closure



481

Changes in the 2011 WAPM

6D – Pedestrian and Worker Safety

Pedestrians with disabilities requirements:

- **If a pedestrian facility was accessible to pedestrians with disabilities, the footpath provided during TTC should also be accessible.**
- **Use of audible devices for TTC information**
- **Use of barriers that are detectable by a person using a cane due to visual constraints.**
- **Pathways at least 60" wide, or 60" x 60" passing space every 200 feet.**

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New TCD's To Address ADA Pedestrian Concerns

483

Pedestrian Considerations

- If a pedestrian facility was accessible to pedestrians with disabilities, the footpath provided during TTC should also be accessible.
- Use of audible devices for TTC information

484

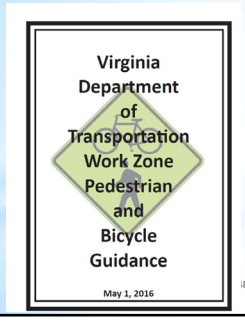
Pedestrian Considerations

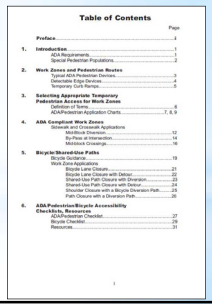
- Individual devices, tape or rope, used to connect devices, etc.

DO NOT PROVIDE A DETECTABLE PATH

485

* Proposed Virginia Work Zone Pedestrian and Bicycle Guidance





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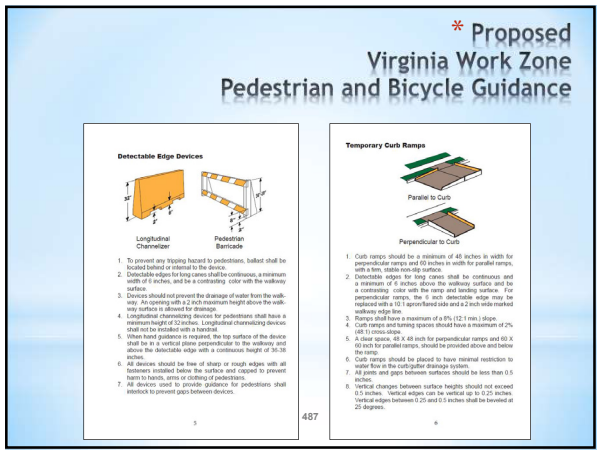
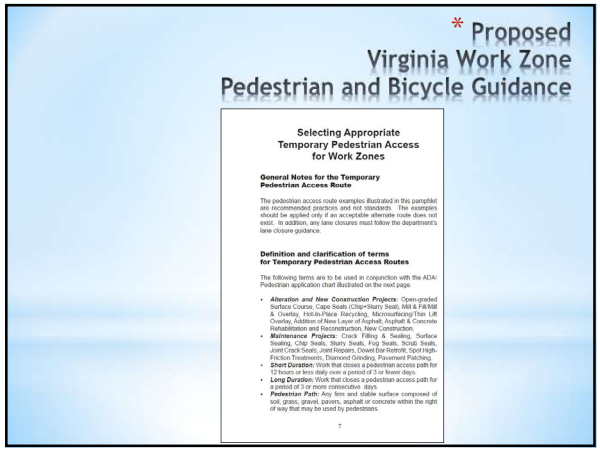
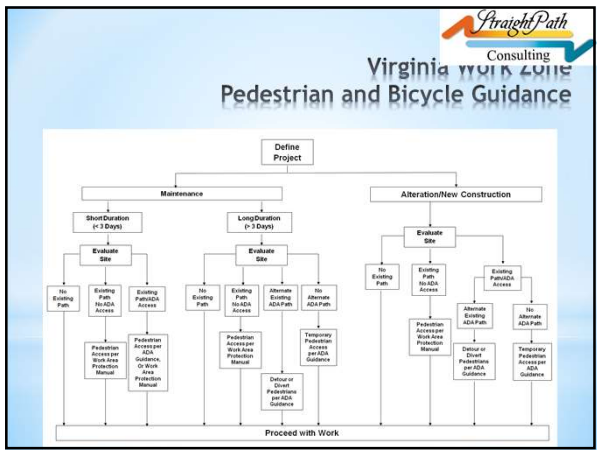

* Proposed
Virginia Work Zone
Pedestrian and Bicycle Guidance
Detectable Edge Devices
Longitudinal Channelizer
Pedestrian Barricade
1. To prevent any tripping hazard to pedestrians, ballast shall be located behind or internal to the device.
2. Detectable edges for long canes shall be continuous, a minimum width of 6 inches, and be a contrasting color with the walkway surface.
3. Devices should not prevent the drainage of water from the walkway. An opening with a 2 inch maximum height above the walkway surface is allowed for drainage.
4. Longitudinal channelizing devices for pedestrians shall have a maximum height of 6 inches. Longitudinal channelizing devices shall not be penetrated with a handrail.
5. When hand guidance is required, the top surface of the device shall be in a vertical plane perpendicular to the walkway and above the detectable edge with a continuous height of 36-38 inches.
6. All devices should be free of sharp or rough edges with all fasteners installed below the surface and capped to prevent harm to hands, arms or clothing of pedestrians.
7. All devices used to provide guidance for pedestrians shall interlock to prevent gaps between devices.
5
Temporary Curb Ramps
Parallel to Curb
Perpendicular to Curb
1. Curb ramps should be a minimum of 48 inches in width for perpendicular ramps and 60 inches in width for parallel ramps, with a firm, stable non-slip surface.
2. Detectable edges for long canes shall be continuous and a minimum of 6 inches above the walkway surface and be a contrasting color with the ramp and landing surface. For perpendicular ramps, the 6 inch detectable edge may be replaced with a 10:1 apron/flared side and a 2 inch wide marked walkway edge line.
3. Ramps shall have a maximum of a 8% (12:1 min.) slope.
4. Curb ramps and turning spaces should have a maximum of 2% (48:1) cross-slope.
5. A clear space, 48 X 48 inch for perpendicular ramps and 60 X 60 inch for parallel ramps, should be provided above and below the ramp.
6. Curb ramps should be placed to have minimal restriction to water flow in the curb/gutter drainage system.
7. All joints and gaps between surfaces should be less than 0.5 inches.
8. Vertical changes between surface heights should not exceed 0.5 inches. Vertical edges can be vertical up to 0.25 inches. Vertical edges between 0.25 and 0.5 inches shall be beveled at 23 degrees.
6
487

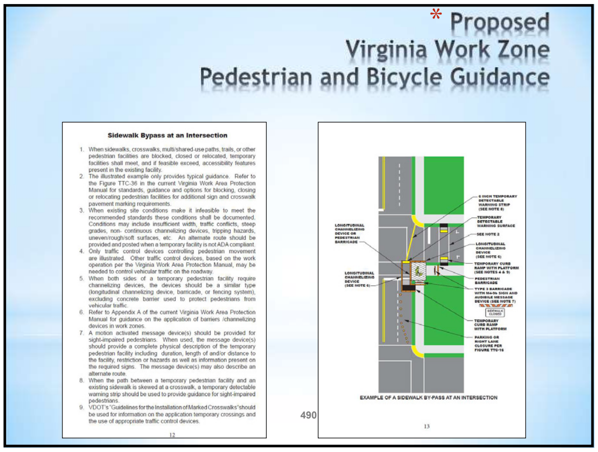
487


* Proposed
Virginia Work Zone
Pedestrian and Bicycle Guidance
Selecting Appropriate
Temporary Pedestrian Access
for Work Zones
General Notes for the Temporary
Pedestrian Access Route
The pedestrian access route examples illustrated in this pamphlet are recommended practices and not standards. The examples should be applied only if an acceptable alternate route does not exist. In addition, any lane closures must follow the department's lane closure guidance.
Definition and clarification of terms
for Temporary Pedestrian Access Routes
The following terms are to be used in conjunction with the ADA/ Pedestrian application chart illustrated on the next page.
Alteration and New Construction Projects: Open-graded Surface Course, Cape Seals (Chip+Slurry Seal), Mill & Fill/Mill & Overlay, Hot-In-Place Recycling, Microsurfacing/Thin Lift Overlay, Addition of New Layer of Asphalt, Asphalt & Concrete Rehabilitation and Reconstruction, New Construction.
Maintenance Projects: Crack Filling & Sealing, Surface Sealing, Chip Seals, Slurry Seals, Fog Seals, Scrub Seals, Joint Crack Seals, Joint Repairs, Dowel Bar Retrofit, Spot High-Friction Treatments, Diamond Grinding, Pavement Patching.
Short Duration: Work that closes a pedestrian access path for 12 hours or less daily over a period of 3 or fewer days.
Long Duration: Work that closes a pedestrian access path for a period of 3 or more consecutive days.
Pedestrian Path: Any firm and stable surface composed of soil, grass, gravel, pavers, asphalt or concrete within the right of way that may be used by pedestrians.
7

488


Straight Path
Consulting
Virginia Work Zone
Pedestrian and Bicycle Guidance
Define Project
Maintenance
Alteration/New Construction
Short Duration (< 3 Days)
Long Duration (> 3 Days)
Evaluate Site
No Existing Path
Existing Path No ADA Access
Existing Path/ADA Access
Alternate Existing ADA Path
No Alternate ADA Path
Pedestrian Access per Work Area Protection Manual
Pedestrian Access per ADA Guidance Or Work Area Protection Manual
Temporary Pedestrian Access per ADA Guidance
Detour or Divert Pedestrians per ADA Guidance
Proceed with Work

489



Sidewalk Bypass at an Intersection

1. When sidewalks, crosswalks, multi/shared-use paths, trails, or other pedestrian facilities are blocked, closed or relocated, temporary facilities shall meet, and if feasible exceed, accessibility features present in the existing facility.
2. The illustrated example only provides typical guidance. Refer to the Figure TTC-36 in the current Virginia Work Area Protection Manual for standards, guidance and options for blocking, closing or relocating pedestrian facilities for additional sign and crosswalk pavement marking requirements.
3. When existing site conditions make it infeasible to meet the recommended standards these conditions shall be documented. Conditions may include insufficient width, traffic conflicts, steep grades, non- continuous channelizing devices, tripping hazards, uneven/rough/soft surfaces, etc. An alternate route should be provided and posted when a temporary facility is not ADA compliant.
4. Only traffic control devices controlling pedestrian movement are illustrated. Other traffic control devices, based on the work operation per the Virginia Work Area Protection Manual, may be needed to control vehicular traffic on the roadway.
5. When both sides of a temporary pedestrian facility require channelizing devices, the devices should be a similar type (longitudinal channelizing device, barricade, or fencing system), excluding concrete barrier used to protect pedestrians from vehicular traffic.
6. Refer to Appendix A of the current Virginia Work Area Protection Manual for guidance on the application of barriers /channelizing devices in work zones.
7. A motion activated message device(s) should be provided for sight-impaired pedestrians. When used, the message device(s) should provide a complete physical description of the temporary pedestrian facility including duration, length of and/or distance to the facility, restriction or hazards as well as information present on the required signs. The message device(s) may also describe an alternate route.
8. When the path between a temporary pedestrian facility and an existing sidewalk is skewed at a crosswalk, a temporary detectable warning strip should be used to provide guidance for sight-impaired pedestrians.
9. VDOT's "Guidelines for the Installation of Marked Crosswalks" should be used for information on the application temporary crossings and the use of appropriate traffic control devices.

12

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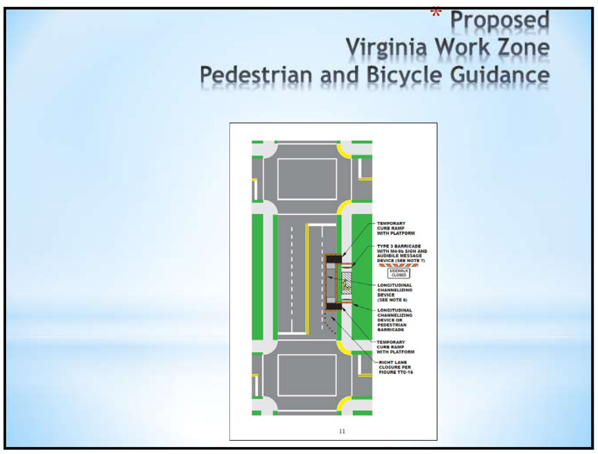

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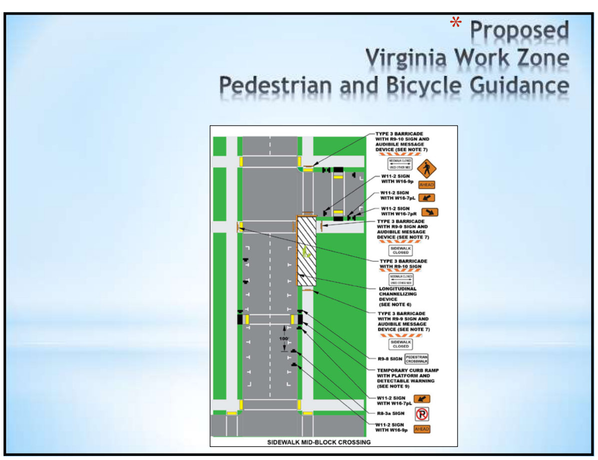
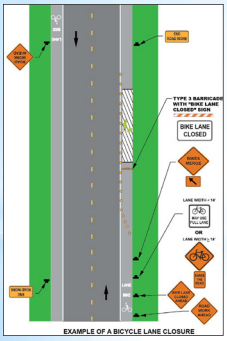
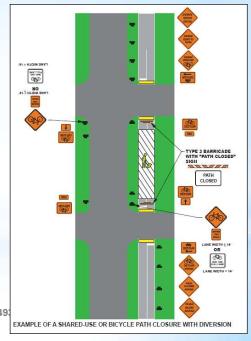


492

* Proposed Virginia Work Zone Pedestrian and Bicycle Guidance



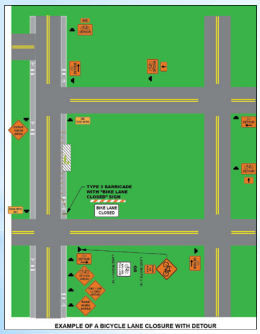
EXAMPLE OF A BICYCLE LANE CLOSURE



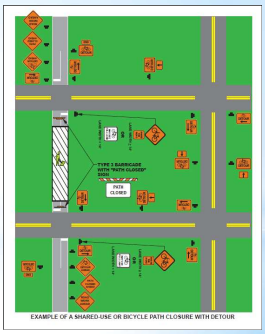
EXAMPLE OF A SHARED-USE OR BICYCLE PATH CLOSURE WITH DIVERSION

493

* Proposed Virginia Work Zone Pedestrian and Bicycle Guidance



EXAMPLE OF A BICYCLE LANE CLOSURE WITH DETOUR



EXAMPLE OF A SHARED-USE OR BICYCLE PATH CLOSURE WITH DETOUR

494

* Motorcyclists Considerations

- Crashes tend to be serious
  - *1 of 10 crashes is fatal
- Crashes are increasing
- Work zone standards may not always consider the effects on motorcycles.
- Special users deserve special considerations

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* Motorcycle Countermeasures

- Provide sufficient warning of temporary shoulders and lane drop-offs, milled sections, and other hazardous areas
- Avoid steel plates

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496

* Motorcycle Countermeasures

- Provide smooth edge transitions (ramps)
- Minimize water ponding
- Proper ballast to keep devices off traveled areas
- Detours

Module 11 - AWZTCT

497

* Motorcycle Countermeasures

- Dust control products may cause friction reduction for motorcycles on concrete surfaces
- Provide a gap for a motorcycle's wheel path on mainline transverse rumble strips

Module 11 - AWZTCT

498

PROJECT CATEGORIES

In recognition that projects undertaken by VDOT vary in size, complexity, and risk, a project ranking system has been defined to group projects by category based primarily on level of complexity and risk. The categorization of projects allows for a statewide consistent assignment of the appropriate scheduling provision to ensure that the appropriate level of scheduling efforts needed to establish and maintain schedule control on the project is applied.

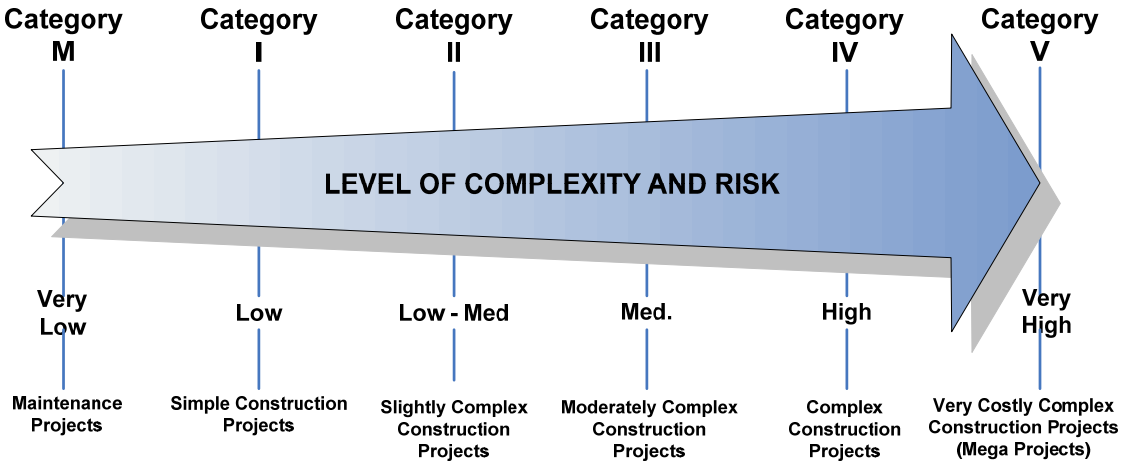


Figure 1-2: Project Category – Level of Complexity and Schedule Risk

The VDOT project ranking system consists of six categories representing varying levels of complexity and risk ranging from very low to very high. Category M is the lowest, which represents typical maintenance projects and schedule type work. Categories I through V represent typical single-contract construction projects ranging from simple to very complex. Characteristics of each project category are described as follows:

1. **Category M –** Category M represents typical maintenance contracts and seasonal schedule type work of very low complexity and risk, where specific timeframes for accomplishing the work is generally not a major constraint rather a full construction season is generally given to allow for a flexible schedule. Such projects, therefore, do not require the level of scheduling efforts needed for typical construction projects.

   A. **Criteria for Category M Projects –** Category M projects must generally meet the following criteria:

      i) Typical maintenance and schedule type work; or

ii) Seasonal contracts with contract duration of one construction season or less (Time is not a major constraint); or

iii) Simple repairs or straight-forward maintenance work; and

iv) Minimal traffic impact or limitations to the Work; and

v) No involvement with other major construction or improvement projects.

B. Examples of Category M Projects – The following are typical Category M projects:

- Pavement schedules (Asphalt overlay, surface treatments & slurry seals);
- Bridge joint repairs;
- Bridge painting (minimum traffic impact);
- Guardrail improvements;
- Curb and gutter repair/replacement;
- Raised pavement marker installation, lens replacement;
- Pavement marking schedules;
- Minor Bridge repair (District wide, minor miscellaneous);
- Rumble strip installation;
- Slope slide repair, scour repair;
- Ground mounted sign maintenance/replacement;
- Incidental concrete repair;
- Pipe culvert rehabilitation;
- Bridge cleaning;
- Retaining wall/ Sound wall repair;
- Signal maintenance & repair (District wide).

C. Category M Scheduling Requirements – Category M scheduling requirements are based on the basic scheduling information necessary for the Department to coordinate all work required to complete the Contract and to communicate with the public. The schedule information will also be used to plan for and manage the Department's cash flow, resources, and traffic. The Category M Progress Schedule submittal consists of:

i) A Schedule of Operations in the form of a Narrative to provide a written description of the overall plan and sequence of operations; as well as a general schedule of operations to indicate when each segment of the work will be completed. The schedule may be provided in a tabular or bar-chart format.

ii) A weekly rolling two-week look-ahead schedule will also be required to show the detailed schedule of work planned for the following two weeks. The look-ahead schedule may be provided in a tabular or bar-chart format.

2. **Category I –** Category I is the lowest level of the project ranking system for typical construction projects, which represents simple and low risk projects. Such projects include typical small, simple, and short duration construction projects with very limited and straight-forward operations. Category I may also include other simple and low risk single season or less construction projects with minimal or no limitations to the Work, whose plan of operations and schedule can be effectively communicated in written words.

   A. **Criteria for Category I Projects –** Category I projects must generally meet the following criteria:

      i) Contract duration of one construction season or less (typically short durations); or

      ii) Estimated contract value of $1 million or less; and

      iii) Limited items of work; and

      iv) Simple operations with favorable conditions; and

      v) Minimal traffic impact or limitations to the Work; and

      vi) Does not include utility adjustments or relocations; and

      vii) Contract does not contain any Special Provisions for special time-related conditions, such as Interim Contract Milestones, A+B Bidding, Insensitive/Disincentive, or Lane Rental; and

      viii) Project has no major materials delivery restrictions, environmental impacts, delayed right-of-way acquisitions or access, or other similar constraints and restrictions.

   On a case by case basis, certain single-season simple and low risk projects with estimated contract value greater than $1M that generally meet the criteria listed above may qualify as Category I, as determined by the Area Construction Engineer (ACE);

On a case by case basis, certain Federal Oversight (FO) maintenance projects or time sensitive maintenance projects with traffic impact may qualify as Category I, as determined by the ACE. Such projects may include concrete pavement repairs or overlay work on major corridors or certain relatively complex time sensitive maintenance projects that are involved with major construction or improvement projects. In such cases, the ACE should consult with the State Construction Scheduler for concurrence.

B. Examples of Category I Projects – The following are typical Category I projects:

- Rural grade, drain, & pave of unpaved roads (may include minor horizontal & vertical alignment changes and rural rustic projects with drainage work);
- Minor bridge deck repair & concrete overlay (may include multiple bridges);
- Break, seat, & overlay concrete pavement;
- Spot improvements (multiple locations any of: incidental concrete, minor widening, enhanced pavement marking, & sign installation);
- Building demolition in advance of construction projects;
- Retaining wall installation or extensive repair;
- Minor bridge substructure repairs (with traffic impact);
- Bridge painting (multiple locations or with traffic impact);
- Minor urban reconstruction & improvement (could include curb & gutter and sidewalks; new or extended turn lanes);
- Surface reclamation, sub-grade stabilization & overlays;
- Bridge steel repair (with traffic impact);
- Signal installation – Site specific (w/o intersection improvements, no regional on-call installations);
- Overhead sign installation & lighting installations (multiple locations & or significant amount of lighting);
- Simple concrete pavement repair and/or asphalt overlay (major corridor, minimum traffic impact).

C. Category I Scheduling Requirements – Category I scheduling requirements are based on the basic scheduling information needed to communicate the Contractor's work plan and to assess progress of the Work. The schedule information will also be used to plan for and manage the Department's resources, expenditures, traffic, as well

as to communicate with the general public. The Category I Progress Schedule submittal consists of:

i) A Narrative to provide a written description of the overall plan and sequence of operations;

ii) A Tabular Schedule to show the detailed schedule of work and key dates associated with the work;

iii) A Progress Earnings Schedule (Form C-13C) to assess progress of the Work.

A Baseline Progress Schedule is required at least 7 calendar days prior to beginning the Work. Progress of the work will be monitored relative to the anticipated earnings or the project milestone dates. The Progress Schedule needs updated only when either the plan or the work has changed significantly; at such time, the Engineer will request submission of a revised schedule to include the updated information and the revised plan to complete the remaining work.

3. **Category II –** Category II is the second level of the project ranking system for typical construction projects, which represents slightly complex and low to medium risk projects. Category II projects are typical low volume single season construction projects with a limited number of straightforward contiguous, linear, or repetitive operations; and low to medium traffic impact or constraints. Such projects include, but are not limited to single or two lane widening or turn lane projects in an urban setting. Category II may also include certain multi-season slightly complex and low risk projects. Such projects may include, but are not limited to long duration projects with minimal constraints or traffic impact, such as projects involving simple repetitive operations performed at multiple locations; or widening projects in a rural setting, involving a limited number of straightforward contiguous or linear operations, whose schedule can be effectively communicated in a time-scaled bar-chart.

   A. **Criteria for Category II Projects –** Category II projects must generally meet the following criteria:

      i) Contract duration of one construction season or less (may be two construction seasons, but involve simple linear or repetitive operations); or

      ii) Estimated contract value generally less than $3 million; and

      iii) Limited number of straightforward contiguous or linear operations; and

      iv) Low to medium traffic impact; and

      v) Typical conditions and limitations to the work; and

      vi) May include minimal utility adjustments; and

vii) Contract does not contain Special Provisions for special time-related conditions, such as Contract interim milestones, Incentives/Disincentives, A+B bidding, or Lane Rental, etc.; and

viii) Project has no major materials delivery restrictions, environmental impacts, right-of-way acquisitions, or other similar constraints and restrictions.

On a case by case basis, certain slightly complex and low to medium risk projects with estimated contract value over $3M that generally meet the criteria listed above may qualify as Category II, as determined by the ACE.

On a case by case basis, certain high-volume Federal Oversight (FO) maintenance projects or relatively complex maintenance projects that involve multiple items of work, multiple schedule constraints, or significant traffic impact may qualify as Category II, as determined by the ACE. Such projects may include concrete pavement repairs or overlay work on major corridors or certain relatively complex time sensitive maintenance projects that are involved with major construction or improvement projects. In such cases, the ACE should consult with the State Construction Scheduler for concurrence.

B. **Examples of Category II Projects –** The following are typical Category II projects:

- Urban grade, drain, & pave projects of low to medium complexity;
- Rural new construction or reconstruction grade separation roadway and bridge projects (low to medium size and complexity);
- Complex reconstruction and improvements, including widening and multiple turn lanes that may include utility adjustments;
- Major bridge substructure repairs (with low to medium traffic impact);
- Bridge deck replacements, such as multi-span or over railroads;
- Major bridge deck repair & concrete overlay (multi-span or over railroads);
- Intersection improvements with lighting and/or signal installation;
- Bridge & drainage structure replacements (frequently single span with limited approach work);
- Major drainage improvements;
- Complex concrete pavement repair and/or asphalt overlay (major corridor, significant traffic impact);
- Multi-season bridge painting (with low to medium traffic impact).

C. **Scheduling Requirements for Category II –** As the amount of work, project duration, or level of complexity and associated risks increases, a scheduling tool that can graphically depict the sequence and timing of the activities in a time-scale format is required to effectively communicate the Contractor's plan of operations and the intended sequence of progress. The Category II scheduling requirements are based on the bar-chart method. The Category II Progress Schedule submittal consists of:

i) A Narrative to provide a written description of the overall plan and sequence of operations;

ii) A Bar-chart Schedule to graphically depict the general sequence and timing of work and key dates associated with the work;

iii) A Progress Earnings Schedule (Form C-13C) to assess progress of the work.

The Category II Baseline Progress Schedule is required at least 7 calendar days prior to beginning the Work. The Bar-chart Progress Schedule and Progress Earnings Schedule will be updated monthly to reflect the actual status of work accomplished and the proposed plan to complete the remaining work. The schedule will be revised accordingly when either the plan or the work has changed significantly; at such time, the Engineer will request submission of a Revised Progress Schedule to include the updated information. Progress of the work will be monitored relative to the planned earnings and project milestone dates.

4. **Category III –** Category III is the middle level of the project ranking system for typical construction projects, which represents moderately complex and medium risk projects. Category III projects are typical medium size multi-season construction projects with limited number of concurrent operations and constraints. Such projects include, but are not limited to new construction, reconstruction, extension, or widening/improvements of medium size roadway/bridge projects with typical constraints and/or traffic impact. Category III projects may also include certain medium to large size multi-season projects of relative complexity and low risk. Such projects may include, but are not limited to long duration projects with typical constraints and minimal traffic impact, such as limited span bridge or interchange projects in a rural setting.

A. **Criteria for Category III Projects –** Category III projects must generally meet the following criteria:

i) Med-size projects with contract duration generally spanning 2-3 construction seasons; or

ii) Estimated contract value generally between $3M and $10M; and

iii) Limited number of concurrent work-paths; and

iv) Medium limitations to the work and traffic impact; and

v) Limited number of utility adjustments; and

vi) Contract does not contain Special Provisions for special time-related conditions, such as Contract interim milestones, Incentives/Disincentives, A+B bidding, or Lane Rental, etc.; and

vii) Project has no major materials delivery restrictions, environmental impacts, right-of-way acquisitions, or other similar constraints and restrictions.

On a case by case basis, certain moderately complex and medium risk projects with estimated contract value over $10M that generally meet the criteria listed above may qualify as Category III, as determined by the ACE.

On a case by case basis, certain high-volume Federal Oversight (FO) maintenance projects or relatively complex maintenance projects that involve multiple items of work, multiple schedule constraints, and/or significant traffic impact may qualify as Category III, as determined by the ACE. Such projects may include major concrete pavement repairs or overlay work on major corridors or certain relatively complex time sensitive maintenance projects that are involved with major construction or improvement projects. In such cases, the ACE should consult with the State Construction Scheduler for concurrence.

B. Examples of Category III Projects – The following are typical Category III projects:

- Intersection improvements, including widening and multiple turn lanes with utilities, lighting and/or signal installation (with medium complexity and traffic impact);
- New roadway/bridge construction or extension projects (medium size, complexity, and traffic impact);
- Bridge deck replacements (multi-span, medium traffic impact);
- Bridge & drainage structure replacements (limited span with approach work);
- Bridge reconstruction/widening projects (medium size, complexity, and traffic impact).

C. Scheduling Requirements for Category III – As the number of operations or level of complexity and risk grows a scheduling tool that will allow for adequate planning and scheduling of concurrent activities with considerations for associated constraints is required to plan and execute the Work. Such scheduling method will require that activity relationships are added to establish inter-dependencies between related activities to form network paths to aid the project staff to efficiently plan for and manage the level of resources required to complete the work as planned. The longest continuous network path through the project then defines the project critical path and

the overall time to complete the project. The Category III scheduling requirements are based on the Critical Path Method (CPM). The Category III Progress Schedule submittal consists of:

i) A Narrative to provide a written description of the overall plan and sequence of operations;

ii) A CPM Schedule to graphically depict when the activities that make up the project can be performed;

iii) A Progress Earnings Schedule (Form C-13C) to assess progress of the work.

The Category III Baseline Progress Schedule submission is required within 30 calendar days after the Contract Notice to Proceed (NTP) date. The CPM Progress Schedule and Progress Earnings Schedule will be updated monthly to reflect the actual status of work accomplished and the proposed plan to complete the remaining work. The schedule will be revised accordingly when either the plan or the work has changed significantly; at such time, the Engineer will request submission of a Revised Progress Schedule to include the updated information. Progress of the work will be monitored relative to the planned earnings and project milestone dates.

5. **Category IV –** Category IV is the fourth level of the project ranking system for typical construction projects, which represents complex and high risk projects. Category IV projects are typical medium to large size multi-season construction projects with multiple concurrent operations and constraints. Such projects include, but are not limited to new, reconstruction, extension, or widening/improvements of medium to large roadway/bridge projects with substantial constraints and/or traffic impact. Category IV projects may also include certain med-size high-risk projects of relative complexity that include provisions for special time-related constraints or conditions. Such projects may include, but are not limited to major intersection widening/improvement projects in an urban setting with significant traffic impact, involving any combination of the following: utility/drainage adjustments, multi-lane roadway construction, lighting and/or traffic signals.

   A. **Criteria for Category IV Projects –** Category IV projects must generally meet the following criteria:

      i) Medium to large size projects with contract duration generally spanning 3 or more construction seasons; or

      ii) Estimated contract value generally between $10M and $75M; or

      iii) Contract contain Special Provisions for special time-related conditions, such as Contract interim milestones, Incentives/Disincentives, A+B bidding, or Lane Rental, etc.; and

      iv) Multiple concurrent work-paths; and

v) Complex construction staging, phasing, or MOT issues; and

vi) Complex constructability issues; and

vii) Substantial traffic impact and limitations to the work; or

viii) May include major utility relocation/adjustments; and

ix) Project has no major materials delivery restrictions, environmental impacts, right-of-way acquisitions, or other similar constraints and restrictions.

On a case by case basis, certain relatively complex and high risk projects with estimated contract value less than $10M that generally meet the criteria listed above may qualify as Category IV, as determined by the ACE. In such cases, the ACE should consult with the State Construction Scheduler for concurrence.

On a case by case basis, certain relatively complex and high risk projects with estimated contract value over $75M that generally meet the criteria listed above may qualify as Category IV, as determined by the ACE.

B. Examples of Category IV Projects – The following are typical Category IV projects:

- Major urban intersection improvements, including widening and multiple turn lanes with utilities, lighting and/or signal installation (medium to large size, complex, and significant traffic impact);
- Rural/Urban new construction or reconstruction grade separation roadway and bridge projects (medium to large size, complex, major corridor);
- Major bridge deck replacements (substructure repairs, multi-span, multi-lane, major corridor, with significant traffic impact);
- Major bridge & drainage structure replacements (multi-span with extensive approach work);
- Major widening projects (medium to large size and complexity, major corridor, with significant traffic impact).

C. Scheduling Requirements for Category IV – As the size, complexity, and associated risks grow, a scheduling tool that will allow for adequate planning and scheduling of manpower, equipment, and expenditures is required to accomplish the Work. Category IV schedules will also allow for an accurate assessment of the current status of the individual activities and the overall progress of the Work. The Category IV scheduling requirements are based on the Category III requirements with additional requirements for cost-loading. The Category IV Progress Schedule submittal consists of:

i) A Narrative to provide a written description of the overall plan and sequence of operations;

ii) A Cost-loaded CPM Schedule to graphically depict when the activities that make up the project can be performed;

iii) A Progress Earnings Schedule (Form C-13CPM) to assess progress of the work;

iv) A 30-day look-ahead schedule to depict work planned for the next period.

The Category IV Baseline Progress Schedule submission is required within 45 calendar days after the Contract Notice to Proceed (NTP) date. The CPM Progress Schedule and Progress Earnings Schedule will be updated monthly to reflect the actual status of work accomplished and the proposed plan to complete the remaining work. The schedule will be revised accordingly when either the plan or the work has changed significantly; at such time, the Engineer will request submission of a Revised Progress Schedule to include the updated information. Progress of the work will be monitored relative to the planned earnings and project milestone dates.

6. **Category V –** Category V is the highest level of the project ranking system for typical construction projects, which represents complex and very high risk mega-projects. Category V projects are typical very costly and multi-season construction projects with a considerable number of concurrent operations and significant constraints. Such projects include, but are not limited to new, reconstruction, extension, expansion, or widening/improvements of very large and/or very complex roadway/bridge projects with substantial constraints and/or traffic impact. Category V projects are also typical very long duration multi-phased mega-projects with multiple roadway segments and/or several bridge structures on major corridors that may involve multiple contracts or construction projects. Such projects typically involve major roadway/bridge construction/widening, very complex multiple-span bridges, or major interchange work on major corridors.

   A. **Criteria for Category V Projects –** Category V projects must generally meet the following criteria:

      i) Very large projects with contract duration generally spanning 3 or more construction seasons; or

      ii) Estimated contract value generally greater than $75M; and

      iii) Contract contain Special Provisions for special time-related conditions, such as Contract interim milestones, Incentives/Disincentives, A+B bidding, or Lane Rental, etc.; and

      iv) Considerable number of concurrent work-paths; and

v) Complex construction staging, phasing, or MOT issues; and

vi) Complex constructability issues; and

vii) Substantial traffic impact and limitations to the work; and

viii) Substantial number of right-of-way acquisitions and/or relocations; or

ix) Major material delivery restrictions; or

x) Significant utility relocation/adjustments; or

xi) Major environmental or community impact.

On a case by case basis, certain relatively complex and very high risk projects with estimated contract value less than $75M that generally meet the above listed criteria may qualify as Category V, as determined by the ACE. In such cases, the ACE should consult with the State Construction Scheduler for concurrence.

B. **Examples of Category V Projects –** The following are typical Category V projects:

- Major rural/urban new construction or reconstruction grade separation roadway and bridge projects (large size, complex, major corridor, significant traffic impact);
- Major widening projects (large size, complex, major corridor, significant traffic impact);
- Major interchange projects (large size, complex, major corridor, significant traffic impact);
- Major bridge deck replacement projects (large size or multiple bridges, complex, major corridor, significant traffic impact);
- Individual Category III or IV level projects that are included in multiple-contract mega-projects like Woodrow Wilson, Springfield Interchange, etc.).

C. **Scheduling Requirements for Category V –** As the size, complexity, and associated risks grow, a scheduling tool that will allow for adequate planning and scheduling of manpower, equipment, and expenditures is required to accomplish the Work. Category V schedules will also allow for an accurate assessment of the current status of the individual activities, progress of selected major operations that will have the greatest influence on the schedule, and the overall progress of the Work. The Category V scheduling requirements are based on the Category IV requirements with additional requirements for a qualified and dedicated project scheduler/coordinator, resource-loading, and commodity-tracking (progress of selected controlling items of work).

For individual Category III or IV level projects that are included in multiple-contract mega-projects such as Woodrow Wilson, Springfield Interchange, etc., contractors will be required to develop and maintain their schedules in a collaborative structured environment within the master-project schedule database. The Category V Progress Schedule submittal consists of:

i) A Narrative to provide a written description of the overall plan and sequence of operations;

ii) A Resource-loaded and Cost-loaded CPM Schedule to graphically depict when the activities that make up the project can be performed;

iii) A Progress Earnings Schedule (Form C-13CPM) to assess progress of the work;

iv) A Commodity Progress Report (Form C-13COM) to assess progress of the selected commodities (controlling items of work);

v) A detailed 4-week look-ahead schedule with a 1-week look-back.

The Category V Baseline Progress Schedule submission is required within 60 calendar days after the Contract Notice to Proceed (NTP) date. The CPM Progress Schedule, Commodity Progress Report, and Progress Earnings Schedule will be updated monthly to reflect the actual status of work accomplished and the proposed plan to complete the remaining work. The schedule will be revised accordingly when either the plan or the work has changed significantly; at such time, the Engineer will request submission of a Revised Progress Schedule to include the updated information. Progress of the work will be monitored relative to the planned earnings, anticipated progress of the selected commodities, and project milestone dates.

Advanced Work Zone Traffic Control Training
Traffic Barrier/Channelizing Exercise

TASK: By using Appendix A of the Virginia Work Area Protection Manual, determine what type of device is needed to protect the work area and the motorists. If the determination is for use of concrete barriers, also list the barrier flare/slope ratio needed in the transition.

1. **A 12'x 10' double box culvert extension is being located 6 feet from the edge of the travelway on a two-lane rural secondary route. The posted speed limit is 45 mph, and the vehicle count is 15, 000 vehicles per day (VPD). What device or barrier should be used if the hazard is to exist for 4 months?**

   Accident exposure (f) from frequency factor curve: _____
   Accident factor (P) = f x t x L: _____
   Type of device: _____
   Barrier flare/slope ratio (if required): _____

2. **A project is adding an outside climbing lane on one side of an Interstate highway for a length of 1.3 miles. The posted speed limit is 55 mph and the vehicle count is 36,000 VPD. What device should be used if the work zone is expected to last 26 weeks?**

   Accident exposure (f) from frequency factor curve: _____
   Accident factor (P) = f x t x L: _____
   Type of device: _____
   Barrier slope ratio (if required): _____

3. **An excavation for a stormwater management basin is within 8 feet of a 2 lane urban highway. The length and width of the basin is 1200' x 400' respectively with a maximum depth of 5'. The posted speed limit is 35 mph and the vehicle count is 10,000 VPD. The clear zone area between the curb and the proposed basin has a 6:1 slope. Construction is expected to last 6 weeks. What device is needed?**

   Accident exposure (f) from frequency factor curve: _____
   Accident factor (P) = f x t x L: _____
   Type of device: _____
   Barrier slope ratio (if required): _____

WORK ZONE TRAFFIC CONTROL TRAINING

Work Zone Exercise Number 8

Intersection Design

Design a work zone traffic control for the following condition:

A sink hole has been discovered on the eastbound lanes of I-24 and the interstate must be closed completely and a detour installed. Route 900 to Route 10 will be the detour route. Speed limit for the intersection roadways as follows:

- ✓ Route 46 35 mph
- ✓ Route 900 55 mph
- ✓ Route 10 45 mph

Route 10 lane width is 12". Due to lack of space on the work sheet, just show traffic control for southbound Route 10. Northbound traffic control will be the same.

Your mission (should you choose to accept it) is to develop traffic control for the intersecting roadways.

Traffic must be controlled continuously by flaggers for a 7 day period.

What TTC figures would you reference?_____

_____

_____

What is the sign spacing for each intersection?

Route 46 _____

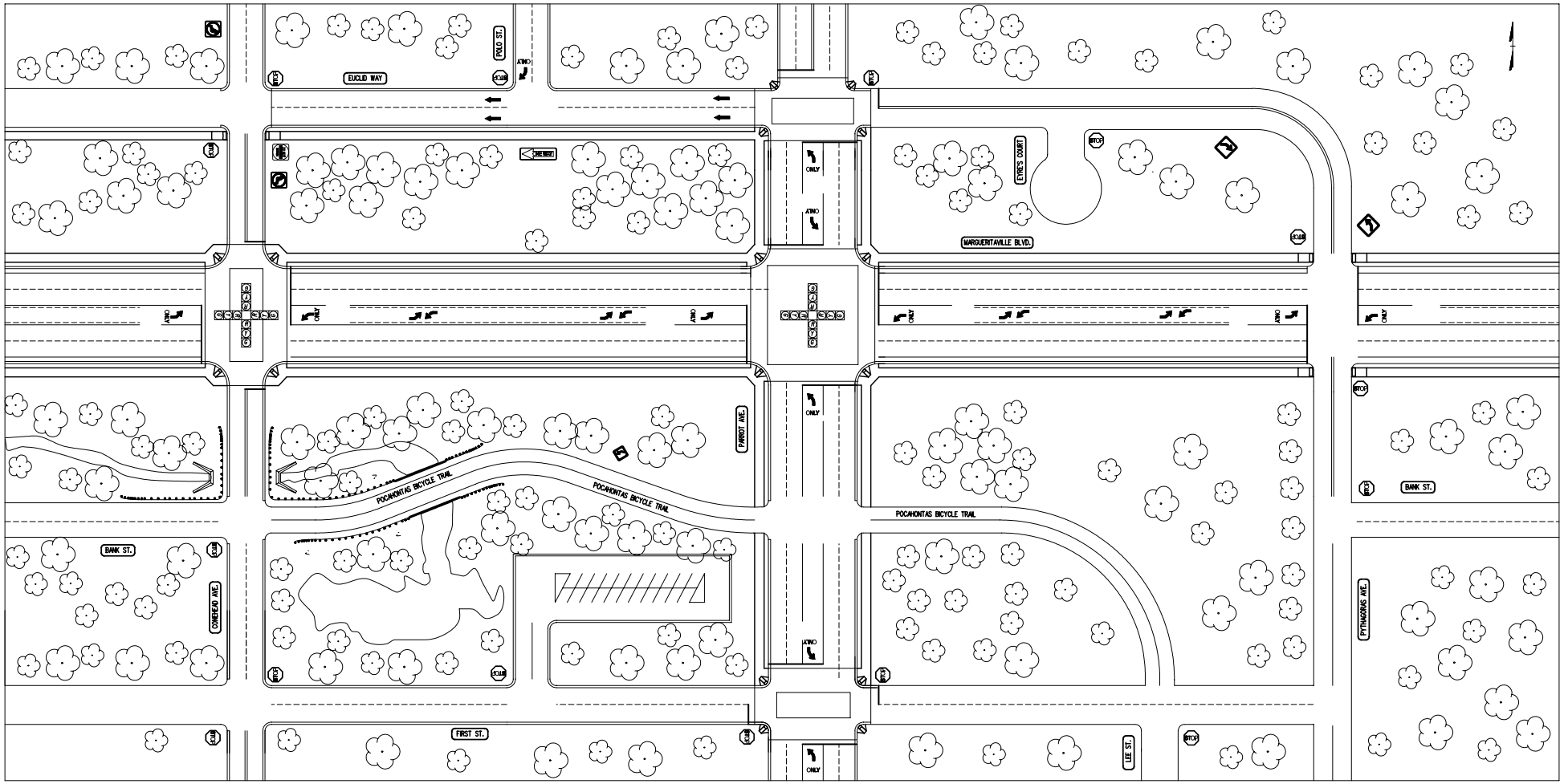
Route 900 _____

Route 10 _____

Channelizing device spacing and what type? _____

Merging Taper Length? _____

Buffer Space Length? _____


EUCLID WAY
POLO ST.
ONE-WAY
EYRES COURT
MARGUERITAVILLE BLVD.
POCAHONTAS BICYCLE TRAIL
POCAHONTAS BICYCLE TRAIL
POCAHONTAS BICYCLE TRAIL
PARROT AVE.
BANK ST.
BANK ST.
CONGRESS AVE.
FIRST ST.
LEE ST.
PYTHAGORAS AVE.
ONLY
STOP

WORK ZONE TRAFFIC CONTROL TRAINING

Work Zone Exercise Number 9

Bridge Replacement

Design a work zone traffic control for the following condition:

A bridge must be replaced on the westbound lanes of I24. Traffic will be diverted onto the eastbound lanes causing a two-way situation. The length of the work zone is 1,000'. Existing traffic volumes are 30,000 ADT. Truck volumes are very high, therefore; shoulder widening has been installed to allow for the installation of traffic barrier service. The speed limit will be reduced to 55 mph and 12' wide lanes must be maintained. The median width is 16" plus 4' shoulders. The total lane shift is 16 + 4 + 4 +12 = 36'. The operation is expected to be completed in 20 days.

What TTC's would you reference? _____

Signs? 1_____ 2_____ 3_____ 4_____ 5_____ 6_____

Sign Spacing? _____

Channelizing Device? _____ Spacing? _____

Merging Taper Length? _____ Shifting Taper Length _____

Buffer Space Length ? _____

Do you think the barrier should be secured to the roadway? _____

Why or why not?_____

What is the clear zone for this roadway? _____

Do you need impact attenuators? _____

Why or why no t? _____

Advance Work Zone Traffic Control Training
Tapers and Buffer Spaces Exercise

TASK: By using the 2011 VA WAPM, determine the minimum taper and buffer lengths needed for the following work zone activities.

1. **A right lane closure as shown in TTC 16.0 on a 45 mph posted primary route with a travel lane width of 12 feet and a shoulder width of 10 feet.**

   Length of Shoulder Taper: _____
   Length of Merging Taper: _____
   Length of Buffer Space: _____

2. **As shown in TTC 40.0, the 11 foot wide travel lanes on a multilane secondary route are being shifted over toward the right shoulder 10 feet to accomplish a three day work activity. What is the length of the shoulder and shifting tapers and buffer space for the 35 mph posted roadway (the shoulders are 8 feet wide)?**

   Length of Shoulder Taper: _____
   Length of Shifting Taper: _____
   Length of Buffer Space: _____

3. **An inside lane closure is needed for one day as shown in TTC-17.0. What is the shoulder, merging, and buffer space lengths for the 55 mph limited access highway with 12 foot wide travel lanes and 10 foot wide shoulders?**

   Length of Shoulder Taper: _____
   Length of Merging Taper: _____
   Length of Buffer Space: _____

TASK: ***Design a TTC Plan for a project that requires pavement repairs on Eastbound Interstate 66 at the on ramp from Route 234 North.***

The actual work is approximately 400 feet of the right lane. This will take up 14 feet of the right lane and about 10 feet of the acceleration lane. This will prohibit the full length of the acceleration lane to be used.

The repair will consist of removing and replacing 2" of surface and 8" of base.

The work will take approximately ????? hours to complete.

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- **Route 234** is a major route with approximately 50,000 VPD
  - The speed limit is 45 mph
- The **Route 234 ramp** to eastbound Interstate 66 is two 12' lanes
  - The speed on the ramp is 35 MPH
- **Interstate 66** is 4 through lanes 14" wide
  - The shoulder width is 10 feet
  - The speed limit in this area is 60 MPH
- This area is normally congested with constant backups during normal rush hours. Frequently, this area remains congested after 9:00 a.m. The Engineer reserves the option to extend rush hour restrictions in these cases.
- The nearby asphalt plants are limited to production between 5:00 a.m. and 11:30 p.m.
  - The plants all continuous mix drum plants
  - The storage capacity of the 3 silos are 300 tons each
  - The silos will hold asphalt at 350 degrees for 6 hours
  - Asphalt weighs approximately 115 pounds per square yard inch

==========

Indicate all facets of this Traffic Control Plan to include but not be limited to:

1. What signs are required on each of the 3 roadways?
2. What is their spacing?
3. Show how you plan to physically move traffic away from the work area.
4. Indicate all traffic control devices you plan on using and their approximate lengths and locations
5. Will you require exceptions to the standards shown in the Virginia Work Area Protection Manual?
6. What other factors influence the plan?

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Work Zone Safety and Mobility	NUMBER: IIM-LD-241.7 IIM-TE-351.5
SPECIFIC SUBJECT: Transportation Management Plan Requirements	DATE: January 3, 2017
	SUPERSEDES: IIM-LD-241.6 IIM-TE-351.4
LOCATION AND DESIGN DIVISION APPROVAL: B. A. Thrasher, P.E. State Location and Design Engineer Approved December 12, 2016	TRAFFIC ENGINEERING DIVISION APPROVAL: R. J. Khoury, P.E. State Traffic Engineer Approved December 8, 2016

Changes are shaded.

CURRENT REVISION

- This memorandum was revised to replace Regional Traffic Engineer with "responsible District Traffic Engineer", effective January 25, 2017.

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:
    - Requires 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.
    - Requires 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.
    - Recognizes the state policy may vary based on the characteristics and expected work zone impacts of individual projects or classes of projects.
    - Requires the development of 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.

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 and 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. 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 Communication Managers for acquiring the information to develop a Transportation Management Plan (TMP). Project personnel shall involve the FHWA Area Engineer 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 Scoping Activities and continued throughout the Project Development Process (PDP) and during all phases of construction. For additional information on the PDP, 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://vdotforms.vdot.virginia.gov/SearchResults.aspx?strFormNumber=LD-436

Specific work requirements are noted in the Project Development Process for each milestone, as are the Project Management forms that are to 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 responsible District Traffic Engineer (DTE) and noted in the plans.

- **Initial Scoping Meeting** – The Project team shall use field observations, 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, pedestrian and bicycle routes, as well as temporary traffic control, public communications and transportation operations strategies. The Project Manager shall request that the responsible District Traffic Engineer (DTE) 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. The Project Manager shall request that a preliminary Public Communications Plan be drafted by the District Communications Manager.

- **Final Scope / 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 responsible District Traffic Engineer (DTE), 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 Team 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 responsible District Traffic Engineer (DTE) and Regional Operations Director as applicable. Recommendations/corrections submitted by the responsible District Traffic Engineer (DTE)/Regional Operations Director (ROD) 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 Outreach/Public Hearing and Design Approval.

- **Field Inspection Meeting** – The Roadway Designer shall complete the project's TMP for review by the project team during the Constructability and Work Zone Review stage for the Detailed Design Phase of the Project Development Process. 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 responsible District Traffic Engineer shall review the TMP to check that all safety information and crash data have been incorporated into the TMP.

- **Pre-Advertisement Conference** – The Roadway Designer shall complete the project's final TMP for review during the Constructability, Work Zone and TMP Review stage in the Final Design and ROW Acquisition Phase of the Project Development Process. Accepted 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 Work Zone Safety 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 assigned Work Zone Safety Coordinator shall conduct an on-site review of the work zone's performance and inform the contractor all required changes to the TMP for implementation to enhance the work zone's safety and mobility. All such changes shall be documented. If the project is a federal oversight project, the FHWA Area Engineer shall be afforded the opportunity to review all such changes prior to implementation. An on-site review of the project's work zone traffic control by the Regional Work Zone Safety Coordinator, Project's Manager/Work Zone Safety Coordinator, District Safety Engineer, and the Contractor shall be conducted within 48 hours of any fatal incident/crash within the work zone. This review shall be recorded on the Work Zone Safety Checklist, Form TE-97000.

- **Evaluation of the Transportation Management Plan** – A performance assessment of the project's TMP including area–wide impacts on adjacent roadways should be performed by the project's designated Work Zone Safety Coordinator during construction as circumstances dictate. Any recommendations and comments shall be communicated to the construction inspection team in writing for appropriate changes to the TMP. 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 project's TMP will be forwarded to the State Traffic Engineer for review.

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 Project Development Process.

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 Project Development Process, 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 is available at: TMP Design Checklist.

- **Responsible District Traffic Engineer (DTE):** ATTACHED

  In order to promote the safety of workers as well as the safe and efficient movement of traffic through the project's work zone, the responsible DTE shall consider various temporary traffic management strategies and provide the project team with the following recommendations. The responsible DTE shall review the TMP to assess that all 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
  - Quantities for all temporary traffic control devices

- **Regional Operations:**
  In order to promote the safety of workers as well as the safe and efficient movement of traffic through the project's work zone, the Regional Operations Director shall consider various transportation management strategies and provide the Roadway Designer and the project team with the following recommendations. The Regional Operations Director shall review the TMP to check that the applicable information is included in the project's TMP:

  - Temporary transportation operations strategies
  - Incident/emergency management plan
  - Use of ITS for traffic monitoring and queue detection
  - 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 diversions 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.
  - Identification of all temporary pedestrian and bicycle routes.
  - Identification of all temporary pavement locations and temporary drainage items
  - Illustrations of 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)
  - Identification of all emergency pull-off areas
  - Identification of all construction vehicle and equipment ingress and egress locations (for Temporary Traffic Barrier applications)
  - Identification and notation of 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 specific aspects of the TMP pertaining to structures by providing the following:

  - Movement, staging and use of cranes, other large equipment and materials
  - Need for 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
  - Placement of the above information in the plan assembly in narrative or illustrated format

- **Communications**

  Shall ensure that the transportation management plan is communicated to appropriate key audiences (motorists, law enforcement, emergency services, businesses, residents, elected officials and media). Strategies will include:

  - Development of project-specific communications plan to keep key customers informed about construction-related impacts before and during the construction;
  - Communication and promotion of ways commuters can avoid construction-related delays, i.e. rideshare, telework, public transportation;
  - Development of a crisis communications plan which outlines steps to be taken during a major incident and includes emergency contact information; and,
  - Determination of the need for 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 specific 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 and ensuring that:

- Right of way is provided for the placement of construction equipment and materials
- Access is provided to the work area(s) for construction equipment and materials
- Consideration has been given for, methods of deep utilities and large diameter pipe construction.
- Adequate time is provided to complete the construction
- Utility plans have been coordinated with all phases of 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 identified safety and mobility issues have been addressed for any unusual construction methods
- The project can be built as designed with the minimum necessary road closures and detours to avoid major recurring traffic impacts

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, responsible District Traffic Engineer, Regional Operation Directors and Communications Managers for developing TMP. In general, the TMP shall consist of a traffic control plan and, as required, 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 temporary traffic barrier is used to protect work areas. Consideration should 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:

designate use of lane closures for ingress/egress when using barrier

- 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 meeting the requirements in the Virginia Work Area Protection Manual 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 temporary traffic barrier 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 responsible District Traffic Engineer and based on an engineering study per Traffic Engineering Division Memorandum IIM-TE-350.
- Warning signs ("Construction Entrance X" and "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. Temporary Traffic Control plans that only reference the Work Area Protection Manual do not requiring sealing and signing (refer to Traffic Engineering Division Memorandum IIM-TE-362).
  - 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 traffic analysis tool recommended in VDOT's Traffic Operations and Safety Analysis Manual (TOSAM). http://www.virginiadot.org/business/resources/TOSAM.pdf. Lane closures, the use of traffic control devices and their placement, Public Information and Traffic Operations Plans will be approved by the Regional Operations Director with implementation based on the traffic impact evaluation and the Regional Operations Director's approval.

Major Components:

- Temporary Traffic Control Plan

  Major components will consist of General Notes, Typical Sections, and if needed Special Details. Each component should 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 responsible District 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 Engineer/Administrator of scheduled work plans and traffic delays.
  - A process to notify the Project Manager/Residency Engineer/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 space 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 Engineer / Administrator, District Work Zone Safety Coordinator / responsible District 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. Project will be constructed over several phases and may include 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 a traffic analysis tool recommended in VDOT's Traffic Operations and safety Analysis Manual (TOSAM) http://www.virginiadot.org/business/resources/TOSAM.pdf. Lane closures and detour routes will be implemented based on this evaluation. All lane closures and time restrictions shall comply with the Regional Operation's lane closure policies, with any deviations requiring the approval of the Regional Operations Director.

- 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.
          - Locations of emergency pull-off areas.

        - 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.
- Provide 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 Operations Director 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 space 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 and substantial 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.

- 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, Alexandria, Fairfax, Loudoun, Prince William, Spotsylvania and Stafford), Richmond (including the City of Richmond, Chesterfield Charles City, Goochland, Hanover, Henrico, New Kent, and

Powhatan Counties as well as the Town of Ashland), Hampton Roads (including the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Virginia Beach and Williamsburg as well as James City and York Counties), and Roanoke Valley (including the cities of Roanoke and Salem as well as Roanoke County). 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 several traffic shifts 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 a traffic analysis tool recommended in VDOT's Traffic Operations and Safety Analysis Manual (TOSAM) http://www.virginiadot.org/business/resources/TOSAM.pdf. Lane closures and detour routes shall comply with the Regional Operation's lane closure policies, with any deviations requiring the approval of the Regional Operations Director.

- 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 as well as a list identifying the location of reduced width lane(s) with the width reduction specified.
    - 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.

http://www.virginiadot.org/business/resources/traffic_engineering/memos2/Examples_of_Temporary_Traffic_Control_Plans.pdf

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, as well as identifying and communicating issues related to the design and usage of temporary traffic control devices.
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 TMP post-construction reports to ascertain the effectiveness of the TMP and noting 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 Work Zone Traffic Control 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, of work requiring lane shifts, lane closures and/or phase changes two working days prior to implementing this activity.
- Ensuring that the project's assigned Work Zone Traffic Control Coordinator completes and submits the TMP post-construction report.

- **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 project's assigned Work Zone Traffic Control Coordinator in performing their assigned duties

- **Residency Engineers / Administrators**

Specific responsibilities of the Residency Engineer/Administrator for project's administered by the residency 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 Work Zone Traffic Control 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 corresponding 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, at a minimum, daily 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. This plan shall have the approval from 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 at all times that the permittee is working within the public right of way. This person shall have the training and 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's personnel assigned to the work activity are trained in traffic control to a level corresponding 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, at a minimum, daily 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. The determination shall be 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 for approval training courses submitted in compliance with established procedures. The committee will also 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 .

TRANSPORTATION MANAGEMENT PLAN TYPE A PERFORMANCE ASSESSMENT

Project/Permit/Route No.:	Project's PMP Category:
Report Completed By:	Date of Report:
VDOT Project/Contract Manager:	
Contractor:	

Please check all applicable boxes for the items listed below. All check boxes denoted by an asterisk require comment. This form shall be completed within 30 days of completion of work and submitted to the State Traffic Engineer.

Plan Design

Correct TMP Category Application:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
Correct TTC Plan Application:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
Correct Public Communications Application:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
Correct Traffic Operations Plan Application:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
General Plan Effectiveness:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
Comments:			

Safety

Crashes*	☐ Yes (Attach FR-300 if available)	☐ No
Complaints*	☐ Yes (Attach separate sheet)	☐ No
Specification Violations	☐ Yes (Attach CQIP Report(s))	☐ No
Work Zone Safety Reviews:	☐ Yes (Attach Form(s) TE-97000)	☐ No
General Effectiveness:	☐ Acceptable ☐ Changes Required*	☐ Not Applicable
Comments:		

Mobility

Driver Expectancy:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
Delay & Queue Length* (List time & Length):	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
Travel Times (List time)	☐ Acceptable	☐ Not acceptable*	☐ Not Applicable
Work Hour Restrictions:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable
General Effectiveness:	☐ Acceptable	☐ Changes Required*	☐ Not Applicable

Comments:

_____

_____

Additional Comments

Summarize the most successful and least successful work zone traffic control procedures.

_____

_____

_____

_____

Summarize any suggested improvements or changes to the work zone traffic control procedures for future similar projects.

_____

_____

_____

_____

VIRGINIA DEPARTMENT OF TRANSPORTATION

POST-CONSTRUCTION TRANSPORTATION MANAGEMENT PLAN (TMP) PERFORMANCE ASSESSMENT - TMP Types B and C

This Assessment shall be completed by the project's designated Work Zone Safety Coordinator upon completion of the work and approved by the Project Manager to document lessons learned and provide recommendations on how to improve the TMP process and/or modify guidelines. The responses should allow the reviewer of this completed Assessment to understand the successes/failures of the project TMP and its requirements. Please attach any relevant documents, project logs, etc. as well as any responses which cannot fit within the provided space.

WORK ZONE INFORMATION:
PROJECT TITLE:
WORK ZONE SAFETY COORDINATOR:
LOCATION:
DISTRICT/REGION:
UPC#

1) Summarize/describe all changes necessary to correct oversights in the TMP:

2) Summarize/describe all changes made to the original TMP and their level of success:

3) Describe public reaction to the TMP including the frequency and nature of complaints:

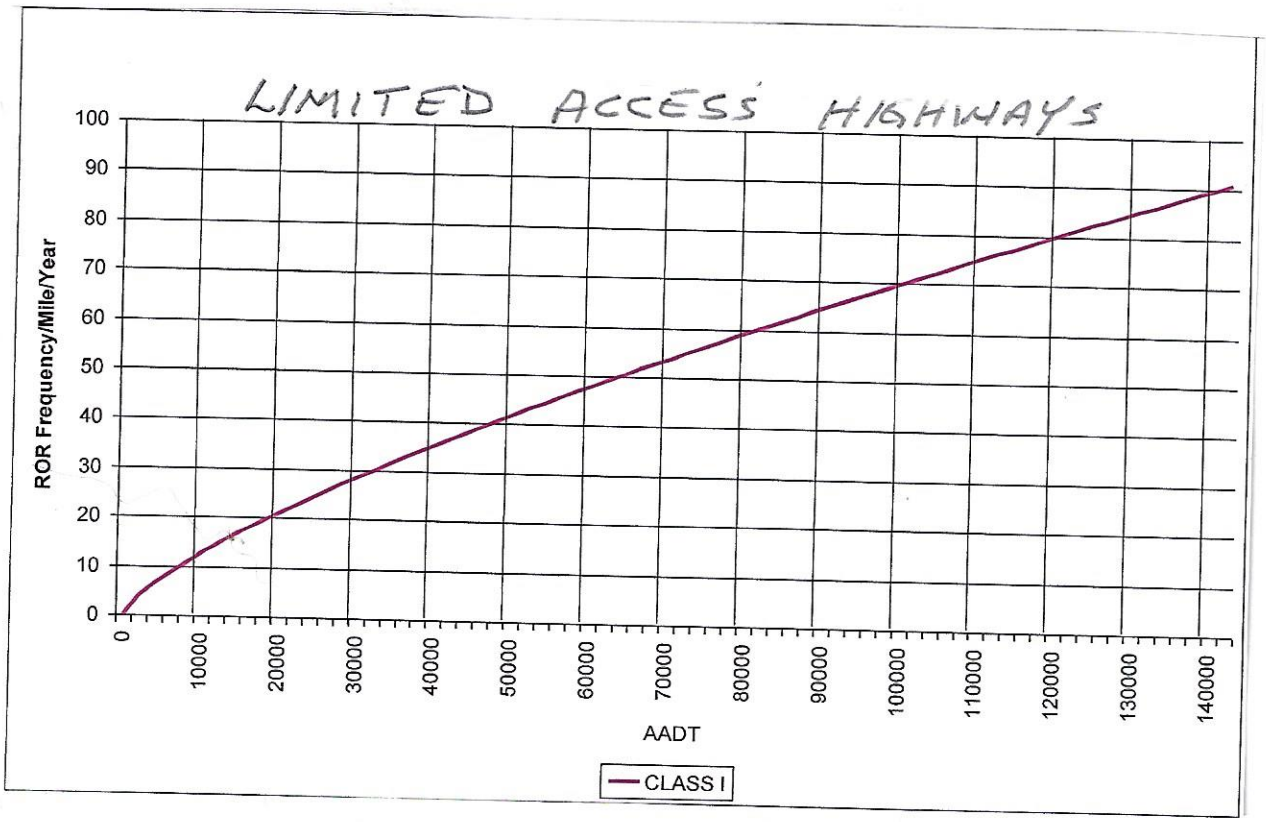
4) Summarize travel times encountered during peak periods (if required):

Starting location:		
Ending location:		
Date	Method Used (i.e., floating car, Bluetooth, etc.)	Average Travel Time

5) Summarize queues encountered during peak periods (if required):

Date	Method Used (i.e., advance warning vehicle)	Queue Length
During-construction average queue length:		
During-construction maximum queue length:		
Predicted average/maximum queue length from impacts analysis:		

LIMITED ACCESS HIGHWAYS



ALL OTHER HIGHWAYS