TRAIN ▪ SERVE ▪ RESPOND

Work Zone Traffic Control

Instructor Guide

Texas Engineering Extension Service (TEEX)
Infrastructure Training & Safety Institute (ITSI)

A Member of The Texas A&M University System

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WORK ZONE TRAFFIC CONTROL

INSTRUCTOR GUIDE

The Texas A&M University System

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WORK ZONE TRAFFIC CONTROL

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Table of Contents

Class Schedule

	Session	Module	Instructional Hours		
			Classroom	Lab/Field Activity	Total
Day 1	AM Session 1	Module 0: Course Introduction	60 min	0 min	60 min
		Module 1: Manual on Uniform Traffic Control Devices	60 min	0 min	60 min
		Break			
	AM Session 2	Module 1: Manual on Uniform Traffic Control Devices, continued	30 min	0 min	30 min
		Module 2: Principles of Temporary Traffic Control	30 min	0 min	30 min
		Lunch			
	PM Session 1	Module 3: Temporary Traffic Control Elements	60 min	0 min	60 min
		Module 4: Traffic Control Devices	60 min	0 min	60 min
		Break			
	PM Session 2	Module 4: Traffic Control Devices, continued	120 min	0 min	120 min
Daily Totals			480 min	0 min	480 min

	Session	Module	Instructional Hours		
			Classroom	Lab/Field Activity	Total
Day 2	AM Session 1	Module 4: Traffic Control Devices, continued	120 min	0 min	120 min
		Break			
	AM Session 2	Module 4: Traffic Control Devices, continued	90 min	0 min	90 min
		Module 5: Pedestrian and Worker Safety	30 min	0 min	30 min
		Lunch			
	PM Session 1	Module 6: Flagger Control	120 min	0 min	120 min
		Break			
	PM Session 2	Module 6: Flagger Control, continued	30 min	0 min	30 min
		Module 7: Control of Traffic Through Incident Management Areas	60 min	0 min	60 min
		Course review and course evaluation	30 min	0 min	30 min
Daily Totals			480 min	0 min	480 min
		Class Total	16 hours	0 min	16 hours

Instructor Course Preparation Checklist

1. Off-site Preparation

☐ If taught at customer location, customer will supply all necessary equipment and field materials as agreed.

☐ Obtain Part 1, General Introduction and Part 6, Temporary Traffic Control of the national MUTCD for the state thecourse is to be taught.At the publication of this Instructor Guide, the states in OSHA Region VI are using the following versions of the MUTCD:

- 2009 national MUTCD—Arkansas, New Mexico, and Oklahoma (should be using in February 2011; consult with the point of contact)
- 2003 national MUTCD—Louisiana and Oklahoma
- 2006 Texas MUTCD—Texas

2. Tools

☐ 3 traffic cones (minimum 28” high)

☐ 1 STOP/SLOW paddle

☐ 1 red flaggers flag, 24” x 24” w/retroreflectivity

☐ 1 ANSI/ISEA 107-1999 or 107-2004 safety vest

☐ Hard hat

☐ Safety glasses

3. Equipment

☐ Computer

☐ Data projector

☐ Screen (if not provided)

☐ Stands for projectors and computers if required (2 each)

☐ Extension cords with multiple plugs

4. Instructional Aids / Media

- ☐ Work Zone Traffic Control Instructor Guide
- ☐ Reference Guide to Work Zone Traffic Control
- ☐ Computer disk with instructional media (back-up)
- ☐ Work Zone Traffic Control Final Exam

5. Special Requirements / Instructions

- ☐ Confirm physical location of class. Some classroom locations may be difficult to find.
- ☐ Set up a static display of tools (cones, paddle, vests, etc.) to use throughout the course as questions/opportunities arise.
- ☐ Check the roster in case a conflict has necessitated sending a replacement participant.
- ☐ If participants are not listed on the roster, verify that they are paid with Customer Care Center (979) 845-6563.

Module

0

Introduction and Orientation

Instructional Guidance

Time

60 minutes

Materials/Equipment

1. Registration Forms
2. General Release Form
3. Student Sign-In Sheet
4. Chapter 6E of the MUTCD version the state uses
5. Defensive Flagging: A Survivor's Guide
6. Laptop computer
7. Computer graphics generator (projector)
8. PowerPoint Presentation

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Complete registration forms
2. Introduce instructor(s)
3. Introduce course participants
4. Overview of participant manual and other resources
5. Static display of all equipment set-up for use throughout the course

Introduction


1 - 2

In this module, participants complete registration procedures and receive course information including prerequisites and attendance requirements, as well as evaluation and certification information. The instructor will conduct a brief overview of the course, which includes the goals and objectives, required participant equipment, and the course schedule.

About Work Zone Traffic Control

The control of all road users through a temporary traffic control (TTC) zone is an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents. It is required to plan for the needs of all road users including motorists, bicyclists, and pedestrians, including persons with disabilities, in accordance with the Americans with Disabilities Act of 1999 (ADA), Title II, Paragraph 35.130.

During this class, we will discuss typical applications, traffic control plans, and complete simple exercises. You will learn about traffic control devices, flagging procedures, and pavement markings.

Course Goal


3

Upon successful completion of this course, the participant will be able to develop a federal compliant work zone traffic control plan that maximizes driving public and work crew safety.

Course Overview


4 - 5

Module 1: The Manual on Uniform Traffic Control Devices

Module 2: Principles of Temporary Traffic Control

Module 3: Temporary Traffic Control Elements

Module 4: Traffic Control Devices

Module 5: Pedestrian and Worker Safety

Module 6: Flagger Control

Module 7: Control of Traffic through Incident Management Areas

Target Audience

This course is designed for city, county, state, toll road authority, public utilities, contractors, and any other personnel directly involved in developing and/or implementing work zone traffic control.

Delivery Methods

Course delivery consists of lectures, group discussions, demonstrations, participant activities, and practical applications.

Prerequisites

None.

Course Length

16 hours

Registration and Attendance

Attendance is crucial in order to receive credit for this course. All participants must complete a registration form at the beginning of the course, sign the attendance roster for each day of the course, and complete the evaluation at the end of the course in order to receive a certificate of completion.

Participant Evaluation Strategy

The instructor will orally test the participants' command of terminal and enabling objectives at the corresponding points in the presentation. Problem areas that are identified during questioning will be reviewed in further detail. In addition, proficiency will be evaluated through participation in group activities that require the application of information presented by the instructor in a street or highway setting.

Administrative Instructions

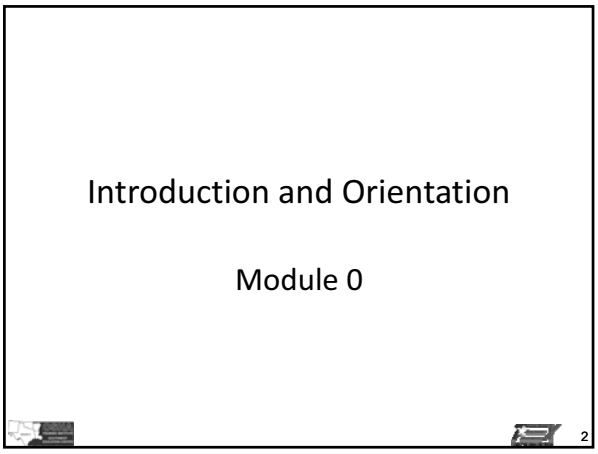

6

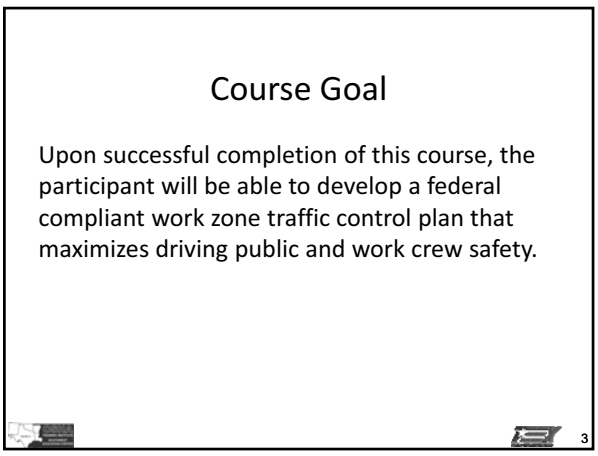
6. Completion of Course Registration Forms
7. Instructor Introduction
8. Participant Introductions
   - Name
   - Work organization
   - Work experience
9. Safety and Convenience Features of the Training Facility
10. Overview of Course Materials and Other Resources
    - Make sure participants have copies of participant manuals.
    - Point out important or frequently referenced material in participant manuals.

Instructor Note

Instructors should inform participants that the Participant Manual is to be used for classroom purposes only and is not intended to be used as a field guide.

Module 0 PowerPoint Slides





Course Overview

- Module 1: The Manual on Uniform Traffic Control Devices
- Module 2: Principles of Temporary Traffic Control
- Module 3: Temporary Traffic Control Elements

4

Course Overview

- Module 4: Traffic Control Devices
- Module 5: Pedestrian and Worker Safety
- Module 6: Flagger Control
- Module 7: Control of Traffic through Incident Management Areas

5

Administrative Details

- Course registration forms
- Introductions
- Safety and convenience features
- Overview of course materials

6

Module

1

The Manual on Uniform Traffic Control Devices

Terminal Objective

Upon successful completion of this module, the participant will be able to explain requirements in the *Manual on Uniform Traffic Control Devices* (MUTCD) that pertain to traffic control devices.

Enabling Objectives

1. Define liability in terms of negligence.
2. Differentiate between the four heading wording choices in the MUTCD.
3. Discuss standard changes between the 2003 and 2009 editions of the MUTCD.
4. Identify five basic requirements of traffic control devices.
5. Discuss aspects to consider regarding traffic control devices.

Instructional Guidance

Time

90 minutes

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 1
3. Screen or monitor
4. Laptop
5. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.

Introduction


1

Failure to follow the *Manual on Uniform Traffic Control Devices* (MUTCD) can have serious, and sometimes fatal, consequences in work zones. It is important for the work crew to follow all standards and guidelines in the MUTCD in order to protect the public and workers.

This module will cover standards and information from the Introduction and Part 1 of the MUTCD.

Activity 1.1: Roadway Diagram


2

Using the following scenario, participants will create a traffic control plan (TCP) based on their current knowledge and abilities. See Roadway Diagram 1a. In module 3, participants will have the opportunity to recreate this traffic control plan using the appropriate tables and compare the new traffic control plan with this original. (10 minutes)

> This is a multi-lane urban street with curb and gutter, with a posted speed of 30 m.p.h. The street has two 12 ft. lanes in each direction. Patching is needed in the curb lane.
>
> The work will require that the curb lane be closed for about three hours during a normal daytime work shift. Traffic volumes are light, and one lane can be closed without causing congestion.
>
> You have been asked to prepare a traffic control plan using a merging taper to close the curb lane. Show the location of all signs, channelizing devices, and any other traffic control devices you recommend.

Conclusion: Now that you have had the opportunity to develop a traffic control plan, we can now start to investigate the Manual on Uniform Traffic Control Devices (MUTCD).

Liability


3

3. Money damages for injury or death
4. Decided by jury or settlement
5. May be the result of negligence


4 - 8

6. Negligence
   - Doing something that a reasonable person would not do
   - Not doing something that a reasonable person would do

Instructor Note

Q: Why do we have the MUTCD? What lead to its development?

A: The auto revolutionized travel which led to the development of uniform signs and markings.

Show video clip of San Francisco (2.5 minutes)

MUTCD Headings


9

7. Standard
8. Guidance
9. Option
10. Support

Activity 1.2: MUTCD Headings


10

Select a statement from the MUTCD. Read the statement to the class. The class determines whether the statement represents a standard, guidance, option, or support heading. The goal is to have at least one of each heading identified.

Participant Response Opportunity

Q: Explain the difference between the words "Standard" and "Guidance" when selecting the installation of a particular traffic control device.

A: A standard is a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. Guidance is defined as a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or an engineering study indicates a deviation to be appropriate.

Part VI Standard Changes from 2003 to 2009

Instructor Note

The MUTCD provides a list of standards that are new or are modified from the previous edition. This listing specifies compliance dates for traffic control devices not previously required but that are required by the new standards in the 2009 MUTCD.

Be sure to review these changes to ensure that you and your organization are complying with the new standards.


11

1. Chapter 6D. Pedestrian and Worker Safety
2. Chapter 6E. Flagger Control, Section 6E.02: High Visibility Safety Apparel For Flaggers
3. Chapter 6F. Temporary Traffic Control Zone Devices
4. Chapter 6I: Control of Traffic through Traffic Incident Management Areas

Participant Response Opportunity

Q: What standards that are new or modified from the previous edition of the MUTCD will affect your job the most?

A: Responses will vary

Basic Requirements of Traffic Control Devices


12 - 16

1. Need
2. Command attention
3. Simple and clear meaning
4. Command respect
5. Adequate time

Participant Response Opportunity

Q: What are the basic requirements of traffic control devices?

A: Fulfill a need; command attention; convey simple and clear meaning; command respect from road users; give adequate time for proper response.

Aspects to Consider Regarding Traffic Control Devices


17 - 22

1. Design
2. Placement and Operation
3. Maintenance
4. Uniformity
5. Responsibility
6. Authority
7. Engineering study and engineering judgement

Activity 1.3: Meeting Requirements?


23 - 26

Participants will view a series of slides and identify which of the basic requirements are or are not being met in terms of the design, placement/operation, maintenance, and uniformity of the traffic control device (Figure 1.1 to Figure 1.3).

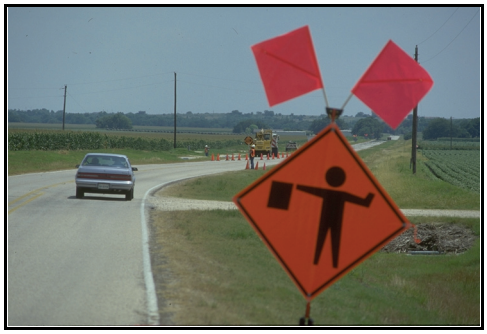


Figure 1.1: Slide 24

Slide 24:

Instructor Note

Answer: Sign fulfilling a need

Figure 1.2: Slide 25

Slide 25:

Instructor Note

Answer: Does not command respect

Figure 1.3: Slide 26

Slide 26:

Instructor Note

Answer: Placement does not command attention

Application of Participants' Knowledge/Skills

Throughout this module, participants will discuss the importance of the MUTCD and what it states regarding the need for and the proper use of temporary traffic control devices. Activities reinforce these expectations and the purpose and application of temporary traffic control devices.

Evaluation of Participants

The instructor will use oral questioning during the presentation to assess participants' mastery of the material. Problem areas that are identified during questioning will be reviewed in further detail. In addition, proficiency will be assessed during activities contained in this module.

Summary

It is important to protect your organization and yourself from liability. The best way to do that is to follow the standards and guidelines pertaining to temporary traffic control.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2009 edition.

Module 1 PowerPoint Slides

The Manual on Uniform Traffic Control Devices

Module 1

1

Participant Activity 1.1: Create a Traffic Control Plan

- Create traffic control plan (TCP)
- Roadway Diagram 1a

2

Liability

- Money damages
- Decided by jury or settlement
- May be result of negligence

3

Negligence

- Doing something a reasonable person would not do
- Not doing something a reasonable person would do

4

Negligence?

5

Negligence?

6

Why do we have the TMUTCD?
What led to its development?

– The auto revolutionized travel
– Led to the development of uniform signs and markings

7

8

MUTCD Headings

- Standard
- Guidance
- Option
- Support

9

Participant Activity 1.2: MUTCD Headings

- Identify the statement as a standard, guidance, option, or support

10

Standard Changes

- Chapter 6D
- Chapter 6E
- Chapter 6F
- Chapter 6I

11

Basic Requirements of Traffic Control Devices

- Fulfill a need

12

Basic Requirements of Traffic Control Devices

- Command attention

13

Basic Requirements of Traffic Control Devices

- Convey a clear and simple meaning

14

Basic Requirements of Traffic Control Devices

- Command respect from road users

15

Basic Requirements of Traffic Control Devices

- Give adequate time for proper response

16

Traffic Control Devices

- Design

17

Traffic Control Devices

- Placement and operation

Traffic Control Devices

- Maintenance

Maintenance of Traffic Control Devices

- "**Acceptable**"
- "**Marginal**"
- "**Unacceptable**"

20

Traffic Control Devices

- Uniformity
- Responsibility

21

Uniformity of Traffic Control Devices

- Uniformity helps us to move rapidly from 1 to 4

1. SEE IT
2. UNDERSTAND IT
3. DECIDE ON A COURSE OF ACTION
4. DO IT

22

Participant Activity 1.3: Meeting Requirements?

- Which basic requirements are either met, or not being met, in the following images?

23

Participant Activity 1.3

Good advance placement of sign

24

Participant Activity 1.3

Command Respect?

25

Participant Activity 1.3

Time for proper response?

Command Attention?

26

Module

2

Principles of Temporary Traffic Control

Terminal Objective

Upon successful completion of this module, the participant will be able to discuss temporary traffic control issues.

Enabling Objectives

Upon successful completion of this module, the participant will be able to:

1. Discuss the function of temporary traffic control.
2. Explain the basic requirements of temporary traffic control devices.
3. Describe five categories of work duration.
4. Describe work location in a temporary traffic control zone.

Instructional Guidance

Time

90 minutes

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 2
3. Screen or monitor
4. Laptop
5. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.

Introduction

Participant Response Opportunity

To transition into this module, have participants discuss why there is a need for temporary traffic control. What would it be like to work a job without temporary traffic control?


1

This module covers the standards and information found in chapters 6A, 6B, and 6G of the MUTCD.

Function of Temporary Traffic Control


2

1. Meet needs and control of all road users
2. Includes persons with disabilities

Fundamental Principles of Temporary Traffic Control

Instructor Note

Refer to Section 6B.01 for the fundamental principles of temporary traffic control. Following these fundamental principles will assist road users and help protect workers in the vicinity of TTC zones.


3 - 21

3. Road user and worker safety and accessibility
4. Road user movement
5. Motorists, bicyclists, and pedestrians

Instructor Note

Slides 9-12 illustrate guiding road users in a clear and positive manner:

- *Initial sign changes motorists' expectations.*
- *Second sign provides further information.*
- *Traffic control devices guide road users.*
- *Pedestrians need a clear travel path.*

6. Routine day and night inspections of TTC elements
7. Maintenance of roadside safety

8. Worker training
9. Public relations

Instructor Note

"Before any detour or temporary route is opened to traffic, all necessary signs shall be in place. All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered."

Work Duration


22 - 24

10. Long-term stationary
11. Intermediate-term stationary
12. Short-term stationary
13. Short duration
14. Mobile

Work Location


25 - 29

15. Outside the shoulder
16. On the shoulder with no encroachment
17. Work on the shoulder with minor encroachment
18. Within the median
19. Within the travel-way

Application of Participants' Knowledge/Skills

Throughout this module, participants will discuss the principles of temporary traffic control.

Evaluation of Participants

The instructor will use oral questioning during the presentation to assess participants' mastery of the material. Problem areas that are identified during questioning will be reviewed in further detail.

Summary

Temporary traffic control serves to safely direct road users through or around a work zone while keeping workers safe. There are several fundamental principles that can guide you to ensure that safety is a key factor while developing a TTC plan. In addition, the work duration and work location will affect the number and type of TTC devices that should be used within a TTC area; these factors should be considered for everyone's safety.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2009 edition.

Module 2 PowerPoint Slides

Principles of Temporary Traffic Control

Module 2

1

Function of Temporary Traffic Control

Move road users through and around TTC zones safely and efficiently

2

Fundamental Principles

Road User Safety

Worker Safety

3

Protecting Drivers?

4

Low Profile Barriers

- Protect drivers and workers

5

Fundamental Principles

- El plan para el TTC debe ser preparado y entendido…

6

Fundamental Principles

- El movimiento de los usuarios de la vía pública se debe inhibir en el menor grado factible.

7

Fundamental Principles

- Guide traffic in a clear and positive manner
  - Tell drivers what to do
  - Show them the way

8

First Sign Changes Motorists' Expectations

9

Second Sign Provides Further Information

10

Traffic Control Devices Guide Road Users

11

Pedestrians Need a Clear Travel Path

12

Fundamental Principles

- Routine day and night inspections of TTC elements

13

Fundamental Principles

- Maintain roadside safety

14

Are these devices crashworthy?

15

Is this sign support crashworthy?

Not Crashworthy

16

Fundamental Principles

- Each person who affects work zone safety should receive training

17

Fundamental Principles

- Public relations

18

Standard

- Before any detour or temporary route is opened to traffic, all necessary signs shall be in place.

19

Standard

- TTC devices shall be removed when no longer needed
- TTC devices shall be removed or covered when work is suspended

20

Adequate Cover?

21

Work Duration

- Long-term stationary
  - More than 3 days
- Intermediate-term stationary
  - More than 1 daylight period up to 3 days
  - Nighttime work lasting more than 1 hour

22

Work Duration

- Short-term stationary
  - Daytime work at a location for more than 1 hour within a single daylight period
- Short duration
  - Occupies up to 1 hour

23

Work Duration

- Mobile
  - Moves continuously or intermittently
  - Stops lasting up to 15 minutes

24

Work Location

Outside the shoulder

25

Work Location

On shoulder – no encroachment

26

Work Location

On Shoulder – minor encroachment

27

Work Location

Within Median

28

Work Location

Within Traveled-Way

29

Module

3

Temporary Traffic Control Elements

Terminal Objective

Upon successful completion of this module, the participant will be able to show correct placement of traffic control devices in a temporary traffic control zone.

Enabling Objectives

Upon successful completion of this module, the participant will be able to:

1. Discuss use of traffic control plans.
2. Explain function of work zone traffic control components.
3. Calculate length of traffic control components based on road or traffic conditions.

Instructional Guidance

Time

60 minutes

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 3
3. Screen or monitor
4. Laptop
5. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.

Introduction


1

This module covers standards and information found in Chapter 6C of the MUTCD.

Traffic Control Plans


2

3. Do not cover every situation
4. Adapt to site specific needs
5. May combine features from several TAs
6. Use engineering judgment
7. Represents minimum solutions

Work Zone Traffic Control Components


3 - 6

8. Advance warning area
9. Transition area
10. Activity area
11. Termination area

Activity 3.1: Work Zone Components


7 - 8

Have participants fill in blank of components.

Participant Response Opportunity

Q: What is the purpose of the Buffer Space?

A: Provides protection for traffic and workers

Q: Is the buffer space optional?

A: Yes

Traffic Control Component Distances


9 - 11

12. Buffer space

Table 6C-2. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

Figure 3.1: 2009 MUTCD Table 6C-2

12 - 16

13. Tapers

– Types

- Merging
- Shifting
- Shoulder
- One-lane, two-way
- Downstream

17 - 25

– Taper lengths

- Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones
- Table 6C-4. Formulas for Determining Taper Length

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

Figure 3.2: 2009 MUTCD Table 6C-3

Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

Figure 3.3: 2009 MUTCD Table 6C-4

Instructor Note

Slides 19-25 provide examples and practice in using Tables 6C-3 and 6C-4 to determine taper lengths.


26 - 30

14. Advance warning sign spacing
    - Sign spacing depends on road classification
    - Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)*	100 feet	100 feet	100 feet
Urban (high speed)*	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

* Speed category to be determined by the highway agency
** The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

Figure 3.4: 2009 MUTCD Table 6C-1

Instructor Note

Be sure to explain the meaning of the asterisks on Table 6C-1 and give an example of how they would be used.


31 - 32

15. Procedures for Planning Lane Closures
    - Installation
        - Install devices in the direction traffic moves.
        - Supervisor should review installation process with crew.
    - Removal - Pick up devices in reverse sequence used for installation.
    - Use of police

Activity 3.2: Device Spacing


33 - 35

Using the tables introduced throughout this module, teams will now determine the buffer space, merging taper length, spacing of TCD in taper and tangent, sign spacing, and length of the downstream taper for the scenario problem introduced in module 1. These components are to be sketched in place on Roadway Diagram 1b.

> This is a multi-lane urban street with curb and gutter, with a posted speed of 30 m.p.h. The street has two 12 ft. lanes in each direction. Patching is needed in the curb lane.
>
> The work will require that the curb lane be closed for about three hours during a normal daytime work shift. Traffic volumes are light, and one lane can be closed without causing congestion.
>
> You have been asked to prepare a traffic control plan using a merging taper to close the 12 ft. curb lane. Show the location of all signs, channelizing devices, and any other traffic control devices you recommend.

The following table is to help participants organize their data.

Posted Speed 30	Lane Width 12 ft.	Information Source	Length or Distance
Buffer Length (Stopping Sight Distance as a Function of Speed)		Table 6C-2	200 ft.
Merging Taper Distance		Table 6C-4	180 ft.
Spacing Distances of Devices in Taper		Section 6C.08 Section 6F.63 RG p. 12	30 ft.
Spacing of Devices in Tangent		Section 6F.63 RG p. 12	60 ft.
Advance Warning Sign Spacing		Table 6C-1	100 ft.
Downstream Taper		Table 6C-3	50 ft. minimum 100 ft. maximum

Application of Participants' Knowledge/Skills

Throughout this module, participants will discuss the principles of temporary traffic control.

Evaluation of Participants

The instructor will use oral questioning during the presentation to assess participants' mastery of the material. Problem areas that are identified during questioning will be reviewed in further detail.

Summary

Temporary traffic control serves to safely direct road users through or around a work zone while keeping workers safe. There are several fundamental principles that can guide you to ensure that safety is a key factor while developing a TTC plan. In addition, the work duration and work location will affect the number and type of TTC devices that should be used within a TTC area; these factors should be considered for everyone's safety.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2009 edition.

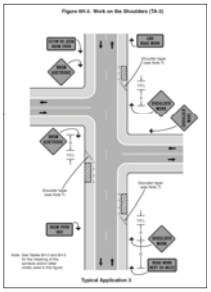
Module 3 PowerPoint Slides

Temporary Traffic Control Elements

Module 3

1

MUTCD Typical Applications



2

Work Zone Traffic Control Components

- Advance warning area
- Transition area
- Activity area
- Termination area

3

Work Zone Traffic Control Components

- Advance warning area
- Transition area
- Activity area
- Termination area

4

Work Zone Traffic Control Components

- Advance warning area
- Transition area
- Activity area
- Termination area

5

Work Zone Traffic Control Components

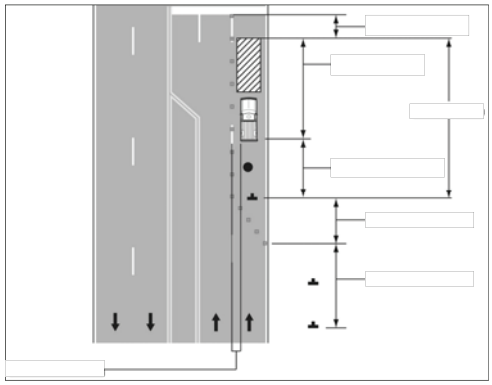
- Advance warning area
- Transition area
- Activity area
- Termination area

6

Activity 3.1: Work Zone Components

- Identify the components indicated on the worksheet.

7



8

Buffer Space

- Positioned in advance of work space
- Separates the traffic space from the work space

9

Buffer Space

10

Buffer Space

Table 6C-2. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

11

Types of Tapers

- Tapers
  - Merging
  - Shifting
  - Shoulder
  - One-lane, two-way
  - Downstream

12

Types of Tapers

- Tapers
  - Merging
  - Shifting
  - Shoulder
  - One-lane, two-way
  - Downstream

13

Types of Tapers

- Tapers
  - Merging
  - Shifting
  - Shoulder
  - One-lane, two-way
  - Downstream

14

Types of Tapers

- Tapers
  - Merging
  - Shifting
  - Shoulder
  - One-lane, two-way
  - Downstream

15

Types of Tapers

- Tapers
  - Merging
  - Shifting
  - Shoulder
  - One-lane, two-way
  - Downstream

16

Taper Length

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

17

Taper Length

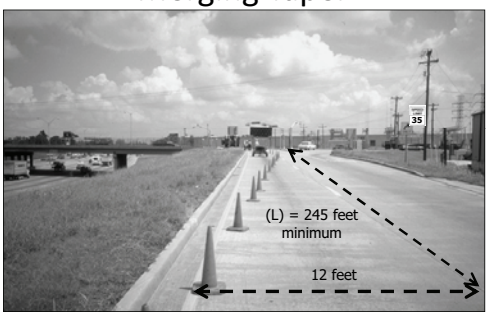
Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

18

Merging Taper



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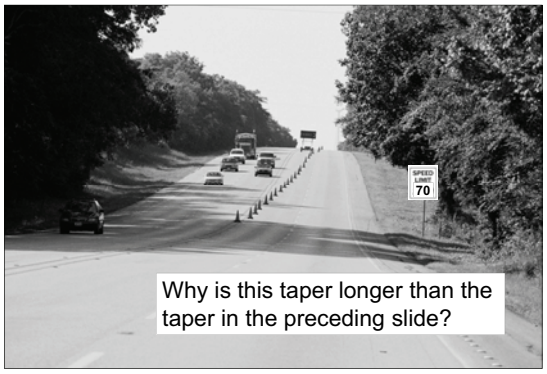


20

Merging Taper

- At 30 mph with a lane width of 12 feet, the merging taper would be _____.
- 180 feet minimum

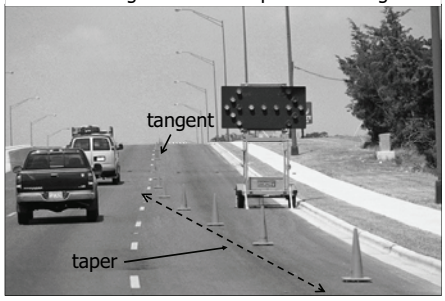
21

Merging Taper

- At 55 mph with a lane width of 12 feet, the merging taper would be _____.
- 660 feet minimum

22

Understanding the words "taper" and "tangent"



23

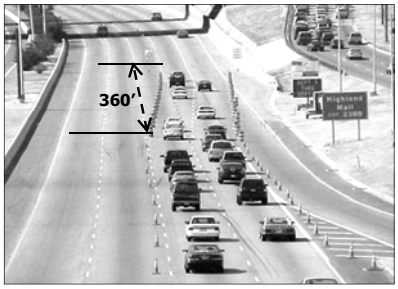
Shifting Taper

Shifting taper
= ½ L

L = 60 mph
W = 12′

L= 720′

½ L = 360′



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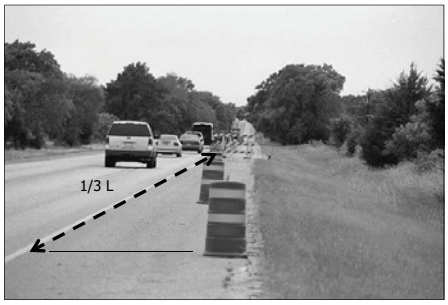
Shoulder Taper



25

Traffic signs in the advance warning area tell drivers what to expect

26

Sign Spacing

- What determines how far apart signs should be spaced?

Depends on whether the road is classified as a/an
- Urban low speed
- Urban high speed
- Rural
- Expressway/freeway

27

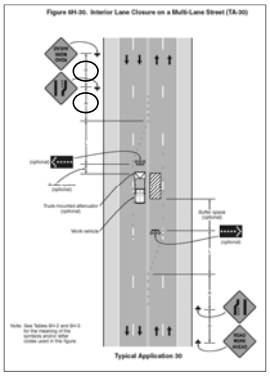
Advance Warning Sign Spacing

Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)*	100 feet	100 feet	100 feet
Urban (high speed)*	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

* Speed category to be determined by the highway agency
** The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

28



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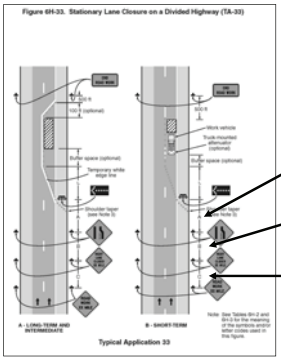


Sign Spacing is Specified for Expressways & Freeways

1,000 ft

1,500 ft

2,640 ft

30

Procedures for Planning Lane Closures

- Multi-lane road
- Two-lane, two-way road

31

Installation and Removal of Temporary Traffic Control Devices

- Installation
- Removal
- Use of police
- Shadow vehicles

32

Activity 3.2: Device Spacing

- Use the tables for component spacing to develop a TCP for the problem you worked in Module 1.
- Roadway Diagram 1b

33

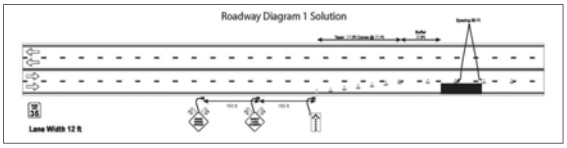
Actividad del Participante 3.2

Posted Speed 30 mph	Lane Width 12 ft	Information Source	Length or Distance
Buffer Length			
Merging Taper Distance			
Spacing Distance of Taper			
Spacing Distance of Tangent			
Advance Warning Sign Spacing			
Downstream Taper			

34

Actividad del Participante 3.2

- How do you compare?



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Module 4

Traffic Control Devices

Terminal Objective

Upon successful completion of this module, the participant will be able to demonstrate appropriate use of traffic control devices.

Enabling Objectives

Upon successful completion of this module, the participant will be able to:

1. Define *crashworthiness*.
2. Discuss proper use of signs in a work zone.
3. Discuss proper use of portable changeable message signs.
4. Explain proper use of arrow panels.
5. Discuss application of channelizing devices.
6. Explain maintenance of pavement markings within a temporary traffic control zone.
7. Prepare a work zone traffic control plan.

Instructional Guidance

Time

6 hours

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 4
3. Screen or monitor
4. Laptop
5. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.

Introduction


1

This module covers standards and information found in Part 6, Section C Temporary Traffic Control Elements of the MUTCD.

Crashworthiness


2

3. Federal Highway Administration requires that all roadside appurtenances used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) 350 and, after January 1, 2011, AASHTOs Manual for Assessing Safety Hardware (MASH).
4. All sign supports are required to be crashworthy.

Participant Response Opportunity

Q: What is the purpose of the having temporary traffic control devices identified as crashworthy?

A: Protects road users by ensuring that devices cause minimal damage to a vehicle and its occupants if hit.

Signs


3 - 5

5. Types of signs
   - Regulatory
   - Warning
   - Guide


6

6. Sign visibility
   - Daytime
   - Nighttime


7 - 8

7. Sign size
   - See Table 6F-1 in MUTCD for minimum sizes of TTC signs
   - Larger signs may be used for emphasis


9 - 10

8. Sign placement
   - Located on right side of roadway
   - Height requirements
   - Lateral location

Participant Response Opportunity

Instructors will use slide 10 for this participant response opportunity.

Q: Look at the photo of the opposing traffic lane divider. Should it be replaced?

A: Yes


11 - 22

9. Sign usage/legend
   - ROAD (STREET) WORK (W20-1)
   - ONE LANE ROAD (W20-4)
   - Lane(s) Closed (W20-5, W20-5a)
   - Flagger (W20-7, W20-7a)
   - Workers (W21-1, W21-1a)
   - Shoulder Sign (W21-5, W21-5a, W21-5b)
   - Utility Work Ahead (W21-7)
   - ROAD WORK NEXT XX MILES (G20-1)
   - END ROAD WORK (G20-2)
   - Detour (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)
   - Advisory Speed Plaque (W13-1P)

Participant Response Opportunity

Q: Is the use of the advisory speed plaque appropriate in slide 20?

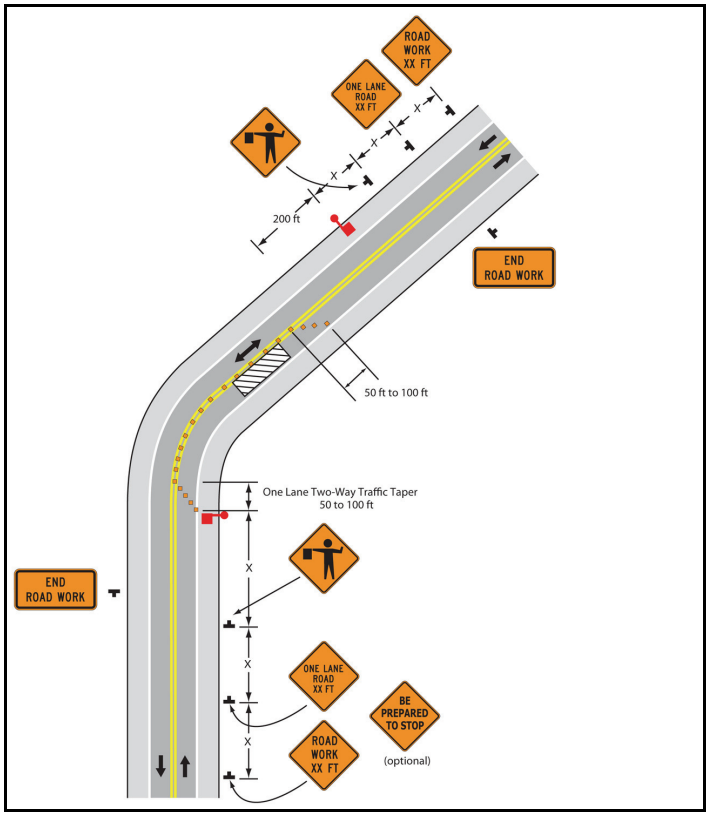
A: No

– UNEVEN LANES (W8-11)

Activity 4.1: Sign Usage

23 - 25

From the selection provided, identify the appropriate signs that should be used on the following typical application.



Portable Changeable Message Signs


26 - 27

1. Can be programmed to display numerous messages
2. Commonly used on urban freeways
3. Appropriate for use on all types of highways

Instructor Note

Discuss the application, components, design requirements, and proper placement of these signs.

4. Message abbreviations
   - Table 1A-1, Acceptable Abbreviations
   - Table 1A-2: Abbreviations That Are Acceptable Only with a Prompt Word
   - Table 1A-3: Unacceptable Abbreviations

Participant Response Opportunity

Q: According to the MUTCD, the bottom of a portable changeable message sign shall be a minimum of ____ ft. above the roadway when in operating mode in an urban area.

A: 7 ft.

Arrow Boards (Panels)


28 - 29

5. Application
6. Arrow displays

Participant Response Opportunity

Q: What are the three operating modes for moving or merging traffic?

A: Flashing arrow, sequential arrow, and sequential chevron

Q: Which display on an arrow panel is the symbol for caution?

A: Four corner lamps flashing simultaneously

Channelizing Devices


30 - 35

1. Cones

Participant Response Opportunity

Q: What is the minimum height of a cone used at night? What is the minimum height of a cone used during the day?

A: 28 inches; 18 inches

Q: What are the general characteristics of cones?

A: Predominantly orange; material will not damage impacting vehicles

2. Vertical panels
3. Drums
4. Barricades
   - Type I barricade
   - Type II barricade
   - Type III barricade

Instructor Note

Discuss slope patterns for different applications.


36 - 40

5. Longitudinal channelizing devices

Instructor Note

Increasing use is being made of water-ballasted channelizing devices.

It is important that the manufacturer be consulted for specific instructions prior to the installation of any water-ballasted system.

6. Opposing Traffic Lane Divider and sign (W6-4)
7. Temporary traffic control signals

8. Temporary traffic barriers as channelizing devices
   - Are not TTC devices
   - Should not be used for a merging taper


41 - 42

9. Crash cushions
   - Stationary
   - Truck-mounted attenuators

Activity 4.2: Roadway Diagram


43 - 46

Using the tables introduced in module 3, work with participants to develop a traffic control plan for the scenario problem below. The traffic control zone components are to be sketched in place on the Roadway Diagram 2.

> Ash Avenue is a four lane urban street with a posted speed of 45 m.p.h. Extensive road repair is needed in a location north of King Street that will necessitate that one lane be closed to traffic for about four hours during a normal daylight work shift.
>
> You have been asked to prepare a traffic control plan for this activity.

Participants will create the TCP on Roadway Diagram 2.

Instructor Note

Roadway Diagram 2 may have more than one solution. Regulatory signs - "Right Lane Must Turn Right" - may be used instead of merging tapers before intersection. See TA-22.

Pavement Markings


47 - 51

10. Pavement markings shall be maintained in all long-term stationary TTC zones
11. Pavement markings that are no longer applicable shall be removed or obliterated

Activity 4.3: Practical Application


52 - 65

Based on the audience, have participants complete at least one of the scenarios listed below. Participants can work alone or in teams of two or three.

Roadway Diagram 3 (TA-22)

This is a two-lane, two-way rural highway, with a posted speed of 50 m.p.h. in an area of rolling terrain. The roadway is 22 ft. wide with 11 ft. paved shoulders. Patching is needed on the shoulder. An intersecting road is located at the top of the hill.

The work will require that the shoulder be closed for about 4 hours during a normal daytime work shift. Traffic volumes are moderate. You have been asked to prepare a traffic control plan for this work activity.

Roadway Diagram 4 (TA-37)

This is a divided freeway with three 12 ft. lanes and with 10 ft. shoulders on both sides of the roadway. The freeway has a posted speed of 60 m.p.h. Work is needed in an interior lane and will take about 3 hours. You have been asked to prepare a traffic control plan. Show the location of all signs, channelizing devices, and any other traffic control devices you recommend.

In order to minimize traffic problems, the work will be done in daylight conditions on a Sunday morning from 7:30-10:30 a.m. One through lane can handle the traffic volumes during that time period.

Application of Participants' Knowledge/Skills

Participants will determine which signs are appropriate for a particular traffic control plan, add signage at the appropriate spacing on the Roadway Diagram 1b, and complete pavement edge drop-off problems.

In addition, participants will create at least one traffic control plan based on given scenarios.

Evaluation of Participants

The instructor will use oral questioning during the presentation to assess participants' mastery of the material. Problem areas that are identified during questioning will be reviewed in further detail. In addition, proficiency will be assessed during activities contained in this module.

Summary

We have learned about the traffic control devices used in and around a temporary traffic control zone.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2009 edition.

Module 4 PowerPoint Slides

Traffic Control Devices

Module 4

1

Crashworthiness

- MUTCD
- Must be NCHRP 350 compliant
- New devices must use MASH testing

2

Regulatory Sign

3

Warning Sign

4

Guide Sign

5

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

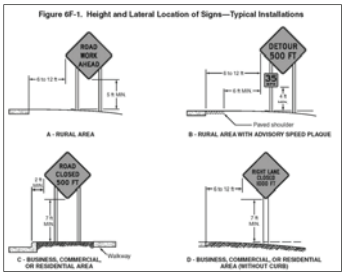
6

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

7

Height and Lateral Locations of Signs Typical Installations



8

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

9

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

10

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

11

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

12

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

13

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

14

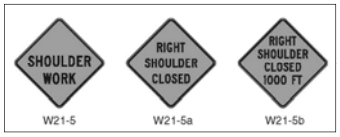
Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

15

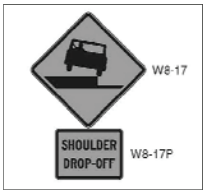
Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend



16

Usage/Legend



17

Signs

Page 6F-23

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

18

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

19

Signs

- Colors
- Size
- Placement
- Maintenance
- Usage/legend

20

Advisory Speed Plaque

21

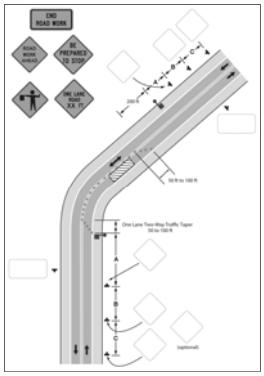
Usage/Legend

22

Activity 4.1: Sign Usage

- Identify which signs should be used for the given work zone. Select the proper sign(s) from the choices given.

23



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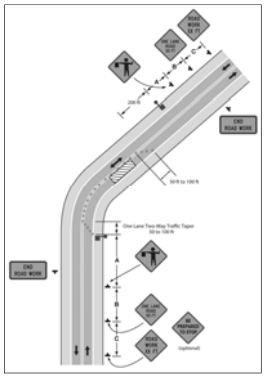


25

Portable Changeable Message Signs

26

Portable Changeable Message Signs

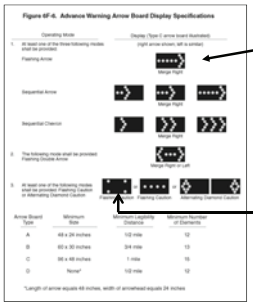
- Mounting
- Visibility
- Message abbreviations

27

Arrow Panels

28

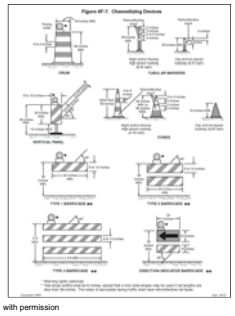
Arrow Panels



- The "flashing arrow" is the standard
- Caution mode

29

Channelizing Devices



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30

Channelizing Devices

- Conos
  - Daytime Use
  - Nighttime Use
  - 2 reflective collars required on cones at night or lighting devices

31

Channelizing Devices

- Panel vertical

32

Channelizing Devices

- Barril

33

Channelizing Devices

- Barricades

Type I Barricade

34

Type III Barricade

35

Longitudinal Channelizing Devices

- Not crashworthy
- Important: Follow manufacturer's installation instructions

36

Opposing Traffic Lane Divider

37

Temporary Traffic Control Signals

- Use
- Operation

38

Temporary Traffic Barriers

Traffic Barriers

Why add reflectors on traffic barriers?

40

Crash Cushions

- Purpose
- Design
- Crashworthiness

41

Truck Mounted Attenuator

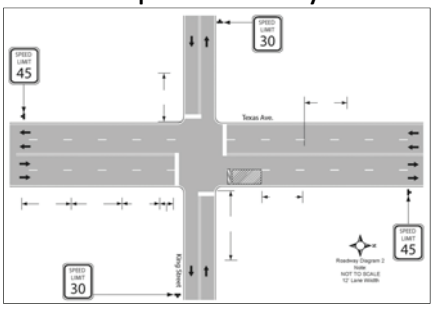
42

Activity 4.2: Roadway Diagram

- Use the appropriate tables to develop a TCP for the scenario provided
- Include proper traffic control devices as needed
- Roadway Diagram 2

43

Participant Activity 4.2



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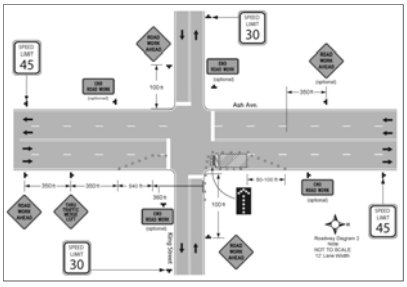
Participant Activity 4.2 Solution 1



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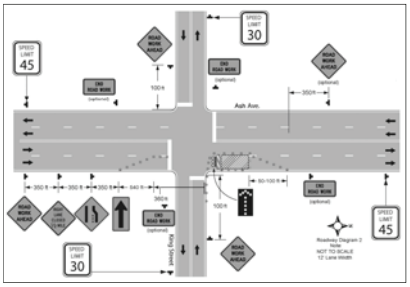
Participant Activity 4.2 Solution 2



46

Pavement Markings

Pavement markings are an important component of the communication system on the highway.

47

Pavement Markings

- Standard markings
- Marcas temporales aplicadas sobre el pavimento
- Marcadores de pavimento elevados

48

Pavement Markings

Shall be maintained in long and intermediate term stationary work zones.

49

Pavement Markings

If no longer applicable, pavement markings shall be removed or obliterated in long-term work zones.

50

Pavement Markings

Temporary pavement markings should not be in place more than 2 weeks unless justified using engineering judgment.

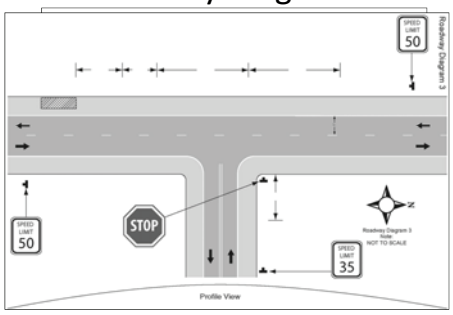
51

Activity 4.3: Practical Application

- The instructor will identify which problem(s) to complete
- Use the appropriate tables to develop a TCP for the scenario provided
- Include proper traffic control devices as needed

52

Roadway Diagram 3



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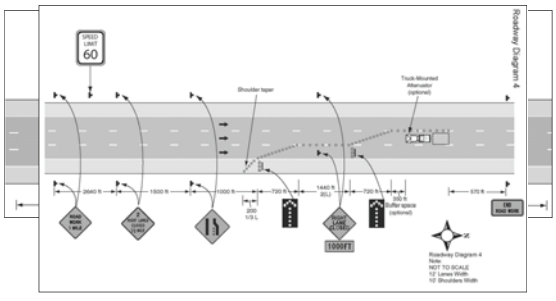
Roadway Diagram 4



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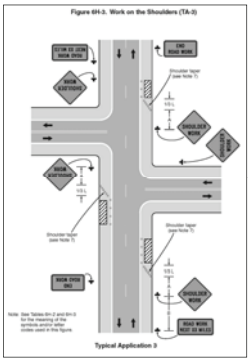
Typical
Application
TA-3



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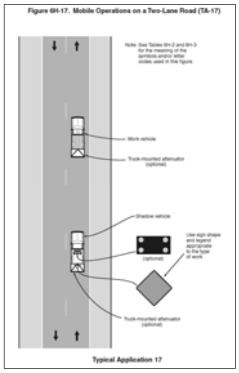
Typical
Application
TA-17



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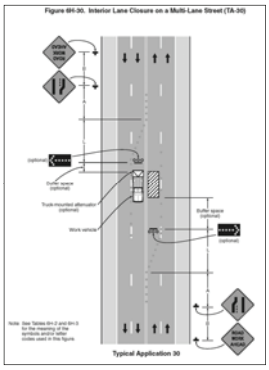
Typical Application TA-30



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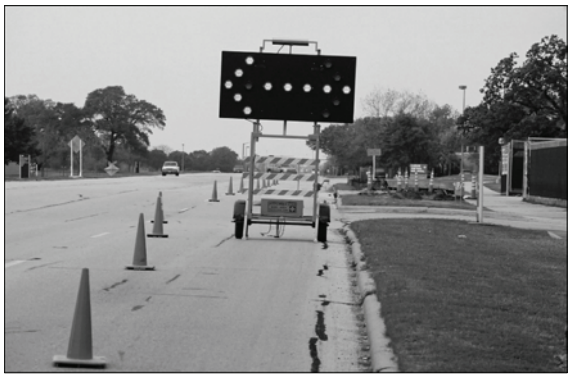

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Module 5

Pedestrian and Worker Safety

Terminal Objective

Upon successful completion of this module, the participant will be able to discuss pedestrian and worker safety in a work zone.

Enabling Objectives

Upon successful completion of this module, the participant will be able to:

1. Describe pedestrian considerations in work zone planning.
2. Discuss accessibility concerns for pedestrians with disabilities.
3. Identify key elements for worker safety in a work zone.

Participant Response Opportunity

Q: Besides workers, who else might be affected by the presence of a work zone?

A: Pedestrians

Q: How might pedestrians be affected by a temporary traffic control zone?

A: Could be led into conflict with work zone vehicles, equipment, and operations

Q: What considerations should be given to pedestrians when planning a temporary traffic control zone?

A: Pedestrian safety, providing an accessible path

Instructional Guidance

Time

1 hour 30 minutes

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 5
3. Screen or monitor
4. Laptop
5. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.

Introduction


1 - 2

The MUTCD has dedicated Section 6D to pedestrian and worker safety.

Participant Response Opportunity

Q: Besides workers, who else might be affected by the presence of a work zone?

A: Pedestrians

Q: How might pedestrians be affected by a temporary traffic control zone?

A: Could be led into conflict with work zone vehicles, equipment, and operations

Q: What considerations should be given to pedestrians when planning a temproary traffic control zone?

A: Pedestrian safety, providing an accessible path

Pedestrian Considerations

Instructor Note

Just like motorists, pedestrians need to be provided with a reasonably safe, convenient, and accessible path. Consideration must be given for the safe passage of those with disabilities.


3 - 7

1. No conflict with vehicles, equipment, and operations
2. No conflict with moving vehicles
3. Provide convenient and accessible path

Participant Response Opportunity

Q: Is a printed sign usable by a person with visual disabilities?

A: No.

Accessibility Considerations


8 - 10

If existing accessible pedestrian facility is closed, then temporary facilities shall be detectable and consistent with the existing pedestrian facility.

Participant Response Opportunity

Q: What are some methods to ensure that a sidewalk remains accessible to pedestrians?

A: Access to transit, 60 inch path

Worker Safety Considerations


11 - 21

4. Worker safety is equally as important as the safety of road users.
5. TTC zones present temporary and constantly changing conditions that are unexpected by the road user.
6. Higher degree of vulnerability for workers on or near the roadway due to constantly changing work environment
7. Worker safety considerations
   - Training
   - Worker safety apparel
   - Temporary traffic barriers
   - Activity area
   - Worker safety planning
8. Additional elements
   - Shadow vehicle
   - Road closures
   - Use of law enforcement
   - Lighting
   - Special devices

Participant Response Opportunity

Q: What are some methods to reduce the speed of motorists?

A: Regulatory speed zoning, lane reduction, use of law enforcement officers, use of flaggers

9. Safety Tips
   - Personnel Protective Equipment (PPE)
   - Drink water
   - Face traffic
   - Use dust mask

Activity 5.1: Safety Apparel

The instructor will ask participants to examine and evaluate safety apparel brought in by the instructor.

1. For working within the right-of-way of a federal aid or Texas state highway, is it mandatory or optional that high-visibility safety apparel meets the requirements of ANSI/ISEA 107-2004?

Instructor Note

Answer: Mandatory

2. How does the user determine if the vest meets the requirements of ANSI/ISEA 107-1999 or 107-2004?

Instructor Note

Answer: See tag

3. What is the minimum visibility distance for a vest worn by a flagger?

Instructor Note

Answer: 1000 ft.

Participant Response Opportunity

Q: Why do we have to wear high visibility safety apparel that complies with ANSI/ISEA 107-1999 or 107-2004?

A: The MUTCD states that workers should wear high visibility apparel meeting ANSI/ISEA requirements.

Q: What can a worker do to minimize their vulnerability while working close to traffic?

A: Know what is going on around you; Remember that you are in a work zone; Look before you step; Watch out for each other; Never turn your back on traffic.

Application of Participants' Knowledge/Skills

The instructor will ask participants to share experiences in which their co-workers were injured within the work zone. Request that they explain how the work zone situation could have been improved to avoid the incident.

Evaluation of Participants

The instructor will use oral questioning during the presentation to assess participants' mastery of the material. Problem areas that are identified during questioning will be reviewed in further detail. In addition, proficiency will be assessed during activities contained in this module.

Summary

When planning a TTC zone, be sure to also consider how any construction activity will affect pedestrians and bicyclists; this must also include their safe passage through or around the work site. We must remember that pedestrians may have a disability, and providing means for their mobility should also be part of the TTC plan.

We must use methods to ensure worker safety. This is achieved by making the workers visible, having the workers trained, and separating workers from traffic. When necessary, apply additional strategies for safety. There can never be too much.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2009 edition.

Module 5 PowerPoint Slides

Pedestrian and Worker Safety

Module 5

1

Pedestrians Need a Usable Travel Path

2

Pedestrian Considerations

- Advance notification required

3

Planning for Pedestrians

- No conflicts with work operations
- No conflicts with moving vehicles
- Provide reasonably safe, accessible path

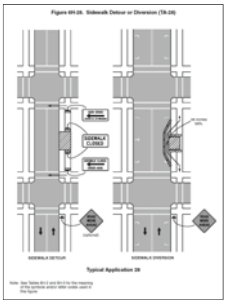
4

Pedestrian Considerations

- Detectable channelized route

5

Device Usage and Techniques



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Separate Usable Footpath

7

Accessibility Considerations

- Continuity of accessible paths
- Access to temporary transit stops
- Plan for disabled pedestrians

8

Accessibility Considerations

- Continuity of accessible paths
- Access to temporary transit stops
- Plan for disabled pedestrians

9

Accessibility Considerations

- Continuity of accessible paths
- Access to temporary transit stops
- Plan for disabled pedestrians

10

Worker Safety Considerations

- Important
- Changing conditions
- High degree of vulnerability

11

Safety Vests

- ANSI/ISEA 107-1999 and 107-2004 Class 2 Risk Exposure

12

Safety Vests

- ANSI/ISEA 107-1999 and 107-2004 Class 3 Risk Exposure

13

Hard Hat

- Protects from flying debris
- Enhances worker visibility

14

Worker Training

- How to work next to traffic
- How to minimize vulnerability
- How to use TTC

15

Activity Area

Minimize backing-up maneuvers by construction vehicles

16

Worker Safety Planning

17

Worker Safety Planning

18

Basic Hazard Assessment

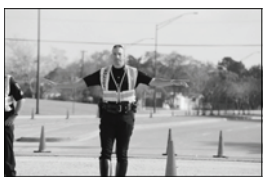
19

Shadow Vehicle

20

Law Enforcement Use

Heightens the awareness of traffic and improves safety



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Module 6

Flagger Control

Terminal Objective

Upon successful completion of this module, the participant will be able to develop a traffic control plan for flaggers.

Enabling Objectives

Upon successful completion of this module, the participant will be able to:

1. Describe the minimum qualifications for a flagger.
2. State requirements for high visibility safety apparel for flaggers.
3. Demonstrate appropriate usage of flagger signaling devices.
4. Identify necessary work zone components when a flagger is present.
5. Discuss flagger positioning on a two lane road when one lane is closed.

Instructional Guidance

Time

2 hours 30 minutes

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 6
3. Variety of safety vests
4. STOP/SLOW Paddle
5. Flag
6. Screen or monitor
7. Laptop
8. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.
3. Prepare devices and vests that will be used in the presentation.

Introduction


1

Many of you, at one time or another, will be called upon to perform flagging duties. Using proper flagging equipment and techniques is just one essential procedure that will ensure the safety of the work crew and the driving public. In this module, you will become acquainted with the specifications of acceptable devices and will learn how to recognize unacceptable ones.

Flagger Qualifications


2

4. A flagger provides temporary traffic control

Participant Response Opportunity

Q: How does a flagger provide TTC?

A: Slow traffic, redirect traffic, stop traffic using hand signals and hand signaling devices

5. Abilities

Participant Response Opportunity

Begin a discussion where participants describe the problems that can arise when a flagger does not have one or more of the abilities required for flaggers.

Flagger Personal Protective Equipment (PPE)


3

6. High-Visibility Safety Apparel must meet American National Standards Institute/International Safety Equipment Association (ANSI/ISEA) standards
7. Hard hat
8. Safety eyewear
9. Safety footwear
10. Additional flagger equipment

Hand-Signaling Devices and Procedures


4 - 7

11. STOP/SLOW paddle
    - Primary hand-signaling device.
    - Standards
        - Color
        - Size of STOP/SLOW paddle
        - Letters at least 6 inches high
        - Retroreflectorized for night use
    - Procedures
        - Stop
        - Proceed
        - Alert and slow traffic

Participant Response Opportunity

Q: Should a STOP/SLOW Paddle be left unattended in the top opening of a cone or any type of stand?
A: No.
Q: What is the recommended size of the sign plate on a STOP/SLOW Paddle?
A: The minimum is 18".
Q: In what hand does the flagger hold the STOP/SLOW Paddle?
A: Right hand.


8 - 11

12. Flag
    - Standards
        - 24" x 24"
        - 36" staff
        - Red or fluorescent red/orange

- Procedures
  - Stop
  - Proceed
  - Alert and slow traffic

Participant Response Opportunity

Q: Is the flag the primary hand signaling device?

A: No.

Q: What size is the flag used for flagging?

A: 24 inch x 24 inches.

Q: How long should the staff of the flagger's flag be?

A: 36 inches

Activity 6.1: Flagging Procedures


12

Demonstrate proper flagging procedure using the stop/slow paddle and the flag. If time allows, have participants demonstrate the procedures.

Activity 6.2: Flagger Video


13

Show the video.

Have participants take the quiz shown at the end of the video to determine if they can locate the 10 errors.

Work Zone Components for Flagging Operations

Instructor Note

Discuss the components of a work zone that use flagger operations on a one-lane, two-way traffic control set-up.


14 - 21

1. Activity Area
   - Buffer space
   - Work space
2. Transition area
   - One-lane, two-way traffic taper (50 foot minimum to 100 foot maximum)
   - Device spacing (20 feet)
3. Advance warning area
4. Termination area
   - Buffer space
   - Downstream taper (50 foot minimum to 100 foot maximum)
   - Device spacing (20 feet)

Participant Response Opportunity

Q: Which traffic control device is installed first when one lane of a multi-lane roadway will be closed?

A: The RWA in the open lane.

Q: Which traffic control device is installed first when one lane of a two-way, multi-road will be closed?

A: The RWA in the closed lane.

One-Lane, Two-Way Traffic Control


22 - 25

5. Two flaggers
6. One flagger
7. Flaggers with pilot car
8. AFADs

Activity 6.3: Roadway Diagram


26

Using roadway diagram 5, participants are to create a traffic control plan based on the following scenario:

> This is a two-lane, two-way rural highway, with a posted speed of 55 m.p.h. Extensive patching is needed in one lane of the road.
>
> The work will require that the lane be closed for about 3 hours during a normal daytime work shift. Traffic volumes are light and you have been asked to prepare a traffic control plan, using alternate one-way traffic control with flaggers, for this work activity. Show the location of the flaggers, channelizing devices, and signs.

Participants should use the following table to aid in organizing their information.

Posted Speed 30	Lane Width 12 ft.	Information Source	Length or Distance
Buffer Length (Stopping Sight Distance as a Function of Speed)		Table 6C-2	495 ft.
Taper Type: One-Lane, Two-Way		Table 6C-3	50 ft. to 100 ft.
Spacing Distances of Devices in Taper		Table 6C-1	55 ft.
Spacing of Devices in Tangent		Table 6C-4	110 ft.
Advance Warning Sign Spacing		Table 6C-1	500 ft.
Downstream Taper		Table 6C-3	100 ft.

Application of Participants' Knowledge/Skills

Participants will evaluate equipment required for flaggers, identify the placement of signage for a work zone with flaggers, and practice using the flags and paddle. Participants will also create a traffic control plan for a given scenario and review liability.

Evaluation of Participants

The instructor will use oral questioning during the presentation to assess participants' mastery of the material. Problem areas that are identified during questioning will be reviewed in further detail.

Summary

The flagger may have one of the most responsible positions on a crew. It is important that flaggers be trained and be able to demonstrate proper flagging commands.

We have learned what qualifications must be met for someone to be eligible as a flagger. We also know the hand-signaling devices and how to properly use them. Lastly, we are now able to develop a TCP that includes a typical two-flagger operation. These skills are important in keeping yourself and others safe when flagging.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2009 edition.

Module 6 PowerPoint Slides

Flagger Control

Module 6

1

Flagger Qualifications

- Abilities
  - Communicate
  - Move and maneuver
  - Control signaling devices
  - Understand TTC practices
  - Recognize dangerous situations, warn workers

2

Flagger Personal Protective Equipment

- High-visibility safety apparel
- Hard hat
- Safety eyewear
- Safety footwear
- Additional flagger equipment

3

Hand Signaling Devices

- Stop/Slow Paddle standards

4

Flagging Procedures

- Stop/Slow Paddle
  - Stop command
  - Proceed command
  - Alert / Slow command

5

Flagging Procedures

- Stop/Slow Paddle
  - Stop command
  - Proceed command
  - Alert / Slow command

6

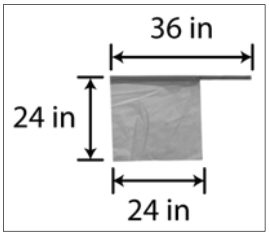
Flagging Procedures

- Stop/Slow Paddle
  - Stop command
  - Proceed command
  - Alert / Slow command

7

Hand Signaling Devices

- Flag standards



8

Flagging Procedures

- Flag
  - Stop command
  - Proceed command
  - Alert / Slow command

9

Flagging Procedures

- Flag
  - Stop command
  - Proceed command
  - Alert / Slow command

10

Flagging Procedures

- Flag
  - Stop command
  - Proceed command
  - Alert / Slow command

11

Activity 6.1: Flagging Procedures

- Participant demonstration

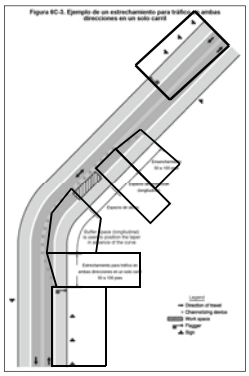
12

Activity 6.2: Flagger Video

13

Work Zone Components for Flagging Operations

- Buffer Space
- Tapers
- Advance Warning



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Buffer Space

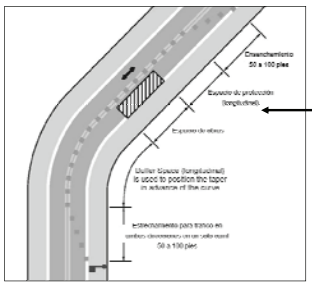


Table 6C-2 may be used as a guide to determine longitudinal buffer space.

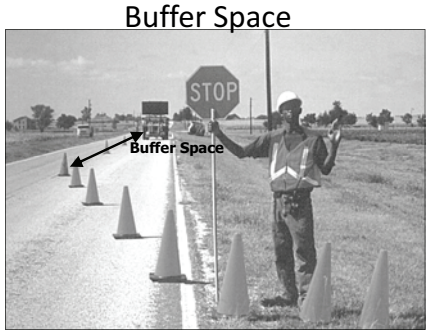
Table 6C-2. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

15

Buffer Space



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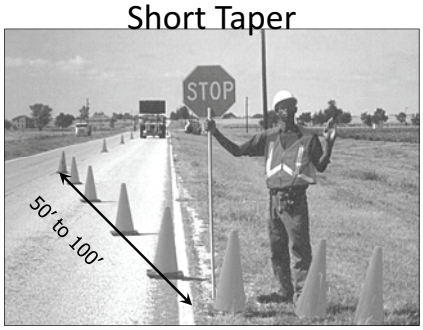
Short Taper



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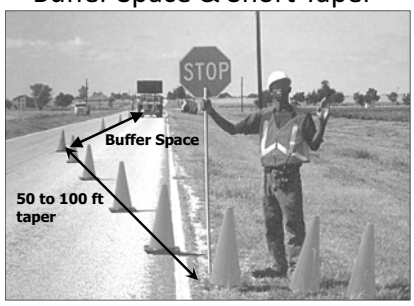
Buffer Space & Short Taper



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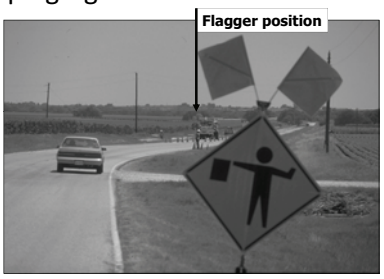
Driver visibility and stopping sight distance

- Adequate distance needed to stop at flagger station
- See Table 6E-1



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Stopping Sight Distance

Table 6E-1. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

20

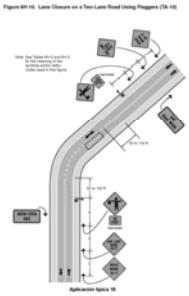
Work Zone Components for Flagging Operations

- Buffer Space
- Tapers
- Advance Warning

21

One-Lane, Two-Way Traffic Control

- Two flaggers
- One flagger
- Pilot car
- AFADs



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One-Lane, Two-Way Traffic Control

- Two flaggers
- One flagger
- Pilot car
- AFADs

23

One-Lane, Two-Way Traffic Control

- Two flaggers
- One flagger
- Pilot car
- AFADs

24

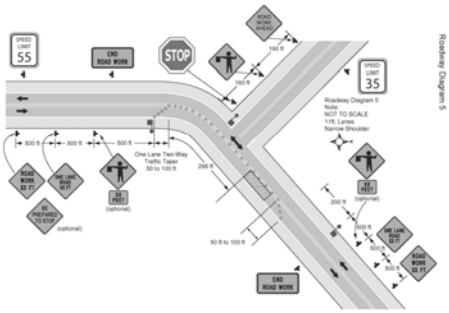
One-Lane, Two-Way Traffic Control

- Two flaggers
- One flagger
- Pilot car
- AFADs

25

Participant Activity: Roadway Diagram

- C



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Module

7

Control of Traffic through Incident Management Areas

Terminal Objective

Upon successful completion of this module, the participant will be able to discuss importance and management of traffic control in an incident area.

Enabling Objectives

Upon successful completion of this module, the participant will be able to:

1. Recognize incident management terminology.
2. Identify signage that designates an incident area.
3. Discuss the use of emergency vehicle lighting.
4. Explain advantage of teamwork between incident responders.

Instructional Guidance

Time

60 minutes

Materials/Equipment

1. Participant Manual
2. PowerPoint Presentation for module 7
3. Screen or monitor
4. Laptop
5. Part 1 and Part 6 of the MUTCD version the state uses

Instructor Preparation

During this portion of the course, the instructor should facilitate the following activities:

1. Become familiar with the content of Part 1 and Part 6 of the MUTCD used by the state in which the course is being taught.
2. Prepare projector and position first PowerPoint slide.

Introduction


1

Have you ever had to respond to a traffic incident? Did you know who to report to, or what to do? The inclusion of *Control of Traffic through Traffic Incident Management Areas* was added to the 2003 MUTCD.

Definitions


2 - 4

1. Traffic incident
2. Traffic incident management area
3. Traffic incident classes
   - Major traffic incident
   - Intermediate traffic incidents
   - Minor traffic incidents

Signage


5 - 14

4. Black legend and border
5. Fluorescent pink background

Emergency Vehicle Lighting


15

6. Essential in initial stages of traffic incident
7. Provides warning only
8. Provides no effective traffic control
9. Often confusing to road users, especially at night
10. Can be reduced if good traffic control has been established
11. Agencies should review policies on use of emergency-vehicle lighting.

Mutual Planning


16

12. Involves
    - Highway agencies
    - Public safety agencies
        - Law enforcement
        - Fire and rescue
        - Emergency communications
        - Emergency Medical Service
    - Private sector responders
        - Towing and recovery
        - Hazardous materials contractors
13. Goal is to mutually plan for occurrences of traffic incidents along the major and heavily traveled highway and street systems and high accident locations

Application of Participants' Knowledge/Skills

Participants will discuss potential issues pertaining to traffic incidents and the need for traffic control at a traffic incident.

Evaluation of Participants

The instructor will lead impromptu discussions during the presentation to assess participants' mastery of the material. Problem areas that are identified during the discussions will be reviewed in further detail.

Summary

Chapter 6I, *Control of Traffic through Traffic Incident Management Areas*, was a new addition to the 2003 MUTCD. Similarly, the use of the pink fluorescent sign was also new to the 2003 MUTCD.

Works Cited

Texas. Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices*. 2006 Edition, Revision 1.

U.S. Department of Transportation. Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 2003 Edition.

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Module 7 PowerPoint Slides

Control of Traffic through Incident Management Areas

Module 7

1

Definitions

- Traffic incident
- Traffic incident management

2

Three Classes of Traffic Incident Duration

- Minor: Under 30 minutes
- Intermediate: From 30 minutes to 2 hours
- Major: Over 2 hours

3

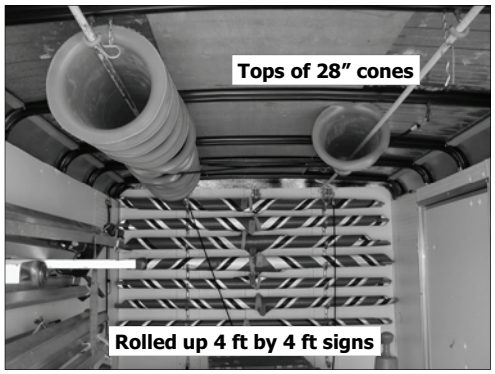
Major Incident (over 2 hrs)

- Diverted through lane shifts or detours
- TTC devices should be readily available

4

Be prepared to deploy traffic control devices

5



6

Provide trained flaggers
to assist incident responders

Public Works or Contractors may be needed to clear an accident

10

Intermediate Incident (30 min to 2 hrs)

- Traffic control on scene to divert traffic
- TTC devices should be readily available

11

Minor Incident (less than 30 minutes)

- Diversion into other lanes often not needed
- Generally not practical to set up lane closure
- If incident blocks lane, move to shoulder

12

Requirements

- Signage/Cones
- Lighting
- Mutual planning

13

Requirements

- Signage/Cones
- Lighting
- Mutual planning

14

Requirements

- Signage/Cones
- Lighting
- Mutual planning

15

Requirements

- Signage/Cones
- Lighting
- Mutual planning

16

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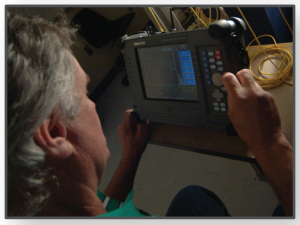

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