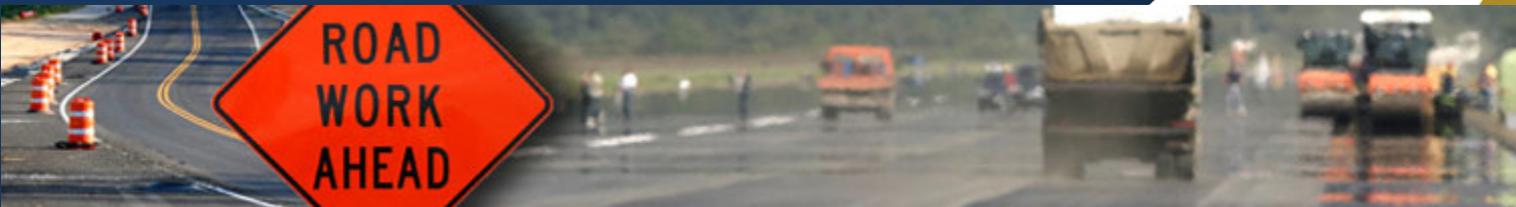


Overview of the Manual on Uniform Traffic Control Devices (MUTCD) Part 6: Temporary Traffic Control



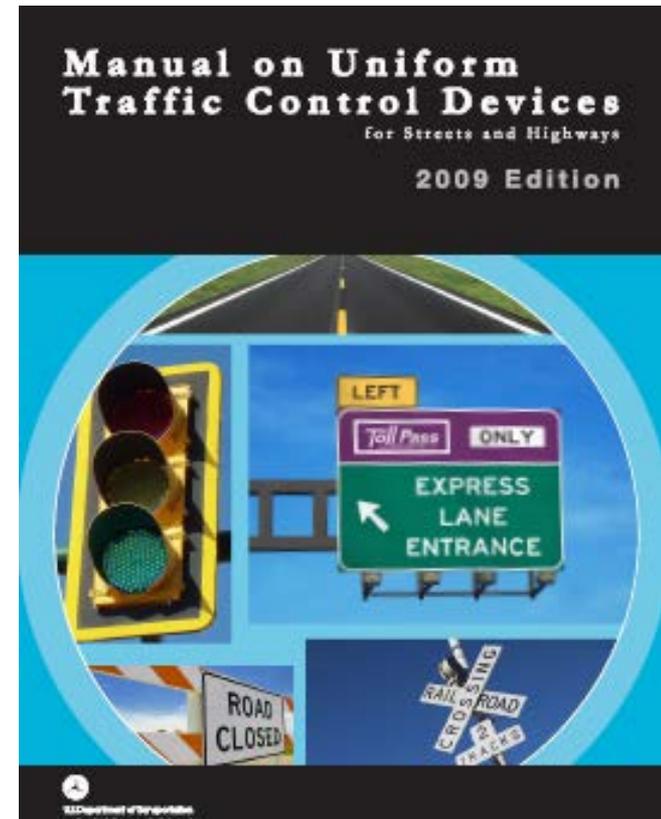


Module Objectives

- Describe basic contents of Part 6 in the MUTCD, which covers temporary traffic control (TCC)
- List the various levels of compliance
- Describe the component parts of a work zone
- List variables in calculating Buffer Space
- Describe a typical application

Federal Temporary Traffic Control (TTC) Standards and Guidelines

- Temporary traffic control devices and their application
- Federal standard is MUTCD
- Part 6: Minimum TTC Federal standards, guidelines and options



The MUTCD

- Applies to **ALL** streets and highways open to the public in the USA, as a minimum
- States have to meet or exceed the MUTCD
- Current edition: 2009
- Published by US Department of Transportation, Federal Highway Administration (FHWA)





MUTCD Levels of Compliance

- **Standard**
 - Mandatory statement, “shall”, bold
- **Guidance**
 - Recommendation, “should”, italics
- **Option**
 - Permissive, “may”, regular text
- **Support**
 - Additional information, regular text



MUTCD Part 6 Contents

- A. General
- B. Fundamental Principles
- C. TTC Elements
- D. Pedestrian and Worker Safety
- E. Flagger Control
- F. TTC Devices
- G. Type of TTC Zone Activities
- H. Typical Applications
- I. TTC through Traffic Incident Management Areas

A. General

- **Defines the primary function of TTC**
 - *“to provide for the reasonably safe and effective movement of road users through or around TTC zones while reasonably protecting road users, workers, responders to traffic incidents, and equipment”*
- **Establishes the responsibility for TTC device maintenance and deployment**
 - *“shall be the responsibility of a public body or official having jurisdiction”*

A. General

- **Defines accessibility requirements**
 - *“Temporary facilities, including pedestrian routes around worksites, are also covered by the accessibility requirements of the Americans with Disabilities Act of 1990 (ADA)”*





B. Fundamental Principles

- Establish TTC zone safety and accessibility as an integral and high-priority element of every project
 - Safety of workers and road users
 - Project planning through design and construction
- Introduces seven fundamental principles that experience has shown will assist road users and help protect workers in the vicinity of TTC zones



The Seven Fundamental Principles of TTC

1. General plans and guidelines should be developed
2. Road user movement should be inhibited as little as practical
3. All users should be guided in a clear and positive manner
4. Routine day and night inspections should be performed
5. Attention should be given to the maintenance of roadside safety
6. Each person whose actions affect safety should receive training appropriate to the decisions they make
7. Good public relations should be maintained

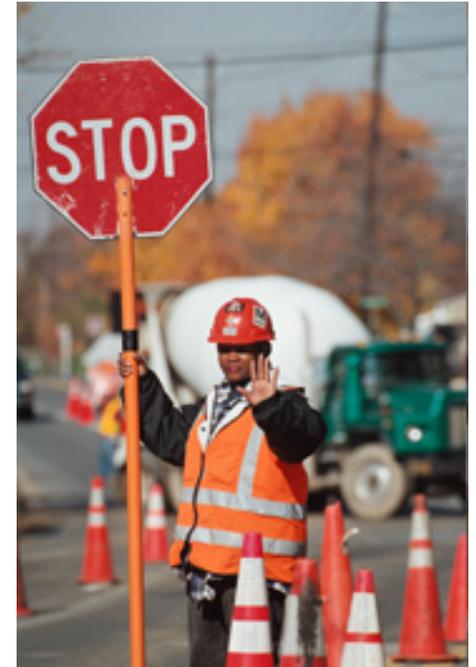
C. TTC Elements

- Defines TTC Plans
- Defines TTC zones
- Defines the four component parts of TTC zones and their requirements
 - Advance Warning Area
 - Transition Area
 - Activity Area
 - Termination Area



Temporary Traffic Control (TTC) Zone

- An area of a highway where road user conditions are (temporarily) changed because of:
 - A work zone
 - An incident zone
 - A planned special event



Components of TTC Zones

1. Advance Warning Area
2. Transition Area
 - Tapers
3. Activity Area
 - Buffer space(s)
 - Work space
 - Traffic space
4. Termination Area

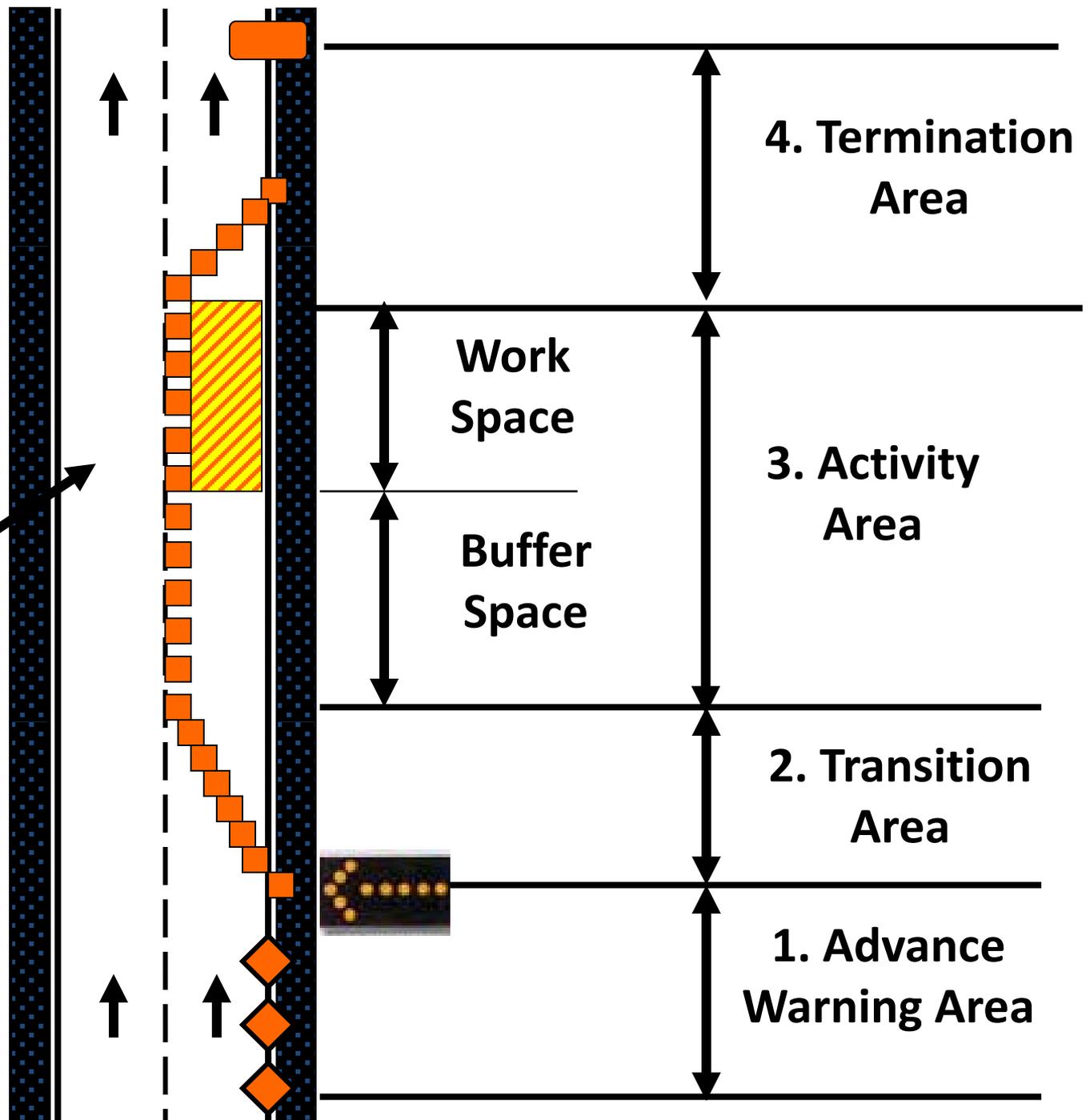




Component Parts of a TTC Zone

Traffic Space

Source: MUTCD Section 6C



4. Termination Area

Work Space

3. Activity Area

Buffer Space

2. Transition Area

1. Advance Warning Area

1. Advance Warning Area



- Advance warning signs
 - Orange
 - Diamond shape
- Inform users about the upcoming TTC zone
- May vary from a single sign to a series of signs

Recommended Advance Warning Sign Min. Spacing

<u>Road Type</u>	<u>A</u>	<u>B</u>	<u>C</u>
Urban (low speed)*	100'	100'	100'
Urban (high speed)*	350'	350'	350'
Rural	500'	500'	500'
Freeways and Expressways	1,000'	1,500'	2,640'

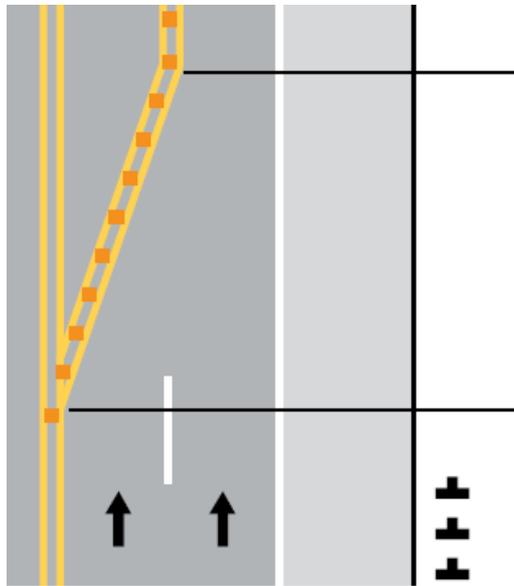
**Speed category to be determined by highway agency.*

2. Transition Area

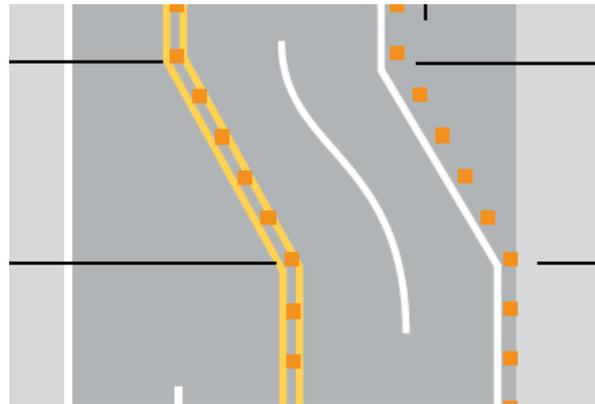
- Where road users are redirected out of their normal path
- Involves the strategic use of **tapers**
 - A series of channelizing devices
 - May be used both in the transition and termination areas



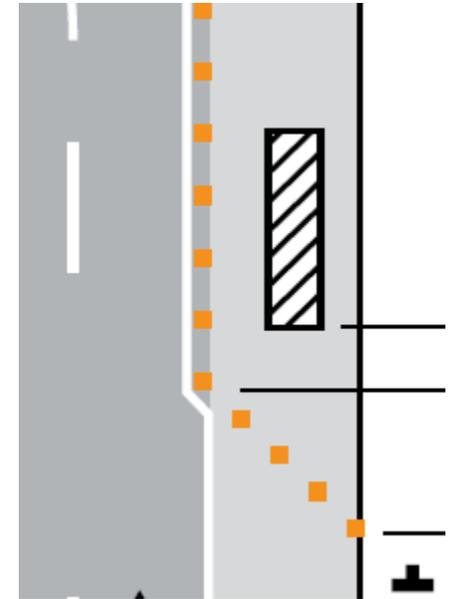
Types of Tapers



Merging



Shifting



Shoulder

Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = (WS^2)/60$
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

Taper Length Criteria

Merging Taper	L Min.
Shifting Taper	L/2 Min.
Shoulder Taper	L/3 Min.
One-Lane, Two-Way Taper	50 ft. Min. - 100 ft. Max.
Downstream Taper	50 ft. Min. - 100 ft. Max.

Exercise

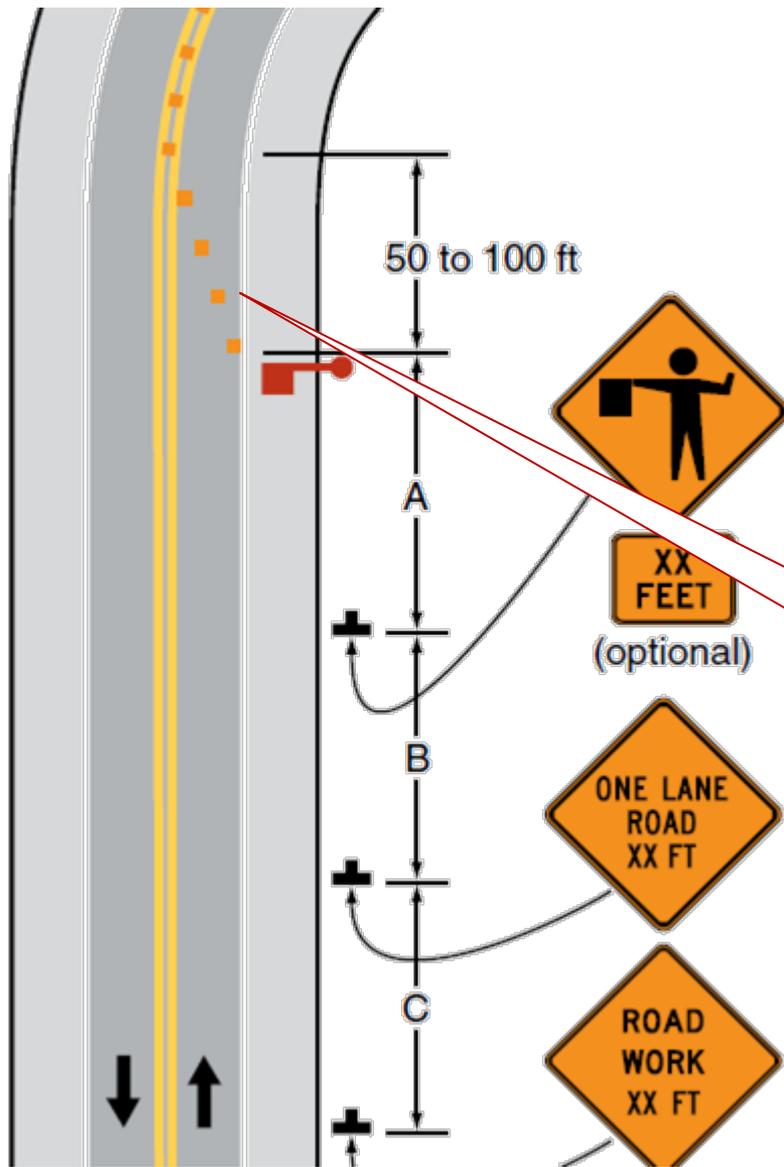
- Assumptions: Lane width is 12 feet and shoulder width 8 feet
- For 25MPH, 35MPH, 45MPH, and 55MPH:
 - Calculate the taper length
 - Calculate the shifting taper length
 - Calculate the shoulder taper length

Solution

Speed	L Merging Taper	(1/2) L Shifting Taper	(1/3) L Shoulder Taper
25 MPH	125	63	42
35 MPH	245	123	82
45 MPH	540	270	180
55 MPH	660	330	220

One-Lane, Two-Way Taper

- On two-lane roads, one lane in each direction
- Flagger control
 - “Flagger taper”

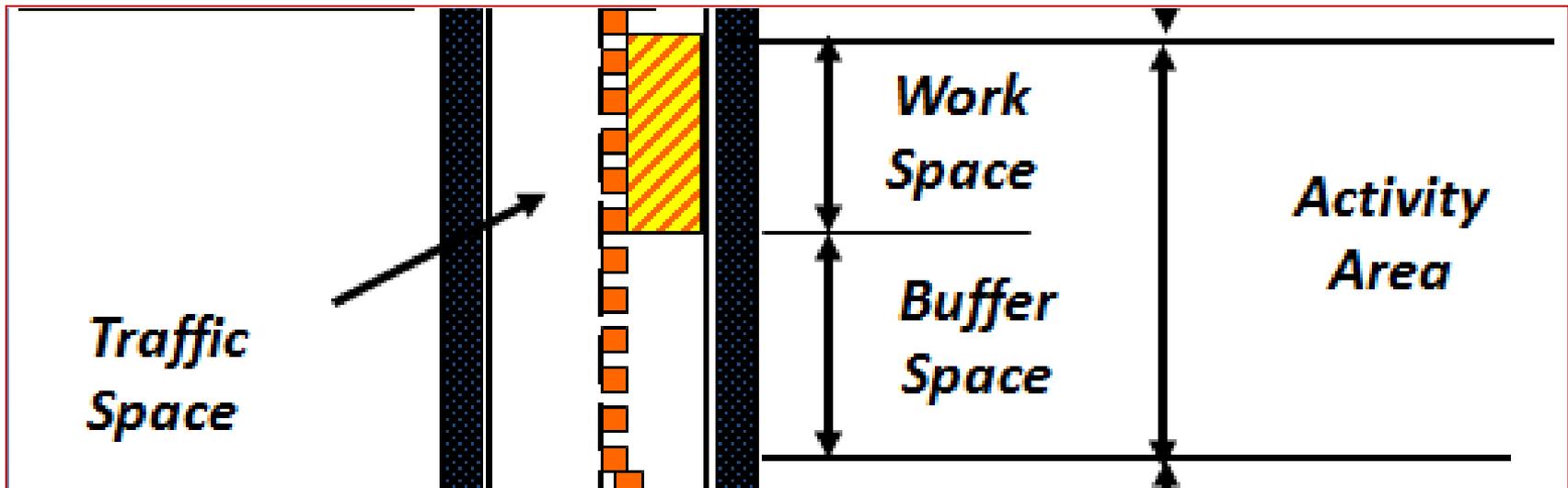


50 ft MIN
100 ft MAX



3. Activity Area

- Where the work activity takes place
 - Work space
 - Traffic space
 - Buffer spaces



Buffer Space(s)

- A lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle
- Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space

Must be empty to provide a recovery area

Longitudinal Buffer Space

- May be placed in advance of a work space
- If one is used, Table 6C-2 in the MUTCD may be used to determine its length



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

Speed (mph)	Buffer (ft.)
20	115
25	155
30	200
35	250
40	305
45	360

Speed (mph)	Buffer (ft.)
50	425
55	495
60	570
65	645
70	730
75	820

May use to determine longitudinal buffer space



Stopping-Sight Distance (SSD) as a Function of Speed

- SSD is the sum of two distances:
 - The distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied (brake reaction distance) and,
 - The distance needed to stop the vehicle from the instant the brakes are applied. (braking distance)

Brake Reaction Distance

- Distance = $1.47 * V * t$
 - V=Speed
 - t = Perception-reaction time
- How long do you think it would take to react to a hazard?

Braking Distance

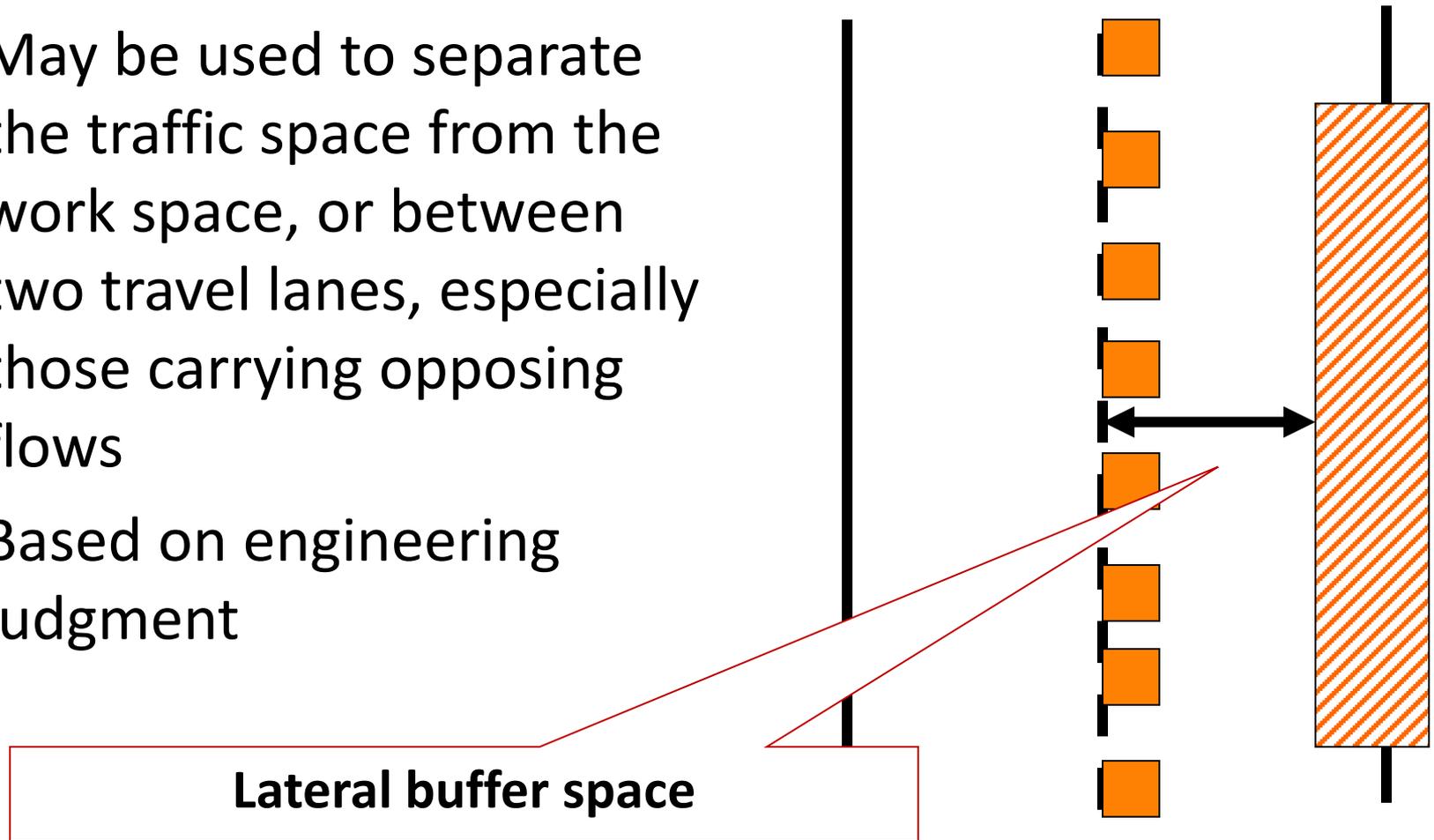
- Distance = $1.075 * V^2 / a$
 - V=Speed
 - a =deceleration rate
- How long do you think it would take to react to a hazard?

Exercise

- Refer to the SSD table 6C-2
- For 25MPH, 35MPH, 45MPH, and 55MPH:
 - Calculate the brake reaction distance
 - Calculate the braking distance
 - Calculate the total Stopping Sight Distance

Lateral Buffer Space

- May be used to separate the traffic space from the work space, or between two travel lanes, especially those carrying opposing flows
- Based on engineering judgment



Work Space

- Set aside for:
 - Workers
 - Equipment
 - Material
 - A shadow vehicle (if one is used)
- Usually delineated by channelizing devices or by temporary barriers



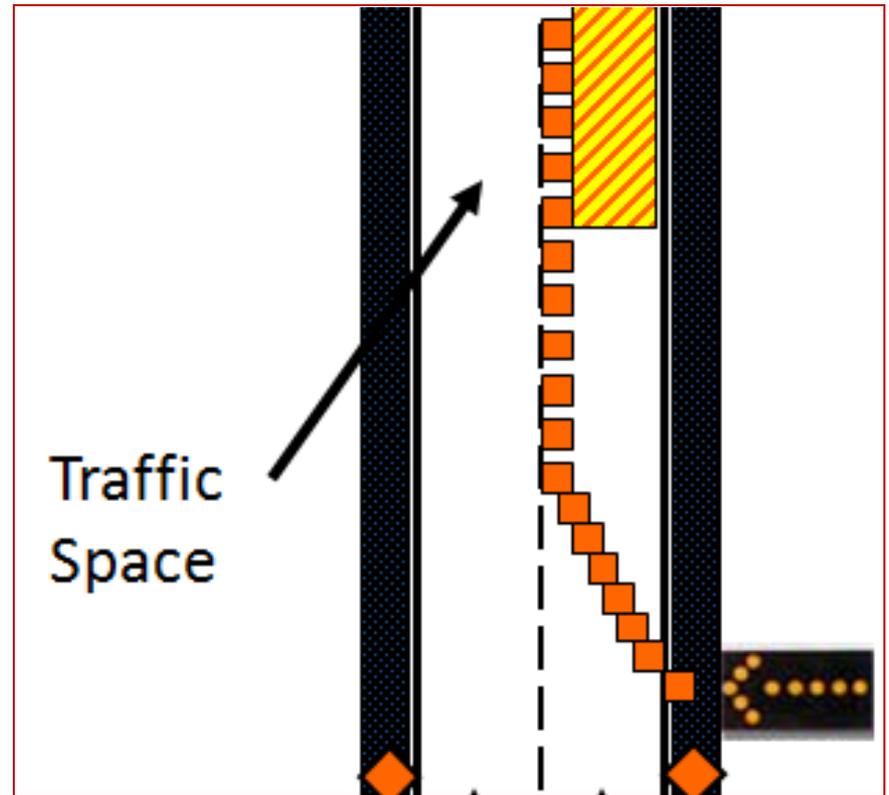
Shadow Vehicles

- Equipped with appropriate lights and warning signs
- May be used to protect the workers from impacts by errant vehicles
- May be equipped with a truck-mounted impact attenuator (TMA)



Traffic Space

- The portion of the highway in which road users are routed through the activity area
- The space open for road users to pass safely



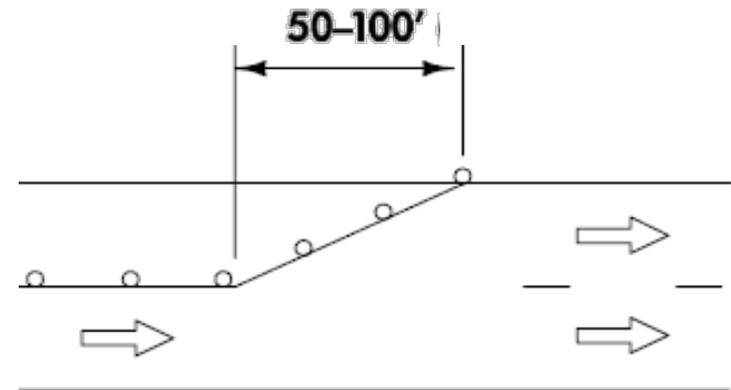
4. Termination Area

- Where road users are returned to their normal driving path
- Extends from the end of the work area to the last TTC device such as **END ROAD WORK** sign, if used
- An **END ROAD WORK** sign may be used to inform road users that they can resume normal operations



Downstream Taper

- Provides visual cue to drivers that lane is reopened
- 50 ft Min.
- 100 ft. max, per lane reopened
- Six devices at 10 to 20-ft. spacing

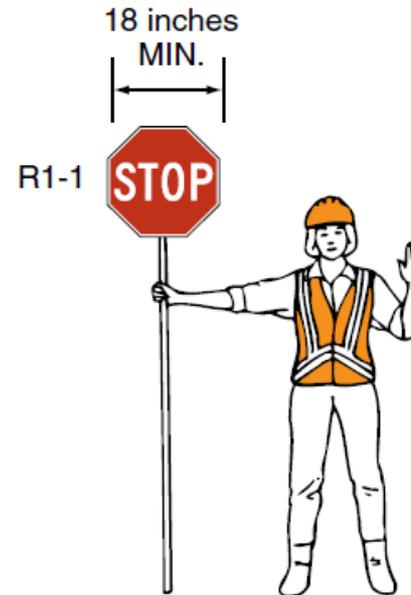


D. Pedestrian and Worker Safety

- Guidance when planning for pedestrians, including those with disabilities, in TTC zones
- Accessible pathways should have:
 - 48” minimum width, 60” preferred
 - Continuous detectable edging
- Provides key elements of worker safety and TTC management that should be considered to improve worker safety

E. Flagger Control

- Flagger qualifications
- High-visibility safety apparel
- Hand-signaling devices
 - STOP/SLOW paddle
 - Red flags for emergencies only
- Automated flagger assistance devices (AFAD)





F. Temporary Traffic Control Zone Devices

- Signs
- Portable changeable message signs (PCMS)
- Arrow boards
- High-level warning devices (flag trees)
- Channelizing devices
- Temporary markings and delineators
- Warning lights
- Temporary traffic barriers
- Crash cushions
- Others

G. Type of TTC Zone Activities

- Defines work duration categories
- Discusses location of work
- Addresses modifications to fulfill special needs
- Discusses TTC during nighttime hours





MUTCD Work Duration Categories

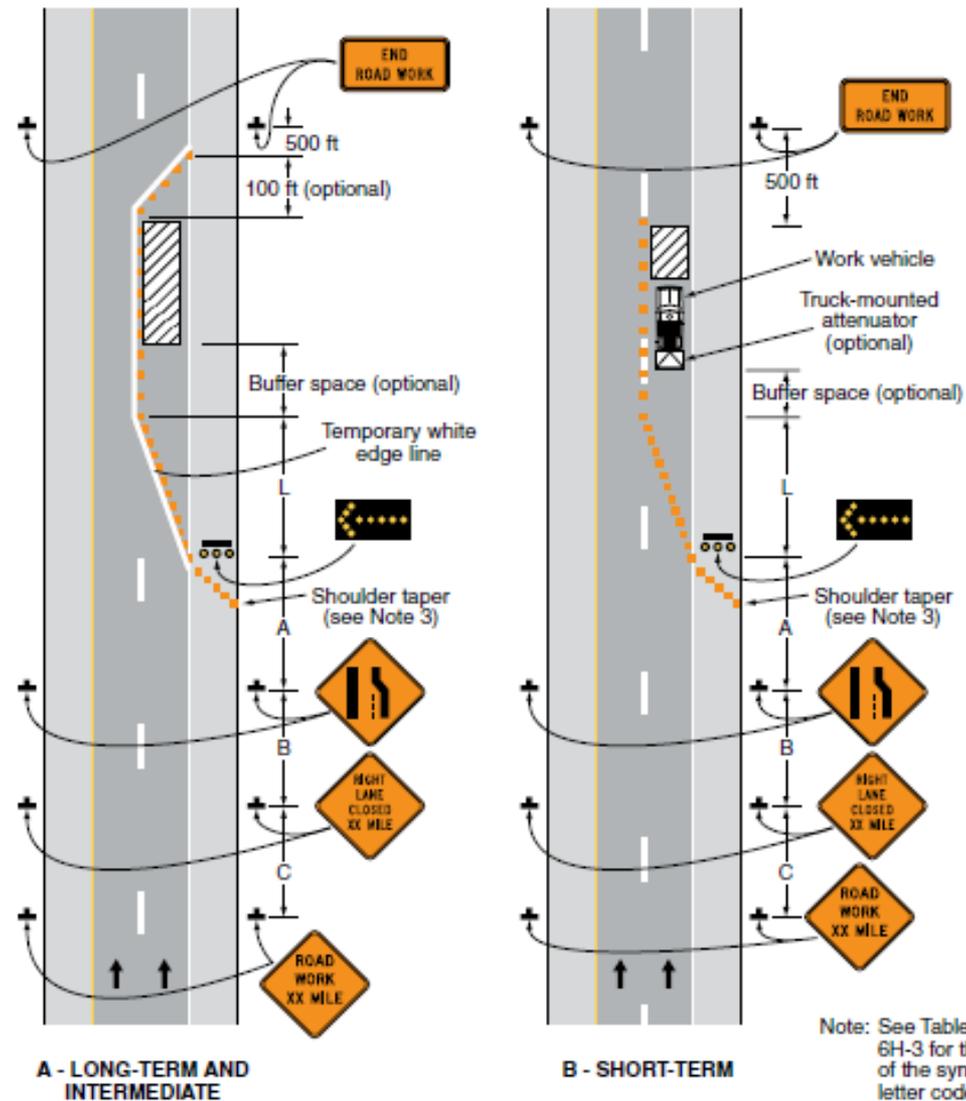
- A. Long-term stationary:** occupies a location more than 3 days
- B. Intermediate-term stationary:** occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour
- C. Short-term stationary:** daytime work that occupies a location for more than 1 hour within a single daylight period
- D. Short duration:** occupies a location up to 1 hour
- E. Mobile:** work moves intermittently or continuously

H. Typical Applications (TAs)

- Sample applications for a variety of situations commonly encountered
- Not every situation is addressed
- Can generally be adapted to a broad range of conditions
- In many instances, an appropriate TTC plan is achieved by combining features from various typical applications
- Other devices may be added to supplement the devices shown
- Fewer devices may be used based on field conditions

Sample TA

- Drawing
- Corresponding notes on facing page

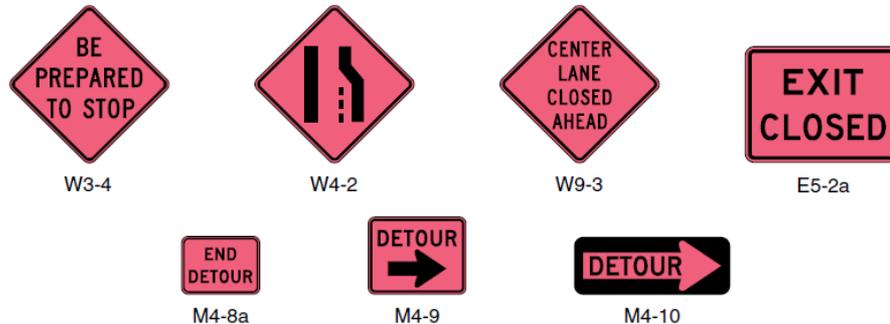


Typical Application 33

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

I. Control of Traffic Through Traffic Incident Management Areas

- Establishes 3 classes, based on expected duration
 - A. Major: more than 2 hours
 - B. Intermediate: 30 minutes to 2 hours
 - C. Minor: under 30 minutes
- Allows fluorescent pink background for signs
- Discusses use of emergency-vehicle lighting



Summary: Part 6 of the MUTCD

- Source of Federal TTC standards and guidelines
- Available at no cost from:

http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm

