



KENTUCKY TRANSPORTATION CENTER

**TRAFFIC CONTROL PROCEDURES FOR  
EMERGENCY RESPONDERS**



**UNIVERSITY OF KENTUCKY**

**College of Engineering**



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**We provide services to the transportation community**  
through research, technology transfer and education.

We create and participate in partnerships  
to promote safe and effective  
transportation systems.

## **OUR VALUES**

### **Teamwork**

Listening and communicating along with  
courtesy and respect for others.

### **Honesty and Ethical Behavior**

Delivering the highest quality  
products and services.

### **Continuous Improvement**

In all that we do.

**Research Report KTC-06-33/SPR317-06-1F**

**TRAFFIC CONTROL PROCEDURES FOR EMERGENCY RESPONDERS**

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in cooperation with

Kentucky Transportation Cabinet  
Commonwealth of Kentucky

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<b>16. Abstract</b>  <p>The objective of this research was to develop a training course and handbook to guide on-scene emergency responders responsible for controlling traffic during a roadway crash and subsequent clearance. Traffic control is an essential component of incident response in order to move road users safely and expeditiously past or around a traffic incident, and to reduce the likelihood of secondary crashes. Emergency responders, with the exception of law enforcement, are provided limited or no training in traffic control but yet by nature of their job often have to perform such duties. There is a need to provide basic knowledge and requirements to on-scene responders in order to reduce traffic delays, secondary crashes, and injuries to those involved in response activities.</p> <p>Deliverables from the study efforts include workshop materials and a presentation suitable for use in training a wide range of incident responders. In addition, information from the presentation materials and the Manual on Uniform Traffic Control Devices has been excerpted and condensed into a handbook titled "Guidelines for Emergency Traffic Control".</p>			
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## EXECUTIVE SUMMARY

Traffic control is an essential component of incident response in order to move road users safely and expeditiously past or around a traffic incident, and to reduce the likelihood of secondary crashes. Emergency responders, with the exception of law enforcement, are provided limited or no training in traffic control but yet by nature of their job often have to perform such duties. There is a need to provide basic knowledge and requirements to on-scene responders in order to reduce traffic delays, secondary crashes, and injuries to those involved in response activities.

The Manual on Uniform Traffic Control Devices (MUTCD) contains guidelines for control of traffic through incident management areas that should be followed for the safety of responders and motorists. Chapter 6I of the MUTCD addresses emergency road occurrences, natural disasters, or other unplanned events that disrupts traffic flow. A specific color (black legend on fluorescent pink background) has also been identified for warning and guide signs used for temporary traffic control. Traffic incidents are divided into three general classes of duration, each with unique traffic control characteristics and needs. Some levels of incidents require significantly more traffic control, dependent upon the duration and severity of the event. Unfortunately, many responders are unaware of these guidelines.

By developing and implementing traffic control training for emergency responders, the safety of those working on-scene, as well as the traveling motorists near the scene, will be improved. Past experience has shown that interagency planning and coordination is critical to the proper response for incidents. Understanding and implementing standardized traffic control should result in improved traffic flow and decreased delay resulting from highway crashes and other incidents. The objective of this study was to develop a training course and handbook to guide on-scene emergency responders responsible for controlling traffic during a roadway crash and subsequent clearance.

Deliverables from the study efforts include workshop materials and a presentation suitable for use in training a wide range of incident responders. In addition, information from the presentation materials and the Manual on Uniform Traffic Control Devices has been excerpted and condensed into a handbook titled “Guidelines for Emergency Traffic Control”.



## 1.0 INTRODUCTION AND BACKGROUND

Traffic control is an essential component of incident response in order to move road users safely and expeditiously past or around a traffic incident, and to reduce the likelihood of secondary crashes. Emergency responders, with the exception of law enforcement, are provided limited or no training in traffic control but yet by nature of their job often have to perform such duties. There is a need to provide basic knowledge and requirements to on-scene responders in order to accomplish the following:

- Reduce traffic delays and preclude unnecessary use of the surrounding road system,
- Reduce the likelihood of secondary crashes,
- Move road users safely and expeditiously past or around the traffic incident, and
- Reduce injuries to those involved in response activities.

The Manual on Uniform Traffic Control Devices (MUTCD) contains guidelines for control of traffic through incident management areas that should be followed for the safety of responders and motorists. All traffic control devices must be in compliance with the MUTCD, which has been adopted by Kentucky as the standard for signs and markings (KRS 189.337 and 603 KAR 5:050). A traffic incident is defined as an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic. Chapter 6I of the MUTCD addresses emergency road occurrences, natural disasters, or other unplanned events that disrupts traffic flow and identifies a specific color (black legend on fluorescent pink background) for warning and guide signs used for temporary traffic control. Traffic incidents are divided into three general classes of duration, each with unique traffic control characteristics and needs. Those classes are:

- A. Major – expected duration of more than 2 hours;
- B. Intermediate – expected duration of 30 minutes to 2 hours; and
- C. Minor – expected duration under 30 minutes.

These classes of incident duration are important to responders arriving at a traffic incident in order for them to assess the magnitude and begin placing temporary traffic controls consistent with the event. It has been recognized that traffic incidents of emergency nature require prompt attention with available temporary traffic control devices. Some levels of incidents require significantly more traffic control, dependent upon the duration and severity of the event. Major events may necessitate involvement of highway agency personnel with more traffic control capabilities and equipment.

By developing and implementing traffic control training for emergency responders, the safety of those working on-scene, as well as the traveling motorists near the scene, will be improved. Past experience has shown that interagency planning and coordination is critical to the proper response for incidents. Understanding and

implementing standardized traffic control should result in improved traffic flow and decreased delay resulting from highway crashes and other incidents.

The objectives of this study were as follows:

- 1) Develop a training course on emergency traffic control for first responders, and
- 2) Prepare a handbook to guide on-scene emergency responders responsible for controlling traffic during a roadway crash and subsequent clearance.

## **2.0 SUMMARY OF RESULTS**

Deliverables from the study efforts include workshop materials and a presentation suitable for use in training a wide range of incident responders. This information is presented in Section 3.0 and is titled “Emergency Responder Traffic Control Training Course”.

Information from the workshop presentation materials and the Manual on Uniform Traffic Control Devices has been excerpted and condensed into a handbook titled “Guidelines for Emergency Traffic Control”. This information is presented in Section 4.0.

### **3.0 Emergency Responder Traffic Control Training Course**

The following pages contain copies of the slides representing the contents of the training course titled “Emergency Traffic Control for Responders”.



# EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 1  
BACKGROUND

## ORIGINAL DEVELOPMENT

Sponsored by the Pennsylvania DOT for the Pennsylvania State Fire Academy

Available through the International Fire Service Training Association at Oklahoma State University



Revised in 2006 by the  
Kentucky Transportation Center

## INCIDENT MANAGEMENT

Our purpose is to enhance public safety and responder safety by establishing guidelines for establishing traffic control and safe traffic flow at highway incidents



## COURSE OVERVIEW

- Background
- Guidelines and Standards
- Highway Safety Principles
- Traffic Control Devices
- Flagging Operations
- Traffic Control Zones
- Incident Zone Procedures
- Exercises

## TYPES OF HIGHWAY INCIDENTS?

- Vehicle Incidents
- Temporary Highway Closures
  - Flooding
  - Fire
  - Storm Damage
  - Special Events
- Detours

## U.S. HIGHWAY CRASHES

- Leading cause of death for people age 3 through 33 in the US
- More than 42,000 deaths per year
- About 117 deaths per day
- About 1 death every 12 minutes

2004 Traffic Safety Facts



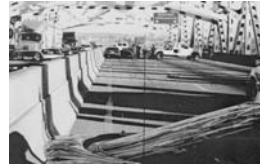


## WE'RE NOT THE ONLY ONES!

- A "Secondary Crash" is one that takes place as a result of traffic or road conditions caused by the original incident.
- Secondary crashes are frequently much more severe than the original incident.

October 6 -7, 2004

I-64 and I-65 in Louisville



A crash with 1 fatality led to two separate secondary crashes, resulting in various lane closures for approximately 18 hours

June 29, 2004

I-71 in Carroll County



Driver of a tractor-trailer failed to observe stopped traffic and caused a rear-end collision involving 5 other vehicles. The driver of the tractor-trailer was fatally injured.

## TRAVELER DELAY

5 min. of stopped traffic = 15 min. of delay

Number of Lanes in Each Direction	Shoulder Blocked	Lanes Blocked		
		One	Two	Three
2	81%	35%	0%	N/A
3	83%	49%	17%	0.00
4	85%	58%	25%	13%
5	87%	65%	40%	20%
6	89%	71%	50%	26%

Percent Capacity Available

Highway Capacity Manual 2000

## TRAVELER DELAY IS COSTLY

- Reduced productivity
- Increased cost of goods and services
- Increased fuel consumption



1 Lane of Interstate Blocked for 20 minutes = \$10,000  
(LEUCG Incident Management Manual)

**\$25.6 Billion**  
The cost of traveler delay in 2000

## Quick Clearance

(KRS 189.580, effective 7/06)



- Four basic components to the law
  1. Driver Stop
  2. Driver Removal
  3. Authority Removal
  4. Authority Tow
- Applicable to interstates and parkways

# EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 2  
GUIDELINES AND STANDARDS

## EVALUATE THIS INCIDENT SITE



## EVALUATE THIS INCIDENT SITE

### CORRECT

- Apparatus "shadowing" work area
- Cones, signs placed
- Flagger on duty

### IMPROVE

- Nonstandard sign
- Cone placement and visibility
- Lack of taper
- Lack of proper equipment
- Personnel visibility
- Lack of lighting



## IS THIS A FLAGGER?



## WHO PROVIDES HIGHWAY STANDARDS:

- Federal Highway Administration (FHWA)
- State Departments of Transportation
- Local Municipal Governments

STATE HIGHWAY SIGNS, SIGNALS, AND MARKINGS ARE CONTROLLED BY

### Legislation

Kentucky Revised Statutes  
Kentucky Administrative  
Regulations

## KRS 189.337 / 603 KAR 4:050

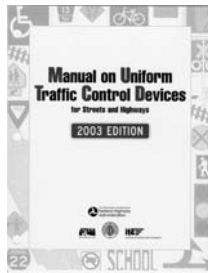
The Department of Highways shall promulgate and adopt **a manual of standards** and specifications for a uniform system of official traffic control devices for use upon all roads and streets. The manual and its future revisions and supplements **shall be applicable to all roads and streets** under the control of the Department of Highways or any county or incorporated city.

The manual specified is the **Manual on Uniform Traffic Control Devices, 2003 Edition**, including Revision No. 1 dated November 2004

## MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

# MUTCD

## MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES



## MUTCD: IT'S THE LAW (Federal)

The *Manual on Uniform Traffic Control Devices* (MUTCD) is incorporated by reference in *23 Code of Federal Regulations (CFR)*, Part 655, Subpart F and shall be recognized as the national standard for traffic control devices on all public roads open to public travel in accordance with 23 U.S.C. 109(d) and 402(a). The policies and procedures of the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices shall be as described in 23 CFR 655, Subpart F.

## CHAPTER 6I of the 2003 MUTCD

### "CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS"

TRAFFIC INCIDENT: "An emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic."

- Section 6I.01, 2003 MUTCD

## CHAPTER 6I of the 2003 MUTCD

- The primary function of temporary traffic control is to move road users reasonably safely and expeditiously past or around the incident, to reduce secondary crashes, and to preclude unnecessary use of the surrounding local road system.
- Highway agencies, public safety agencies, and private sector responders should plan for traffic incidents.

## CHAPTER 6I of the 2003 MUTCD

### Major provisions:

- Classifies incidents by expected duration.
- Recommends interagency pre-planning and management (“unified incident management”).
- Traffic control “size-up” and beginning of action within 15 minutes of arrival.
- “Fluorescent Pink” background/black letters permitted for signs in incident traffic control zones.
- Recommendations on use of Emergency Vehicle Lighting.

## CHAPTER 6I of the 2003 MUTCD

Classifies incidents by expected duration.

- MAJOR: over 2 hours
- INTERMEDIATE: from 30 minutes to 2 hours
- MINOR: under 30 minutes

In general, the longer the duration, the more closely the temporary traffic control measures are expected to conform to the MUTCD. Incidents expected to last 24 hours or longer should comply with Part 6 of the MUTCD.

## TO GET A COPY OF THE MUTCD

### Printed version:

Institute of Transportation Engineers

1099 14<sup>th</sup> Street N.W.

Suite 300 West

Washington, DC 20005

Phone: 202-289-0222

Fax: 202-289-7722

[www.ite.org](http://www.ite.org)

### Electronic version:

[www.mutcd.fhwa.dot.gov](http://www.mutcd.fhwa.dot.gov)

## EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 3

HIGHWAY SAFETY PRINCIPLES

## UNIFORMITY

- No surprises
- Driver expectancy
- MUTCD and Kentucky guidelines

If a car is traveling at 55 mph, how much distance does it need to stop???

## STOPPING SIGHT DISTANCE

### ■ Definition

The distance traveled from the time a driver first detects the need to stop until the vehicle actually stops.

### ■ Two Components

#### 1) Perception/Reaction Distance

#### 2) Braking/Skidding Distance

## PERCEPTION/REACTION DISTANCE

Distance traveled by a vehicle from the instant the driver sees an object to the instant the brakes are applied.

## WHAT IS A TYPICAL DRIVER'S PERCEPTION/REACTION TIME??

- 0.5 seconds
- 1.0 seconds
- 1.5 seconds
- 2.5 seconds
- 4.0 seconds

As much as:  
**2.5**  
seconds

Be prepared for drivers who do not react . . .

At 60 mph, how far will a car travel during perception/reaction time?

**60 mph = 88 feet /second**

**In 2.5 seconds,  
Distance = 220 feet**

## A VEHICLE WILL TRAVEL THE FOLLOWING DISTANCES IN 2.5 SECONDS:

mph	feet
■ 10	37
■ 20	74
■ 30	110
■ 40	147
■ 50	184
■ 55	202
■ 60	220
■ 65	239
■ 75	276

Almost the  
length of a  
football field!

## BRAKING DISTANCE

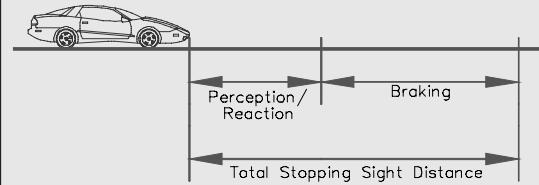
Distance traveled by a vehicle from the instant the brakes lock up until the vehicle stops.

**A VEHICLE WILL SKID THE FOLLOWING DISTANCES:**

mph	feet*
■ 10	7
■ 20	38
■ 30	86
■ 40	154
■ 50	240
■ 55	290
■ 60	346
■ 65	405
■ 75	540

*\*Distances are for wet weather conditions*

**Stopping Sight Distance**



**THE TOTAL DISTANCE A VEHICLE NEEDS TO STOP AT VARIOUS SPEEDS:**

mph	feet
■ 10	45
■ 20	115
■ 30	200
■ 40	305
■ 50	425
■ 55	495
■ 60	570
■ 65	645
■ 75	820

**Almost 3 times the length of a football field!**

**AT NIGHT – HOW FAR AWAY CAN YOU SEE HEADLIGHTS??**

- ½ Mile
- 1 Mile
- 5 Miles
- 10 Miles
- 20 Miles

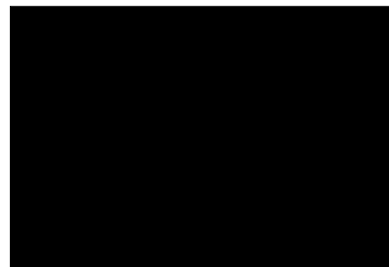
**AT NIGHT – HOW FAR AWAY CAN A DRIVER SEE YOU IN DARK CLOTHES??**

- 100 feet
- 200 feet
- ½ mile
- 1 mile
- 5 miles

**Using low beams**

**300 feet with high beams**

**PHOTO OF PEDESTRIAN IN DARK CLOTHES AT NIGHT**



**ANSI/ISEA Z 107-2004**

**Standard on High-Visibility Safety Apparel and Headwear**

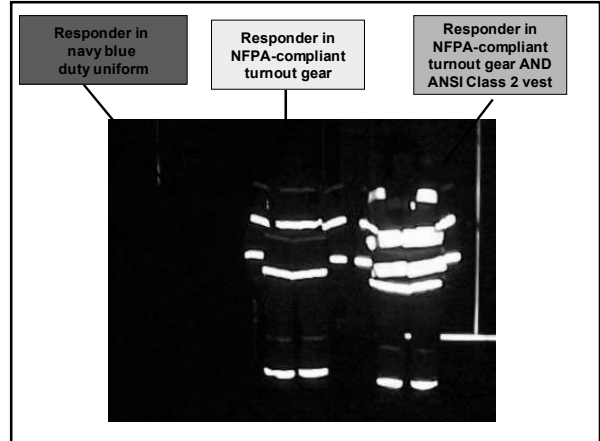
**Four classifications of garments:**

- Performance Class 1 – low speeds, ample separation, full attention.  
Example: Picking up carts in shopping center parking lot.
- Performance Class 2 – higher speeds, complex backgrounds, diverted attention, less traffic/work separation possible.  
Example – Short-term maintenance operation, firefighters engaged in emergency response activities who are wearing turnout gear.
- Performance Class 3 – very high speeds, reduced sight distances, high task loads, need for conspicuity through full range of motion, need to be recognized as a person.  
Example – Highway Emergency Incident.
- Performance Class E – trousers, bib overalls, and shorts designed for use with a Performance Class 2 or 3 garment.

**Which responder “stands out” better – even in daylight?**



**Which responder “stands out” better – even in daylight?**



**EMERGENCY TRAFFIC CONTROL FOR RESPONDERS**

Chapter 4  
TRAFFIC CONTROL DEVICES

**TRAFFIC CONTROL DEVICES**

To promote highway safety by providing for the orderly and predictable movement of all traffic and to provide guidance and warning as needed.

- Signs
- Channelizing devices
- Lighting devices
- Shadow vehicles / advance warning truck

## WARNING SIGNS

Warning signs are used to give notice of an unexpected condition or a condition that may be potentially hazardous to traffic.



## WARNING SIGNS

Warning signs used to alert motorists of an incident:

- Diamond shaped
- 48" x 48"
- Black letters, orange or fluorescent pink background
- Typically placed on the right side of roadway
- Provide adequate advance warning
- Retroreflectorized

## WARNING SIGNS

Orange background/black letters



Fluorescent pink background/black letters



## WARNING SIGNS



## WARNING SIGNS



## WARNING SIGNS (OPTIONAL)





## WARNING SIGNS



## WARNING SIGNS – MOUNTING



## WARNING SIGNS – PLACEMENT

- Right-hand side of roadway.
- As near to the edge of the road as possible, but not closer than 24 inches.
- Right angles, facing traffic.
- No obstructions.
- In advance of hills and curves.

## WARNING SIGNS – PLACEMENT



## WARNING SIGNS – PLACEMENT



## WARNING SIGNS – PLACEMENT



## WARNING SIGNS – PLACEMENT



## WARNING SIGNS – PLACEMENT



## WARNING SIGNS – PLACEMENT



## WARNING SIGNS – PLACEMENT



## CHANNELIZING DEVICES

### Common Channelizing Devices

- Traffic Cones
- Flares (Nonstandard)



## TRAFFIC CONES

- Used to channelize road users.
- Divide opposing motor vehicle traffic lanes.
- Divide lanes when two or more lanes are kept open in the same direction.
- Generally delineate incident area.

## TRAFFIC CONES

- Color – Orange
- Height – 28" minimum
- Retroreflectorized for nighttime use
- Made of a material that can be struck without damaging the vehicle



## FLARES

- Inexpensive and portable
- More effective at night
- Burn out quickly
- Warn but do not inform
- Leaves metal debris on roadway
- When no longer needed, flares and their supporting devices must be removed from the roadway per the 2003 edition of the MUTCD
- Replace with more long-term traffic control devices



## LIGHTING DEVICES

- Flashing Warning Beacons on Equipment
- Flashing Arrow Panels on Trucks/Trailers

## FLASHING WARNING BEACONS

Purpose – to alert drivers to special hazards.

- Rotating Dome Lights
- Emergency Flashers
- Amber Lights
- NFPA Standard 1901 permits use of amber on the rear and sides of the vehicle in "calling for right-of-way" mode and on all four sides in "blocking right-of-way" mode.

## MINIMIZE LIGHTS

- Avoid Glare to Motorists
- Turn Off Unnecessary Lights
  - Refer to MUTCD 61.05
  - Emergency vehicle lighting:
    - Provides warning only and provides no effective traffic control
    - Can be confusing and distracting to drivers
- Use Amber Instead of Red



## ARROW PANELS

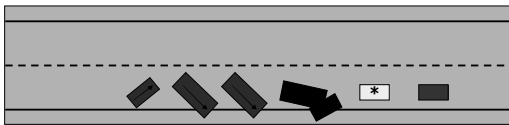
- A sign with a matrix of elements capable of either flashing or sequential displays.
- Provides additional warning to assist in merging and controlling road users through the incident area.



## SHADOW VEHICLES

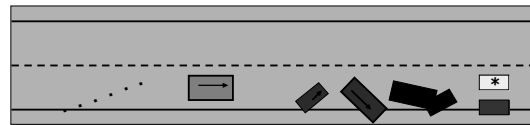
- Shadow Vehicles – Trucks or trailers that are used to protect workers or work equipment from errant vehicles.
- Heavy Vehicle – 33,000 GVWR or greater, loaded at least 20,000 pounds (tanker truck).

### Response Vehicle Management “Safe Parking”



- Response vehicles used in dealing with the incident are angled into the scene toward the shoulder to protect the scene from traffic.
- First vehicle upstream is usually shown angled outward to “channel” traffic into open lane.
- The vehicles should be quickly backed up with Advance Warning (“Emergency Ahead”) signage.
- Response vehicles may “cartwheel” into incident space or traffic space if struck on corners by a vehicle of equal or larger size.

### Response Vehicle Management “Shadow Vehicle”



- A shadow vehicle is a large vehicle (33,000 GVWR loaded to at least 20,000 lbs.); F.D. tankers do well. Once parked, it becomes a *traffic control device (TCD)* placed as an element of the TCZ using the MUTCD as a guide. It is:
  - spotted *parallel with traffic* 100' to 250' upstream from the work space depending upon the speed limit, with *wheels cut toward the shoulder*
  - is not involved* in incident mitigation efforts and *not occupied by people !!!*

## SHADOW VEHICLES



## SHADOW VEHICLES

- Truck-mounted Attenuator (TMA)
- Portable Changeable Message Sign (PCMS) (formerly Variable Message Sign – VMS)



## RECOMMENDED EQUIPMENT FOR EMERGENCY TRAFFIC CONTROL

- Warning Signs (48" x 48", roll-up, retroreflective)
  - "Emergency Scene Ahead" or "Accident Ahead" – 2
  - "Be Prepared to Stop" – 2
  - Flagger – 2
  - Portable Sign Stands – 6
- Flags
  - 18" x 18" orange safety flags for attachment to warning signs – 18 (Optional)
  - 24" x 24" red flagger flags w/ stiffener and 36" staff - 2

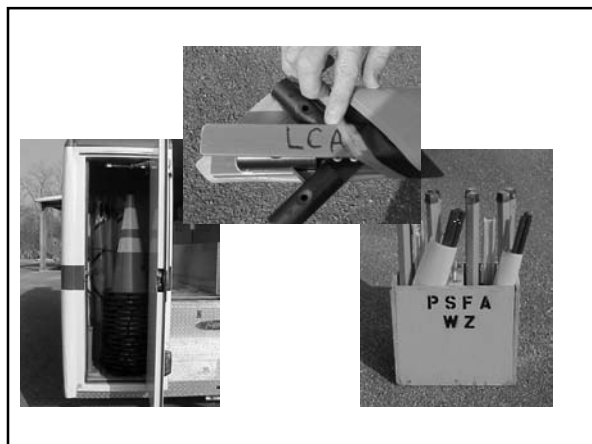
## RECOMMENDED EQUIPMENT FOR EMERGENCY TRAFFIC CONTROL

- Traffic Cones
  - 28", orange with retroreflective trim – 16
- Flagger Paddles
  - 24", retroreflective with 7' handles – 2
- Safety Vests (ANSI Class 3)
  - Yellow-Green - 10

## STORAGE OPTIONS



## STORAGE OPTIONS



# EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 5  
FLAGGING

## CHAPTER 5 – FLAGGING

- Part 1 – Flagger Fundamentals
- Part 2 – Flagger Equipment
- Part 3 – Flagger Positions/Procedures
- Part 4 – Single- vs. Two-Person Flagging
- Part 5 – Review and Examples

### PART 1 – FLAGGER FUNDAMENTALS WHY USE A FLAGGER?

- The primary function of flagging is to provide safety for the incident response personnel, motorists, and pedestrians traveling through the incident area.
- Flaggers are responsible for human safety and make the greatest number of public contacts.
- Purposes are to stop traffic intermittently and maintain safe and continuous flow at reduced speeds through incident zone.

### THE EFFECTIVE FLAGGER KEEPS AN EYE ON THE **MARC**

- **M** – **M**ental alertness (focus).
- **A** – **A**pppearance (first impressions).
- **R** – **A** sense of **R**esponsibility for the safety of the public and the incident response personnel.
- **C** – **C**ourteous but firm manner.

### THE EFFECTIVE FLAGGER IS:

- Clearly **seen** at all times by:
  - Standing out from the background.
  - Standing at a distance sufficient to permit driver-response and speed-reduction time.

### PART 2 – FLAGGER EQUIPMENT

- Hand-Signaling Devices
- Safety Attire

## HAND-SIGNALING DEVICES

- Standard Stop-and-Slow Paddle
- Red Flag
- Red Flashlight Wand

## STOP-AND-SLOW PADDLE

- Used to control one-lane, two-way traffic.
- Octagonal, 18-inch minimum size.
- Stop sign on one face of paddle.
- Diamond-shaped Slow sign on opposite face of paddle.
- Both faces are of retroreflective material.
- Attached to 72-inch pole.

## STOP PADDLE WITH FLASHING LIGHTS

- Stop/Slow paddles may be equipped with certain arrays of flashing lights.
- Check MUTCD for specific permitted colors/positions
- Much more expensive - \$400 vs. \$75

**Retroreflectivity alone is generally considered adequate for day or night use without lights, particularly when "diamond grade" retroreflective material is used for sign faces.**



## RED FLAG

- Used at intersections where a single flagger is present within intersection.
- Used to control traffic ONLY when Stop-and-Slow Paddle is not available.

## RED FLAG

- Flag minimum size is 24" x 24."
- Flag to be red – material to be visible and durable.
- Flag fastened to a 3-foot staff.
- Free edge of flag to be weighted or stiffened to help flag hang vertically.
- When used at night, flags shall be retroreflectorized red.

## WHAT IS WRONG?



## RED LIGHT WAND

- Use when it is dark.
- *Only* use as *supplement* to the retroreflectorized Stop-and-Slow Paddle.

## WHAT IS WRONG?



## DRESSING FOR SAFETY – DAYTIME HIGH-VISIBILITY CLOTHING

- The flagger's vest, shirt, or jacket shall be orange, yellow, yellow-green, or a fluorescent version of these colors.
- Additional dress considerations:
  - Hard hat
  - Reflective gloves (white or orange)
  - Proper footwear
  - Rain gear (orange, yellow, or yellow-green)
  - Sunglasses (nonreflective)

## DRESSING FOR SAFETY – NIGHTTIME HIGH-VISIBILITY CLOTHING

- Shall be retroreflective.
- The retroreflective material shall be either orange, yellow, white, silver, yellow green, or a fluorescent version of these colors.
- Shall be visible at a minimum of 1,000 ft.



## PART 3 - FLAGGER POSITIONS & PROCEDURES

### WHAT IS A FLAGGER STATION?

- Carefully organized safety zone designed to ensure protection for:
  - Yourself
  - Incident response crew
  - Motorists/pedestrians

### FLAGGER STATION MUST BE:

- Visible to allow approaching drivers to see commands.
- In advance of the incident area to allow traffic safe reaction time.
- Away from any roadway obstructions – uncluttered.

### STATION SAFETY

- During darkness, flaggers may supplement stop-and-slow paddles with light wand and flares.

### WHERE TO STAND

- Use shoulder adjacent to traffic being controlled.
- Use spot with safety escape path.
- Stand alone!
- Above all, be clearly seen.

### THE **GREATEST** DANGER TO THIS FLAGGER IS **ONCOMING** TRAFFIC!

- Face oncoming traffic until you are SURE it has stopped.
- Once oncoming traffic stops:
  - Stay aware of the traffic approaching your back.
  - Watch for turns into driveways, etc.



## INCORRECT POSITION



Never stand in front of traffic to direct vehicles to stop!



FLAGGER PROCEDURES: THE FLAGGER USES 3 METHODS TO GIVE DIRECTIONS:

- 1) Stop-and-Slow Paddle Method
- 2) Red-Flag Method
- 3) Red light wand Method

The Common Element is:

**STOP – PROCEED – SLOW (SPS)**

## STOP-AND-SLOW PADDLE (PREFERRED)

### To Stop Traffic

- Stand on shoulder, face traffic.
- Hold STOP sign paddle in stationary position.
- Extend arm horizontally from body.
- Raise palm of free hand toward approaching traffic.
- Proceed toward middle of road after traffic has stopped – keep palm extended.



## SIGNALING TRAFFIC TO PROCEED

- Return to standing position at shoulder.
- Face traffic, maintain free hand with palm toward traffic.
- Display SLOW sign on paddle.
- Gesture with free hand in direction of travel.
- Raise and lower hand with palm down indicating slow speed.

## TO SLOW TRAFFIC

- Stand on shoulder, facing traffic.
- Display SLOW sign on paddle.
- Raise and lower free hand in “dog patting” motion.



## THE RED FLAG

### **To Stop Traffic**

- Face traffic from shoulder position.
- Extend flag horizontally across traffic lane.
- Be sure full area of flag is visible.
- Use free arm with palm facing approaching traffic.



## SIGNALING TRAFFIC TO PROCEED

- Stand parallel to traffic movement.
- Lower flag and arm from view.
- Motion traffic ahead with free arm.
- DO NOT wave the Red Flag!



## TO SLOW TRAFFIC

- Face traffic from shoulder.
- Slowly wave flag in sweeping motion.
- Motion is up and down from shoulder level.



## METHOD 3: RED LIGHT WAND

- Used as **supplement** to Stop/Slow paddle or red flag – primarily at night.
- To stop traffic, light waved back and forth across path of traffic.
- Lower the light to signal traffic to proceed.
- Never shine the light directly into eyes of driver.

## PART 4 - SINGLE / TWO-PERSON FLAGGING

A SINGLE FLAGGER SHOULD ONLY BE USED WHEN:

- Incident zone is extremely short (approx. 150 feet or, about 50 to 60 paces).
- No sight restrictions for traffic approaching from either direction exist.



## SINGLE-FLAGGER PROCEDURE



1. Stand on shoulder opposite incident zone.



2. Stop traffic on the left, extend your right arm with the STOP sign facing the first vehicle.

## SINGLE-FLAGGER PROCEDURE



3. Raise and expose the palm of your left hand.



4. Making sure the traffic on the left remains stopped, rotate the paddle to display STOP to the traffic on the right while keeping your left hand in the Stop position for the traffic on the left.

## SINGLE-FLAGGER PROCEDURE (cont'd)



5. Switch the paddle to your left hand and extend your right palm to stop traffic on your right.



6. When traffic on your right is stopped, switch the paddle back to your right hand and release traffic on your left with your left hand.

## SINGLE-FLAGGER PROCEDURE (cont'd)



7. When you need to stop a car on your left, turn the STOP sign to the car and put your left hand up in the STOP position.



8. When traffic to the left has stopped, switch the paddle to your left hand and direct traffic on your right to proceed through the work zone.

## TWO-FLAGGER OPERATIONS WITH A STOP/SLOW PADDLE



## TWO-PERSON FLAGGER TEAMS

- Appoint chief flagger to coordinate.
- Two flaggers must work with one mind.
- On short one-lane sections, stay **clearly visible** to each other.
- Maintain clear and precise communication.

## TWO-FLAGGER COMMUNICATION METHODS

- Hand signals
  - Not to be interpreted by motorist.
- Gestures
  - Example is tipping of hat.
- Voice
  - Only on short-distance segments.
- Radios or walkie-talkies

## TWO-FLAGGER PROCEDURE

1. STOP traffic as previously mentioned using the Stop-and-Slow paddle.
2. Move to middle of road with stop sign visible to traffic.
3. Signal partner to release traffic.

## TWO-FLAGGER PROCEDURE (cont'd)

4. Wait for all-clear sign from partner and make certain that traffic is stopped.
5. Return to shoulder; keep STOP signal visible.
6. Release traffic by displaying SLOW sign and hand signals.

## JUNIOR FIREFIGHTERS AT HIGHWAY INCIDENTS

- Know and follow state laws and regulations concerning the use of junior firefighters at highway incidents.
- It is highly inadvisable to use youths in this category for any kind of traffic control or flagging duties.



## FLAGGERS DO

- Keep an eye on the **MARC**.
- Be **SEEN**.
- Focus on **SPS** – STOP-PROCEED-SLOW.

## STOP Command

PREFERRED METHOD  
Stop/Slow Paddle



ALTERNATE METHOD  
Red Flag



## PROCEED Command

PREFERRED METHOD  
STOP/SLOW Paddle



ALTERNATE METHOD  
Red Flag



## ALERT/SLOW TRAFFIC Command

### PREFERRED METHOD Stop/Slow Paddle



### ALTERNATE METHOD Red Flag



## FLAGGERS DON'T

- DON'T become distracted – stay focused.
- DON'T stand in the travel lane.
- DON'T start traffic until you communicate with the other end of the incident zone.

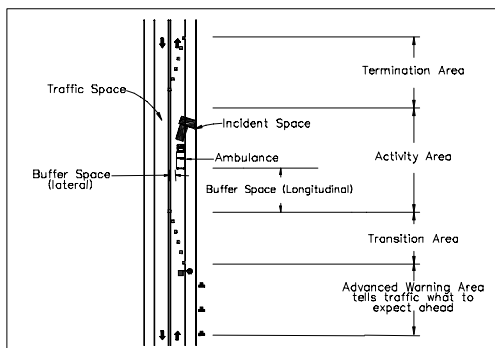
## FLAGGERS DON'T

- DON'T wave the flag or use it to signal, as it confuses drivers.
- DON'T assume traffic will stop.
- DON'T turn your back to traffic unless it is absolutely necessary *and* only after approaching vehicles have stopped.

## EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 6  
TRAFFIC CONTROL ZONES

## ADVANCE WARNING AREA

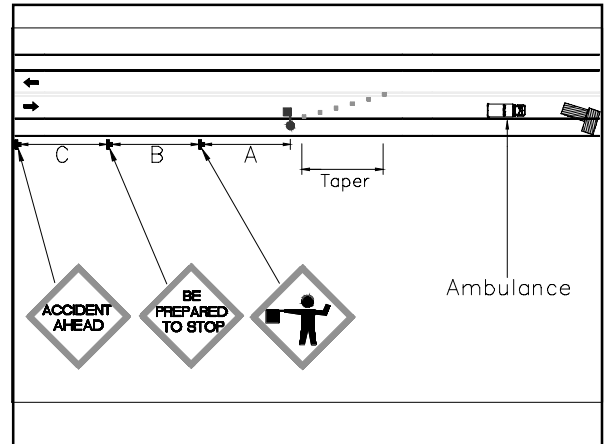
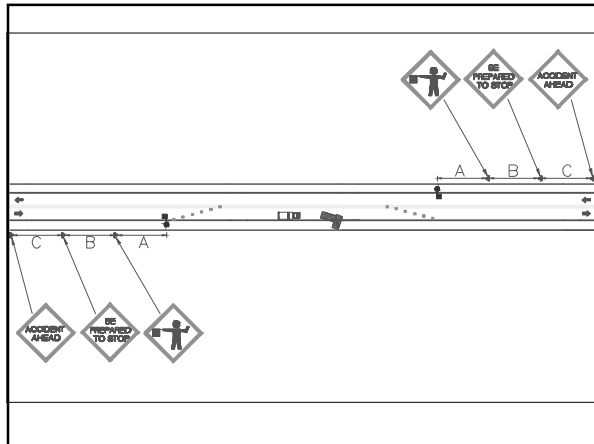


## ADVANCE WARNING AREA

### What would you expect to see in the advance warning area?

- Warning Signs
- Flaggers
- Flares
- Advance Warning Truck





## WARNING SIGN SPACING

Road Type	Distance Between Signs		
	A	B	C
Urban (35 mph or less)	100	100	100
Urban (40 mph or more)	350	350	350
Rural	500	500	500
Expressway/Freeway	1000	1500	2640

## WARNING SIGNS

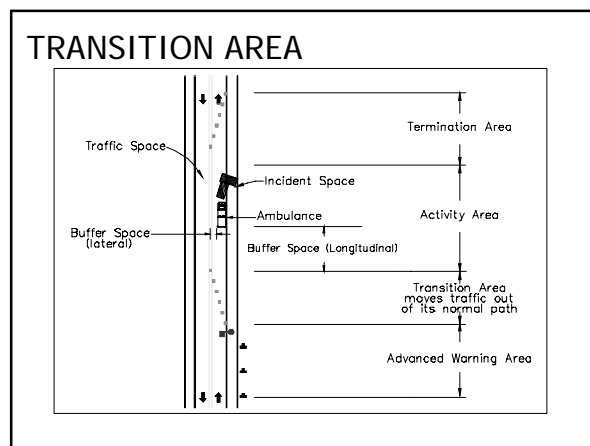
### Example:

Rural two-lane roadway with an incident blocking the right lane. No posted speed limit.

### Question:

What signs should be used and where should they be located?





### TRANSITION AREA

- Whenever a lane or portion of the highway is closed, this area is used to channelize traffic from its normal path to a new path.
- Transition areas consist of tapers, which are created using a series of channelizing devices.

### TRANSITION AREA

- Types of Tapers
  - Merging
  - Shifting
  - Shoulder
  - One-lane, two-way traffic

### MERGING TAPER

- Flagger is not needed
- Taper Length for 40 mph or less:
 
$$L = WS^2/60$$
 where L = taper length in feet  
 W = width of offset in feet  
 S = posted speed limit or anticipated operating speed in mph  
 Example: 11 ft. lanes, 35 mph speed limit = 225 ft. taper
- Cone spacing is 1.0 x the speed limit
- Example: 35 mph = 35 feet

### MERGING TAPER

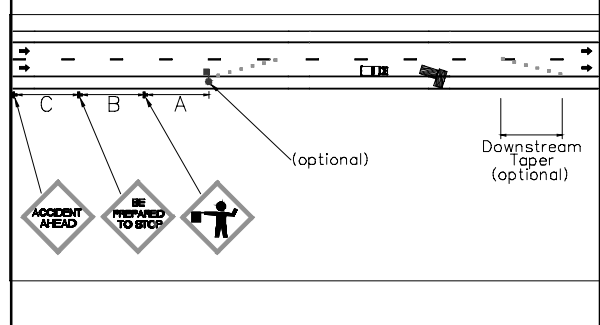
- Taper Length for 45 mph or greater:
 
$$L = WS$$
 where L = taper length in feet  
 W = width of offset in feet  
 S = posted speed limit or anticipated operating speed in mph  
 Example: 10 ft. lanes, 55 mph = 550 ft. taper
- Cone spacing is 1.0 x the speed limit
- Example: 55 mph = 55 feet



## MERGING TAPER LENGTH FOR 12 FT LANE

Speed Limit (S), mph	Taper Length (L)*, feet	Speed Limit (S), mph	Taper Length (L)*, feet
25	125	55	660
30	180	60	720
35	245	65	780
40	320	70	840
45	540	75	900
50	600		

## MERGING TAPER (on a multi-lane road)



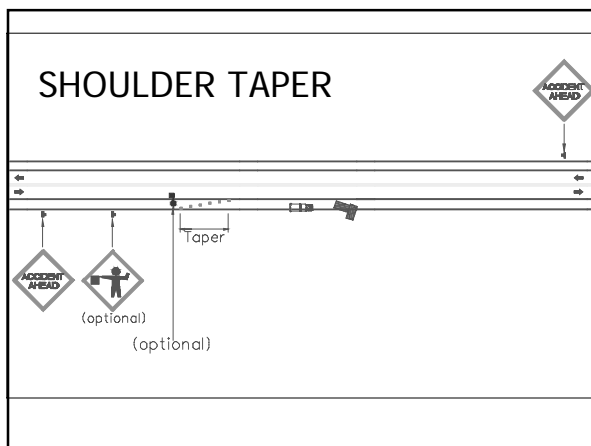
## SHIFTING AND SHOULDER TAPERS

- Flagger is not needed
- Taper Length
  - Shifting Taper =  $1/2 L$
  - Shoulder Taper =  $1/3 L$
- Cone spacing is  $1.0 \times$  the speed limit

## SHIFTING TAPER



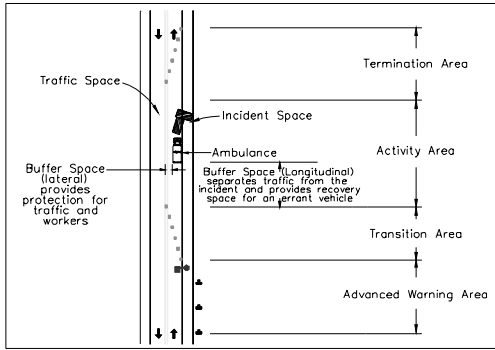
## SHOULDER TAPER



## ONE-LANE, TWO-WAY TRAFFIC TAPER

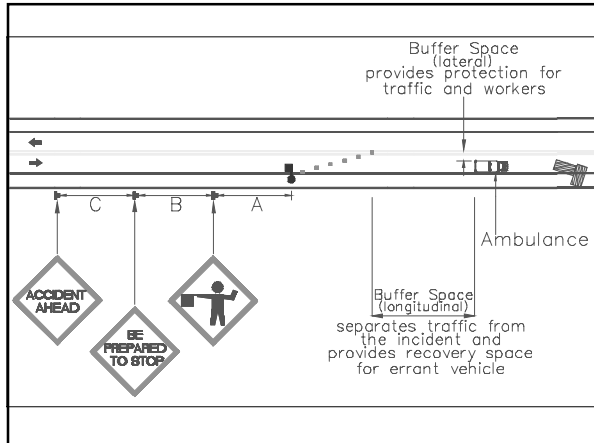
- A Flagger is required
- Taper Length
  - 50 – 100 feet
- Cone spacing = 20 feet

## BUFFER SPACE (OPTIONAL)



## BUFFER SPACE (OPTIONAL)

- The area that separates traffic from the incident and provides recovery space for an errant vehicle.
- Traffic cones may be used to delineate longitudinal buffer space.



## BUFFER SPACE

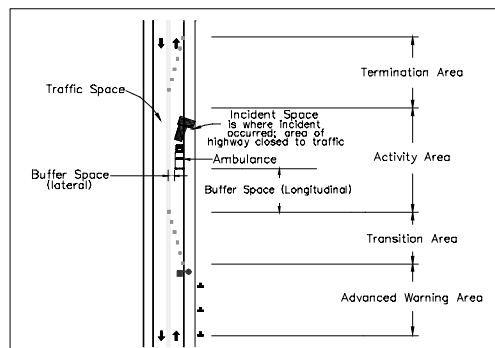
Longitudinal Buffer Space	
Speed (mph)	Distance (ft)
25	155
35	250
45	360
55	495
65	645

## BUFFER SPACE

### Lateral Buffer Space

- Separates traffic from incident
- Separates opposing flows of traffic
- Width varies

## INCIDENT SPACE

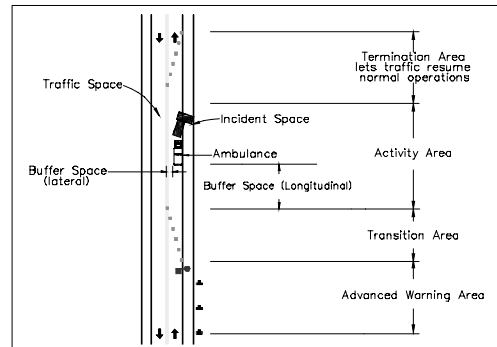


## INCIDENT SPACE (WORK SPACE)

The area of the highway that includes the incident itself and any equipment, vehicles, or people working on it.

- Length varies by incident.
- Safe refuge for emergency personnel.
- Restricted to essential vehicles and equipment.

## TERMINATION AREA



## TERMINATION AREA

- Area used to return traffic to its normal traffic path.
  - Approximately 100 feet in length per lane closed on multilane highways
  - 50 feet to a maximum of 100 feet in length on two-lane, two-direction roads with flagger operation
  - Six channelizing devices spaced evenly

## TERMINATION AREA



## TYPICAL TRAFFIC CONTROL ZONES

- Each traffic control zone (TCZ) is unique.
- Each TCZ must match the conditions encountered at the scene.
- Conditions are often unpredictable and extreme.
- Practical solutions rather than standards.

## TYPICAL TRAFFIC CONTROL ZONES

- Typical traffic control zone drawings provide guidance; actual setup is determined at the site.
- Variables that must be considered
  - Highway type
  - Lane closure vs. off-road incident
  - Location of incident
  - Other considerations

## THINK ABOUT...

### Highway Type

- Speed of approaching vehicles
- Number of lanes
- Traffic volumes
- Available stopping sight distance

## THINK ABOUT...

### Lane closure vs. off road incident

- Distance from pavement edge
- Lane widths
- Paved shoulders

## THINK ABOUT...

### Location of incident

- Urban vs. rural
- Intersection vs. mid-block

## THINK ABOUT...

### Other considerations

- Daylight vs. nighttime
- Weather conditions
- Time required to clear incident
- Hazardous materials
- Alternate road

# EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 7  
INCIDENT ZONE PROCEDURES

## INCIDENT ZONE PROCEDURE

- What do I do if I'm one of the first to respond to an incident?
- If you are a first responder, it is ***your*** responsibility (within the principles of Unified Incident Command) to establish a safe incident zone.



## INCIDENT ZONE PROCEDURE

- Four-Phase Procedure
  - Phase 1 – Provide Immediate Warning to Drivers
  - Phase 2 – Establish Traffic Control
  - Phase 3 – Monitor and Adjust
  - Phase 4 – Hand Off or Removal

## THE TOTAL DISTANCE A VEHICLE NEEDS TO STOP AT VARIOUS SPEEDS:

mph	feet
■ 10	45
■ 20	115
■ 30	200
■ 40	305
■ 50	425
■ 55	495
■ 60	570
■ 65	645
■ 75	820

## PHASE 1– PROVIDE IMMEDIATE WARNING

- Stop traffic if necessary.
- Place the Accident / Emergency Ahead Sign at:
  - 500 feet for all highways except:
  - 1,000 feet for any 4 lane facility with a speed limit of 55 mph or greater
- Until standard traffic control devices are available, use your vehicle, flares, etc. to provide advance warning to drivers.

## PHASE 2– ESTABLISH TRAFFIC CONTROL

- Close the road or keep traffic moving?
- Assume that all incident zones will need manual traffic control (flagging) to maintain traffic flow.

## PHASE 2– ESTABLISH TRAFFIC CONTROL

### **Assess the situation and determine:**

- Location and extent of incident (lane blockage vs. off road).
- Number and position of lanes to be closed.
- Expected duration of incident.
- Call your dispatch center with a size-up/status report within 15 minutes of arrival.
- Speed and volume characteristics of oncoming traffic.
- Available sight distance to the incident.

## Estimating the Duration

- Average closure in Kentucky\*
  - All crashes – 32 minutes
  - Fatal crashes – 2 ½ hours
- 95% of crashes have closures of 1 ½ hours or less\*
- Key indications that a crash may be “major” and could have a closure of 2+ hours:
  - Fatalities, large number of vehicles, hazardous material involved, possible criminal charges

\*Based on 2003 CRASH data

## PHASE 2– ESTABLISH TRAFFIC CONTROL

### Determine traffic control plan elements:

- Need for additional resources.
  - Mutual aid and/or KYTC.
- Flagging/signing/combination.
- Position of flaggers/signs from incident.
- Taper lengths.
- Need for and position of shadow vehicles.
- Staging of emergency response vehicles.

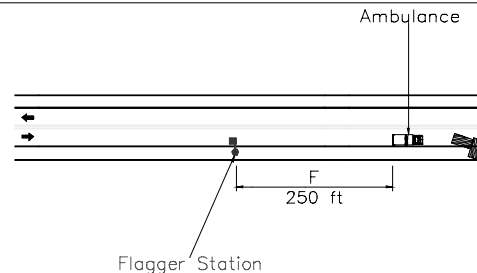
## ESTABLISHING A PHASE 2 TRAFFIC CONTROL ZONE

- Three-Step Process
  1. **Establish Flagger Station.**
  2. Place Advance Warning Signs.
  3. Establish Tapers.

## STEP 1: ESTABLISH FLAGGER STATION

Speed Limit, mph	Distance, feet	Speed Limit, mph	Distance, feet
20	115	45	360
25	155	50	425
30	200	55	495
35	250	60	570
40	305	65	645

## ESTABLISH FLAGGER STATION



## ESTABLISHING A PHASE 2 TRAFFIC CONTROL ZONE

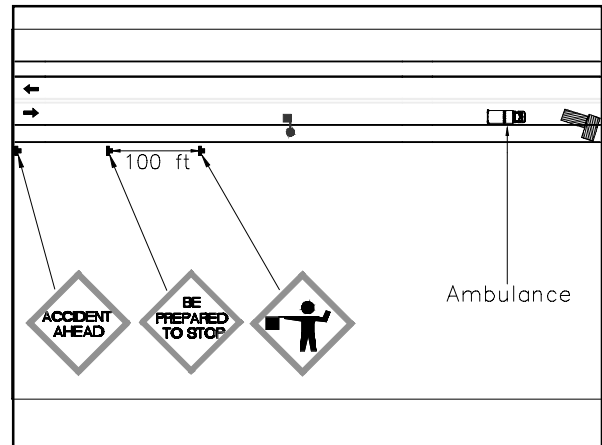
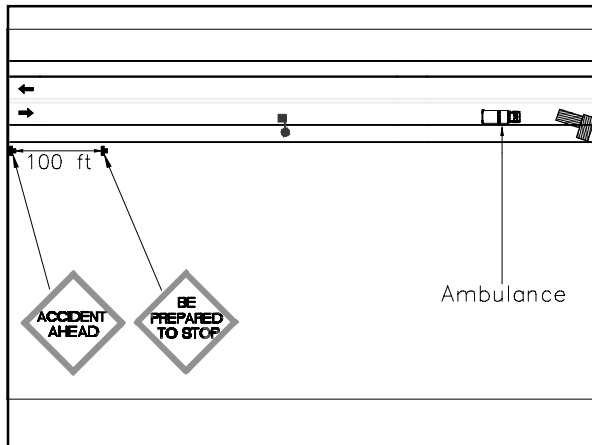
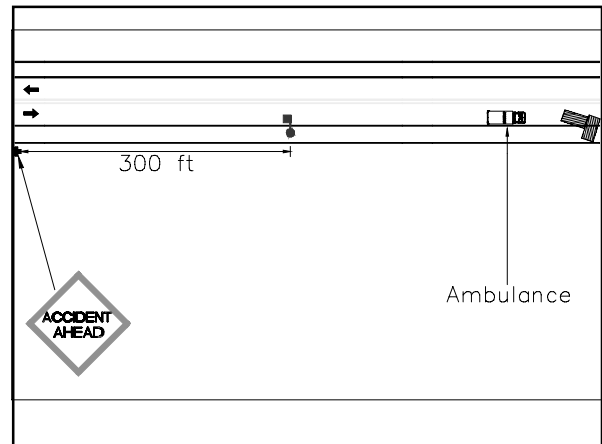
- Three-Step Process
  1. Establish Flagger Station.
  2. **Place Advance Warning Signs.**
  3. Establish Tapers.

## WARNING SIGN SPACING

Road Type	Distance Between Signs		
	A	B	C
Urban (35 mph or less)	100	100	100
Urban (40 mph or more)	350	350	350
Rural	500	500	500
Expressway/Freeway	1,000	1,500	2,640

## WARNING SIGN SPACING

Speed Limit, Mph	Flagger Station or Buffer Space Feet (# Paces)	Distance Between Signs (A, B, C), Feet (# Paces)			
		Low Speed Urban	High Speed Urban	Rural	Expressway
25	155 ( )	100 ( )		500 ( )	
35	250 ( )	100 ( )		500 ( )	
45	360 ( )		350 ( )	500 ( )	
55	495 ( )			500 ( )	A: 1000 ( ) B: 1500 ( ) C: 2640 ( )
65	645 ( )			500 ( )	A: 1000 ( ) B: 1500 ( ) C: 2640 ( )

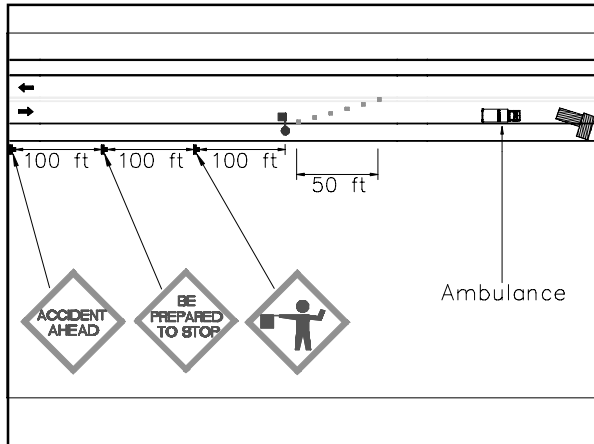


## ESTABLISHING A PHASE 2 TRAFFIC CONTROL ZONE

- Three-Step Process
  1. Establish Flagger Station.
  2. Place Advance Warning Signs.
  3. **Establish Tapers.**

## TAPER LENGTH

- 50 feet for most highways, or
- 100 feet for any 4-lane facility with a speed limit of 55 mph or greater
- Calculate "L" (if no flagger present)



## ESTABLISHING A PHASE 2 TRAFFIC CONTROL ZONE

- Three-Step Process
  1. Establish Flagger Station.
  2. Place Advance Warning Signs.
  3. Establish Tapers.

## PHASE 3 MONITOR & ADJUST

- Observe traffic flow and determine if sign location and/or flagger adjustments are needed.
- Avoid traffic backups!!!

## PHASE 4 – HAND OFF OR REMOVAL

- When appropriate, relinquish control to law enforcement or KYTC.
- 
- Roadway clear of damaged vehicles, emergency vehicles, and debris?
  - Can normal traffic flow be restored?

# EMERGENCY TRAFFIC CONTROL FOR RESPONDERS

Chapter 8  
EXERCISES

## CLASS EXERCISES

- Test/Reinforce
  - Phase 1 and 2 knowledge
  - Flagger requirements
  - Intersection scenarios
  - Two-lane, lane-closure scenarios



## CLASS EXERCISES

- Six Exercises
  - True/False, Multiple Choice
  - Find the Error
  - Complete Setup of Traffic Control
  - Working in Teams (time permitting)

## CLASS EXERCISES

- Format
  - Exercise 1: Class Discussion
  - Exercises 2 – 6: Team

Speed Limit, Mph	Flagger Station or Buffer Space, Feet (# Paces)	Distance Between Signs (A, B, C), Feet (# Paces)			
		Low Speed Urban	High Speed Urban	Rural	Expressway
25	155 ( )	100 ( )		500 ( )	
35	250 ( )	100 ( )		500 ( )	
45	360 ( )		350 ( )	500 ( )	
55	495 ( )			500 ( )	A: 1000 ( ) B: 1500 ( ) C: 2640 ( )
65	645 ( )			500 ( )	A: 1000 ( ) B: 1500 ( ) C: 2640 ( )

## CLASS EXERCISE 1 PHASE 1 and FLAGGING

- 2-lane rural road, 45 mph speed limit.
- Northbound lane closed.
- Ambulance positioned in northbound lane.
- No police on site.

## CLASS EXERCISE 1 PHASE 1 and FLAGGING

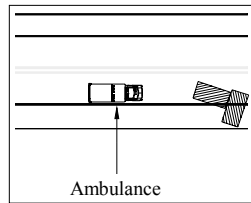
- Q1: The first activity to do is:
  - A. Place flare at rear of ambulance
  - B. Place Accident/Emergency Scene Ahead sign on shoulder
  - C. Stop traffic if necessary
  - D. Slow traffic
- A1: C. STOP TRAFFIC IF NECESSARY

## CLASS EXERCISE #1 PHASE 1 and FLAGGING

- Q2: For northbound traffic, the ACCIDENT/EMERGENCY SCENE AHEAD sign should be set at least \_\_\_\_ feet before the incident vehicles.
  - A. 200
  - B. 400
  - C. 500
  - D. 800
- A2: C. 500

### CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q3: Point the wheels of the ambulance in which direction?
  - A. Straight
  - B. Hard left
  - C. Slightly to the left
  - D. Hard right
  - E. Slightly to the right
- A3: D. HARD RIGHT



### CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q4: Under Phase 1, the positioning of the Accident/Emergency Scene Ahead sign is a function of (more than one may apply):
  - A: The speed limit
  - B: The number of travel lanes
  - C: Sight distance to see the sign
  - D: All of the above
- A4: D

### CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q5: Which is the recommended method to control traffic?
  - A. Red Flag
  - B. Stop/Slow Paddle
  - C. Hand Signals
  - D. Light Wand
- A5: B. STOP/SLOW PADDLE

### CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q6: The flagger should always wear what type of clothing?
  - A. Dark
  - B. White
  - C. Retroreflective
  - D. Comfortable
- A6: C. RETROREFLECTIVE

### CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q7: Keeping your eye on the MARC means which of the following?
  - A. Appearance
  - B. Responsible
  - C. Courteous
  - D. Mental Alertness
  - E. All of the Above
- A7: ALL OF THE ABOVE

### CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q8: Which of the following is/are True?
  - A. SPS means Stop-Proceed-Slow.
  - B. Always stand in front of traffic to direct vehicles to stop.
  - C. To be an effective flagger, you must be visible.
  - D. The flagger should be positioned on the shoulder at the beginning of the taper.
- A8: A, C, and D are true.

## CLASS EXERCISE 1 PHASE 1 and FLAGGING

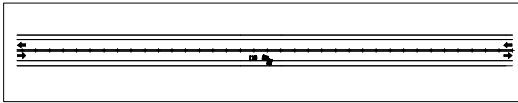
- Q9: Define/describe the following:
  - A. For positioning the warning signs, define the A measurement.
  - B. For positioning the warning signs, define the B measurement.
  - C. For positioning the warning signs, define the C measurement.

## CLASS EXERCISE 1 PHASE 1 and FLAGGING

- Q10: Which of the following is/are True?
  - A. The dog-patting motion is a signal to traffic to slow down.
  - B. Use the free arm with your palm facing traffic to signal stop.
  - C. Wear fluorescent and retroreflective clothing.
  - D. The number of lanes determines how far the flagger is located from the incident.
- A10: A, B, and C are true.

## CLASS EXERCISE 2 DEVELOP TRAFFIC CONTROL PLAN

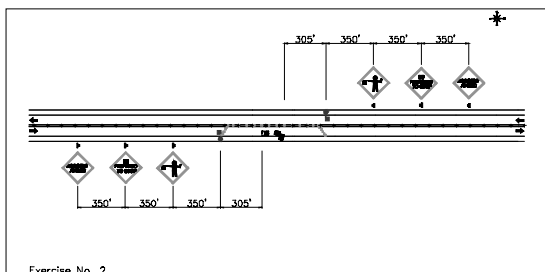
- 2-lane urban road, 40 mph speed limit
- Daytime incident
- Northbound (NB) lane closed
- Ambulance positioned in NB lane



## CLASS EXERCISE 2 DEVELOP TRAFFIC CONTROL PLAN

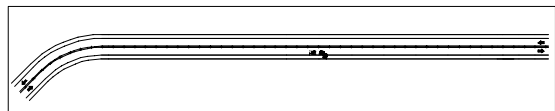
- Flagger station in NB and SB directions.
- Taper location, length, number of cones.
- Location of warning signs.
- In what order should these devices be placed?

## CLASS EXERCISE 2 DEVELOP TRAFFIC CONTROL PLAN



## CLASS EXERCISE 3 DEVELOP TRAFFIC CONTROL PLAN

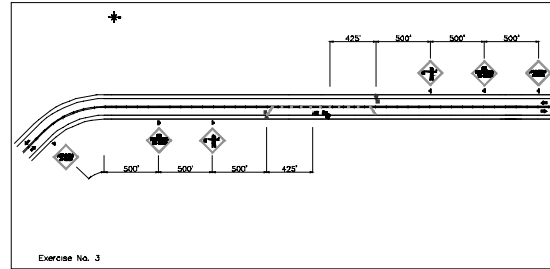
- 2-lane rural road, 50 mph speed limit
- Nighttime incident
- Northbound (NB) lane closed
- Ambulance positioned in NB lane



### CLASS EXERCISE 3 DEVELOP TRAFFIC CONTROL PLAN

- Location of flaggers
- Location of all traffic control devices
- Order in which these devices should be placed
- Necessary clothing

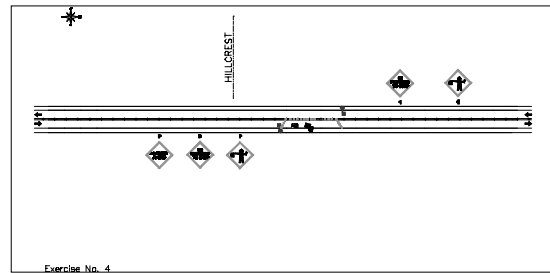
### CLASS EXERCISE 3 DEVELOP TRAFFIC CONTROL PLAN



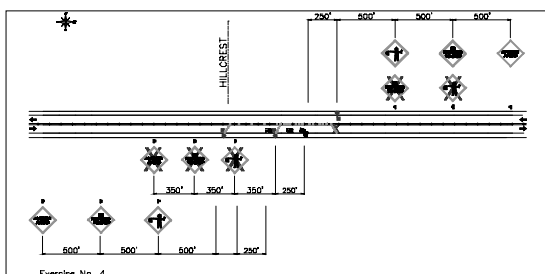
### CLASS EXERCISE 4 FIND THE ERRORS

- 2-lane rural road, 35 mph speed limit
- Daytime incident
- Phase 2 traffic control in place
- Eight errors exist: find the errors and determine what should have been done

### CLASS EXERCISE 4 FIND THE ERRORS



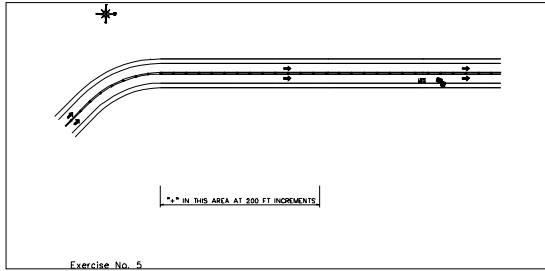
### CLASS EXERCISE 4 FIND THE ERRORS



### CLASS EXERCISE 5 DEVELOP TRAFFIC CONTROL PLAN

- 4-lane interstate, 65 mph speed limit
- Wide median
- Nighttime incident
- Northbound, 12 ft wide, right-hand lane closed

**CLASS EXERCISE 5  
DEVELOP TRAFFIC CONTROL PLAN**



**CLASS EXERCISE 5  
DEVELOP TRAFFIC CONTROL PLAN**

- For Phase 1 conditions, answer Questions 1 and 2.
- For Phase 2, develop the traffic control plan showing:
  - Location of the merging taper
  - Location of all traffic control devices
  - Order in which these devices should be placed

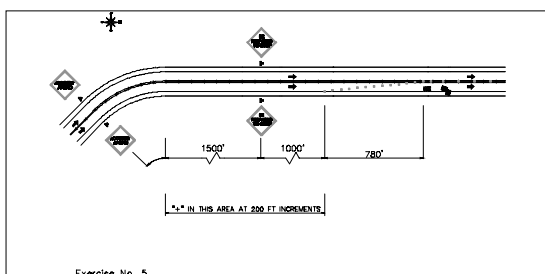
**CLASS EXERCISE 5  
DEVELOP TRAFFIC CONTROL PLAN**

- Q1: For Phase 1, how many Accident/Emergency Scene Ahead signs are required?
- A1: TWO

**CLASS EXERCISE 5  
DEVELOP TRAFFIC CONTROL PLAN**

- Q2: For Phase 1, how far before the incident space should the Accident/Emergency Scene Ahead sign be placed?
- A2: At Least 1,000 Feet.

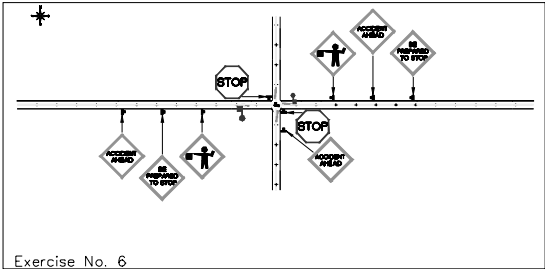
**CLASS EXERCISE 5  
DEVELOP TRAFFIC CONTROL PLAN**



**CLASS EXERCISE 6  
FIND THE ERRORS**

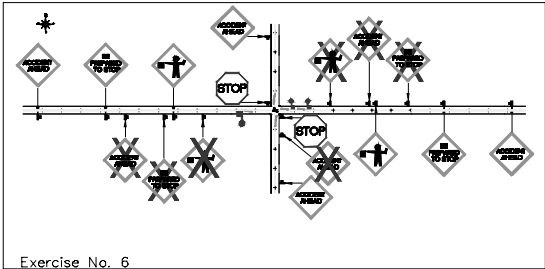
- Four-way urban intersection
- 40 mph speed limit
- Daytime incident
- Phase 2 traffic control in place
- Six errors exist: find the errors and determine what should have been done

CLASS EXERCISE 6  
FIND THE ERRORS



Exercise No. 6

CLASS EXERCISE 6  
FIND THE ERRORS



Exercise No. 6

#### **4.0 Emergency Responder Traffic Control Handbook**

The following pages contain copies of the pages representing contents of the handbook titled “Guidelines for Emergency Traffic Control”.

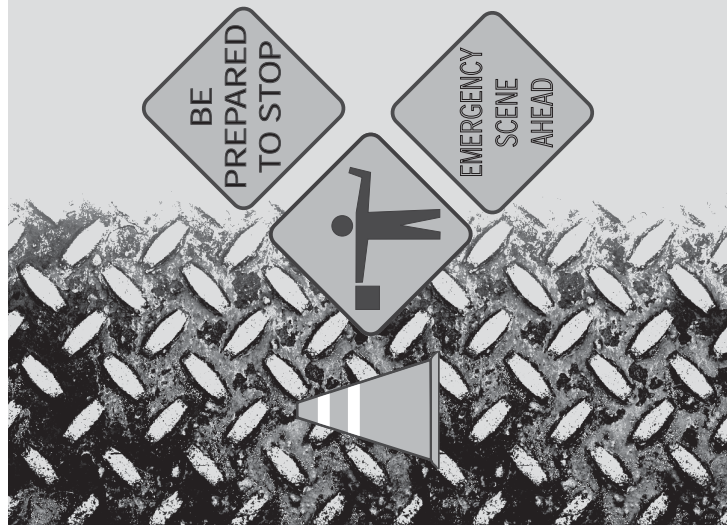






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# Guidelines for Emergency Traffic Control



## **INTRODUCTION**

A temporary traffic control (TTC) zone is an area of highway where road user conditions are changed because of a work zone or an incident through the use of TTC devices, uniformed law enforcement officers, or other authorized personnel.

The primary function in such locations is to provide for the reasonably safe and efficient movement of road users through or around the work zone or incident while reasonably protecting workers, responders to traffic incidents, and equipment. Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD) is the national standard for all traffic control devices used during construction, maintenance, and utility activities plus incident management. Chapter 6I specifically deals with the control of traffic through traffic incident management areas.

This handbook summarizes guidelines listed in the MUTCD with specific focus on traffic incidents. It contains basic principles, a description of standard traffic control devices, guidelines for the application of the devices, and typical application diagrams.

The application diagrams shown represent minimum requirements for typical situations. They are not intended as substitutes for engineering judgment and should be altered to fit the conditions of a particular site. All traffic control devices used must be in compliance with Part 6 of the MUTCD. The MUTCD has been adopted by the Kentucky General Assembly (KRS 189.337 and 603 KAR5:050) as the standard for signs and markings in Kentucky.

**CHAPTER 6I OF THE  
2003 MUTCD  
“Control of Traffic Through Traffic Incident  
Management Areas”**

**TRAFFIC INCIDENT:** “An emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.”

- A traffic incident management area is an area of a highway where TTC are imposed by authorized officials in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.
- The primary function of TTC is to move road users reasonably safely and expeditiously past or around the incident, to reduce secondary crashes, and to preclude unnecessary use of the surrounding local road system.
- Highway agencies, public safety agencies and private sector responders should plan for traffic incidents.

**CHAPTER 6I OF THE  
2003 MUTCD**

**“Control of Traffic Through Traffic Incident  
Management Areas”**

**MAJOR PROVISIONS:**

- Classifies incidents by expected duration.
- Recommends interagency pre-planning and management (“unified incident management”).
- Traffic control “size-up” and beginning of action within 15 minutes of arrival.
- “Flourescent Pink” background/black letters permitted for signs in incident traffic control zones.
- Recommendations on use of Emergency Vehicle Lighting.

Classifies incidents by expected duration.

- **MAJOR:** over two hours
- **INTERMEDIATE:** from 30 minutes to two hours
- **MINOR:** under 30 minutes

In general, the longer the duration, the more closely the TTC measures are expected to conform to the MUTCD. Incidents expected to last 24 hours or longer should comply with guidelines and typical applications contained in Part 6 of the MUTCD.

Access the MUTCD online at:  
**[www.mutcd.fhwa.dot.gov](http://www.mutcd.fhwa.dot.gov)**

## REASON FOR CONTROL

### Safety / Traveler Delay

#### RISK TO RESPONDERS:

- Responders are at risk of being injured or killed while working at the scene of an incident.

#### SECONDARY CRASHES:

- Secondary crashes are significant and frequently more severe than the original incident.

#### TRAVELER DELAY:

Number of Lanes in Each Direction	Shoulder Blocked	Lanes Blocked		
		One	Two	Three
2	81%	35%	0%	N/A
3	83%	49%	17%	0.00
4	85%	58%	25%	13%
5	87%	65%	40%	20%
6	89%	71%	50%	26%

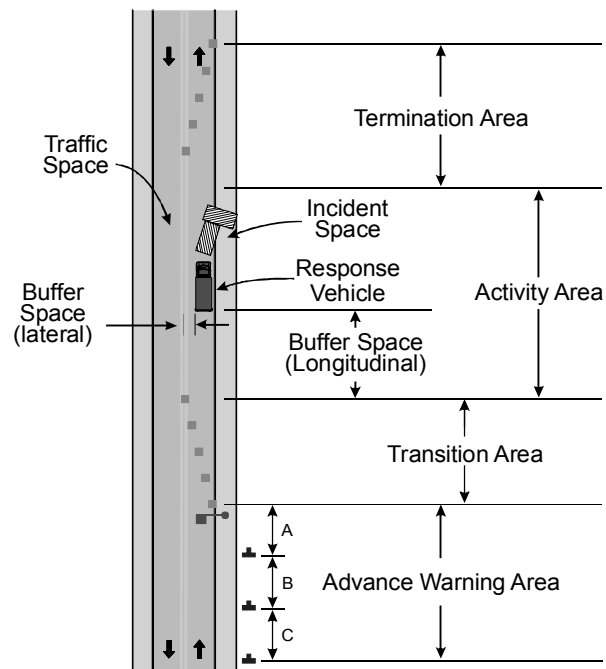


Percent Capacity Available (Highway Capacity Manual 2000)

#### TRAVELER DELAY IS COSTLY

- Reduced productivity
- Increased cost of goods and services
- Increased fuel consumption

## COMPONENTS OF INCIDENT MANAGEMENT AREA



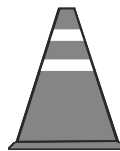
## TRAFFIC CONTROL DEVICES (TCD)

### FUNCTION

To promote highway safety by providing for the orderly and predictable movement of all traffic and to provide guidance and warning as needed.

### TYPES OF TCD

- Warning Signs
- Channelizing devices
  - Traffic zone
  - Flares
- Lighting devices
  - Flashing warning beacon on equipment
  - Flashing arrow panel on truck / trailer
- Shadow vehicles / advance warning truck (large truck, not occupied)



### ADVANCE WARNING AREA

What would you expect to see in the advance warning area?



- Warning Signs
- Flaggers
- Flares
- Advance Warning Truck

### WARNING SIGN SPACING

Road Type	Distance Between Signs*		
	A	B	C
Urban (35 mph or less)	100	100	100
Urban (35 mph or more)	350	350	350
Rural	500	500	500
Expressway/Freeway	1000	1500	2640

\*Refer to Typical Application Diagrams.



## TRANSITION AREA

- Whenever a lane or portion of the highway is closed, this area is used to channelize traffic from its normal path to a new path.
- Transition areas consist of tapers, which are created using a series of channelizing devices.

### TYPES OF TAPERS

- Merging - used to reduce the number of through lanes in one direction.
- Shifting - used to laterally shift traffic in one direction.
- Shoulder - used to close a shoulder.
- One-Lane, Two-Way Traffic - used with a flagger to close one lane on a two-lane road.



### TRANSITION AREA

Type of Taper	Length
Merging	at least L
Shifting	at least 1/2 L
Shoulder	at least 1/3 L
One lane, Two-Way	50 - 100 ft.

Speed Limit (MPH)	Merging Taper Length (L)*			Spacing Between Devices (Feet)
	Lane Width (feet)			
	10	11	12	
25	105	115	125	25
35	205	225	245	35
45	450	495	540	45
55	550	605	660	55
65	650	715	780	65

\*Following are the formulas used to calculate taper length:

Posted Speed	Formula
40 mph or under	$L = WS^2/60$
45 mph or over	$L = WS$

where: L = taper length; W = width of lane or offset, and  
S = posted speed, or off-peak 85th percentile speed

Note that space for a one-lane, two-way taper shall be 20 feet for all conditions.

**BUFFER SPACE  
(OPTIONAL)**

- The area that separates traffic from the incident and provides recovery space for an errant vehicle.
- Traffic cones may be used to delineate longitudinal buffer space.

Longitudinal Buffer Space	
Speed	Distance
25	155
35	250
45	360
55	495
65	645

**LATERAL BUFFER SPACE**

- Separates traffic from incident
- Separates opposing flows of traffic
- Width varies by incident

## INCIDENT SPACE

**The area of the highway that includes the incident itself and any equipment, vehicles, or people working on it.**

- Length varies by incident
- Safe refuge for emergency personnel
- Restricted to essential vehicles and equipment



## **INCIDENT ZONE PROCEDURE**

- Four phase procedure
  - Phase 1 - Provide Immediate Warning to Drivers
  - Phase 2 - Establish Traffic Control
  - Phase 3 - Monitor and Adjust
  - Phase 4 - Hand Off or Removal

### **PHASE 1 - PROVIDE IMMEDIATE WARNING**

- Stop traffic if necessary
- Place the Accident / Emergency Ahead Sign at:
  - 500 feet for all highways except:
  - 1,000 feet for any 4 lane facility with a speed limit of 55 mph or greater
- Until standard traffic control devices are available, use your vehicle, flares, etc. to provide advance warning to drivers.

### **PHASE 2 - ESTABLISH TRAFFIC CONTROL**

- Assess the situation and determine your traffic control plan
  - Consider the location and extent of the incident.
  - Consider the number and position of lanes that need to be closed.

- Determine the expected duration of the incident.
  - The average closure for Kentucky:
    - ◆ 32 minutes for all crashes
    - ◆ 2 1/2 hours for fatal crashes
  - 95% of all crashes in Kentucky have closures of 1 1/2 hours or less
  - Key characteristics of a crash that are a good indication of a closure lasting more than two hours:
    - ◆ Fatalities
    - ◆ Large numbers of vehicles
    - ◆ Hazardous material
    - ◆ Possible criminal charges
  - Request additional resources from KyTC or others as needed.
- Determine what traffic control elements are needed
  - What is the speed of traffic?
  - What is the type of roadway?
  - Is a flagger needed?
  - What type of taper is needed?
  - Is a shadow vehicle available for use?
- Setup Phase 2 traffic control using a 3-step process
  1. Establish flagger station (when needed)
  2. Place advance warning signs
  3. Establish tapers

(Refer to table on following pages for distances)

Speed Limit (mph)	Flagger Station or Buffer Space <sup>1</sup> (feet)	Distance Between Signs (A, B, C) (feet)			One-lane, Two-way	Taper Length			Cone Spacing <sup>3</sup> (feet)
		Urban	Rural	Expressway		10' Lane	Merging (L) <sup>2</sup> (feet)		
							11' Lane	12' Lane	
25	155	100	500		105	115	125	25	
35	250	100	500		205	225	245	35	
45	360	350	500		450	495	540	45	
55	495			A: 1,000 B: 1,500 C: 2,640	50 - 100 feet			55	
65	645			A: 1,000 B: 1,500 C: 2,640	550	605	660	65	
					650	715	780	65	

<sup>1</sup>When establishing a flagger station, the length of the one-lane, two-way taper (50-100 feet) may be added to this distance to maximize the longitudinal buffer space.

<sup>2</sup>For a shifting taper, use 1/2L and for a shoulder taper, use 1/3L.

<sup>3</sup>Note that for a one-lane, two-way taper, cone spacing shall be 20 feet for all conditions.

### **PHASE 3 - MONITOR AND ADJUST**

- Observe traffic flow and determine if sign location and/or flagger adjustments are needed.
- Avoid traffic backups.

### **PHASE 4 - HAND OFF OR REMOVAL**

- When appropriate, relinquish control to law enforcement or KYTC.
- Traffic control can be removed when:
  - The roadway is clear of damaged vehicles, emergency vehicles, and debris.
  - Traffic can be restored to normal flow.



## **FLAGGING**

### **Hand-Signaling Devices**

The stop / slow paddle should be the primary and preferred hand-signaling device. Use of flags should be limited to emergency situations.

### **Flagger Stations**

Flagger stations shall be located far enough in advance of the work space so that approaching road users will have sufficient distance to stop before entering the activity area (incident space).

Flagger stations should be preceded by proper advance warning signs. At night, flagger stations should be illuminated.

The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger should only stand in the lane being used by moving road users after road users have stopped. The flagger should be clearly visible to the first approaching road user at all times. The flagger also should be visible to other road users. The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns, whistles, etc.) of approaching danger by out-of-control vehicles. The flagger should stand alone, never permitting a group of workers to congregate around the flagger station.

### **Communication**

When two flaggers are used, they can communicate verbally or visually if they are close enough and visible to each other. One of the flaggers should be designated as the coordinator. Where the end of a one-lane section is not visible from the other end, the flaggers may maintain control using such methods as a radio or field telephone.

## Flagging Procedures

### Paddles:

1. **To stop road users**, face traffic and aim the STOP paddle face toward drivers in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.
2. **To direct stopped road users to proceed**, face traffic with the SLOW paddle face aimed toward traffic in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand drivers to proceed.
3. **To alert or slow traffic**, face traffic with the SLOW paddle face aimed toward traffic in a stationary position with the arm extended horizontally away from the body.

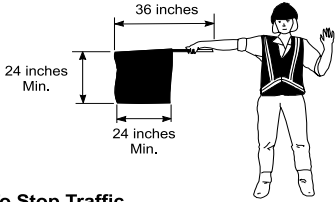
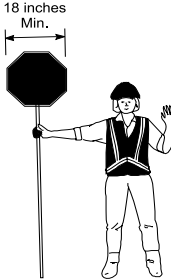
### Flags:

1. **To stop road users**, face traffic and extend the flag staff horizontally across the lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above the shoulder level toward approaching traffic.
2. **To direct stopped road users to proceed**, stand parallel to the traffic movement and with flag and arm lowered from the view of the drivers, and shall motion with the free hand for traffic to proceed. Flags shall not be used to signal road users to proceed.
3. **To alert or slow traffic**, face traffic and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.

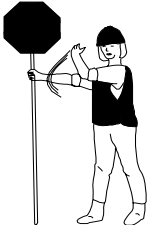
The use of the flag and sign paddle are displayed in the following illustration.

**PREFERRED METHOD  
STOP/SLOW PADDLE**

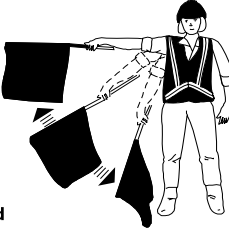
**EMERGENCY SITUATIONS ONLY  
RED FLAG**



**To Stop Traffic**



**To Let Traffic Proceed**



**To Alert and Slow Traffic**

## EQUIPMENT LIST

### Recommended Equipment for Emergency Traffic Control

- Warning Signs (48" x 48", roll-up, retroreflective)
  - "Emergency Scene Ahead" or "Accident Ahead" - 2
  - "Be Prepared to Stop" - 2
  - Flagger - 2
  - Portable Sign Stands - 6
  
- Flags
  - 18" x 18" orange safety flags to attach to warning signs - 18 (optional)
  - 24" x 24" red flagger flags w /stiffener and 36" staff - 2
  
- Traffic Cones
  - 28", orange with retroreflective trim - 16
  
- Flagger Paddles
  - 24", retroreflective with 7' handles - 2
  
- Retroreflective Safety Vests (Class 3)
  - Yellow-Green - 10

## **SAFETY CLOTHING**

### **High-Visibility Safety Apparel**

(Must meet ANSI 107-2004 standards)

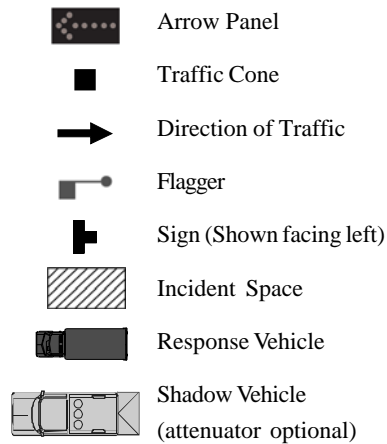
#### **Four classifications of garments:**

- ❑ Performance Class 1 - low speeds, ample separation, full attention  
Example: Picking up carts in shopping center parking lots
  
- ❑ Performance Class 2 - higher speeds, complex backgrounds, diverted attention, less traffic / work separation possible  
Example: Short-Term maintenance operation, firefighters engaged in emergency response activities who are wearing turnout gear
  
- ❑ Performance Class 3 - very high speeds, reduced sight distances, high task loads, need for conspicuity through full range of motion, need to be recognized as a person  
Example: Highway Emergency Incident
  
- ❑ Performance Class E - trousers, bib overalls, and shorts designed for use with a Performance Class 2 or 3 garments

Responders should use either Class 2 or Class 3, depending on the location.

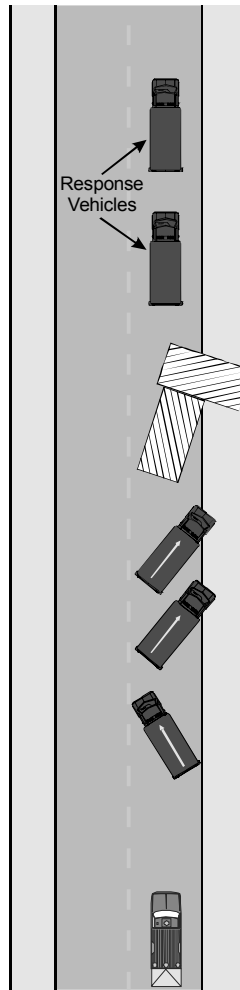
## TYPICAL APPLICATION DIAGRAMS

The diagrams on the following pages represent examples of the application of principles and procedures for safe and efficient TTC for traffic incidents. The layouts represent minimum requirements. It is not possible to include illustrations to cover every situation which will require work area protection. They are not intended as a substitute for judgment and should be altered to fit the conditions of a particular site. All traffic control devices used must be in compliance with the MUTCD. For further information, refer to Part 6 of the MUTCD.

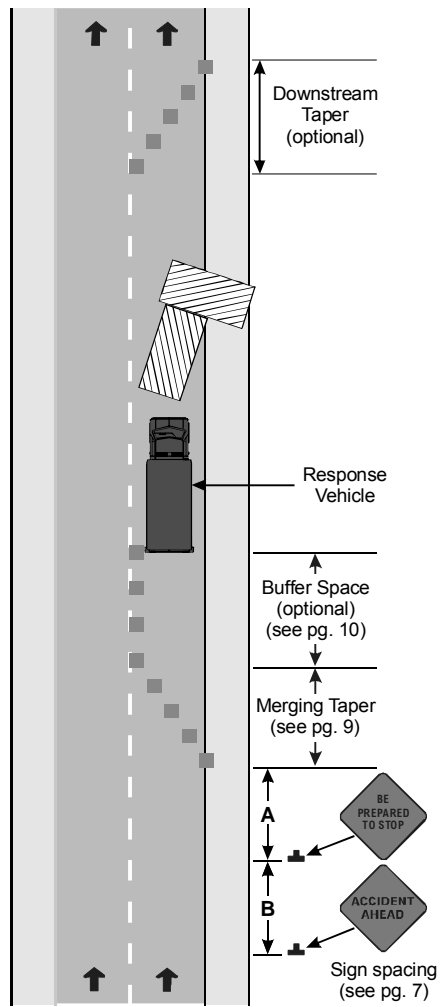


## RESPONSE VEHICLE MANAGEMENT “Safe Parking Using a Shadow Vehicle”

- ❑ Response vehicles used in dealing with the incident are angled into the scene toward the shoulder to protect the scene from traffic
- ❑ First vehicle up stream (not including shadow vehicle) is usually shown angled outward to “channel” traffic into open lane
- ❑ The vehicles should be quickly backed up with Advance Warning (“Emergency Ahead”) signage
- ❑ Response vehicles may “cartwheel” into incident space or traffic space if struck on corners by a vehicle of equal or larger size

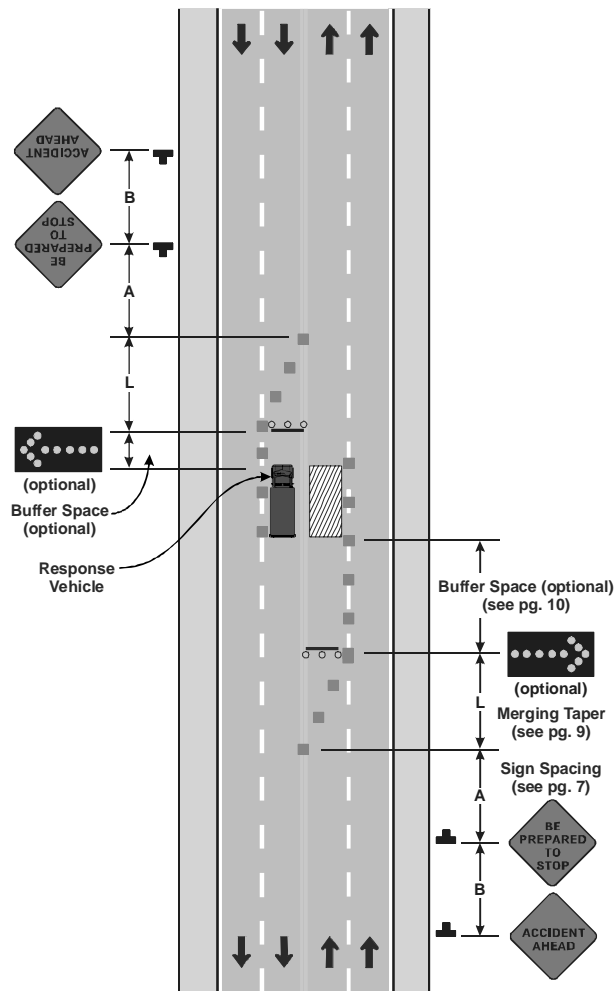


**MERGING TAPER**  
**(on a multi-lane road - one lane closed)**

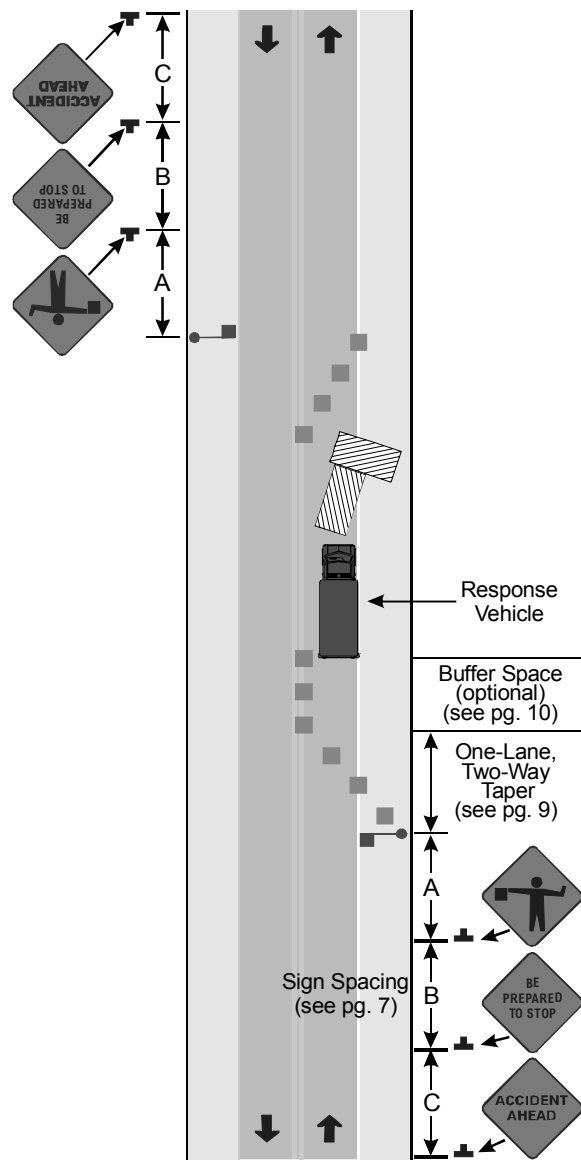




## MERGING TAPER (on a multi-lane road - interior lane closed)

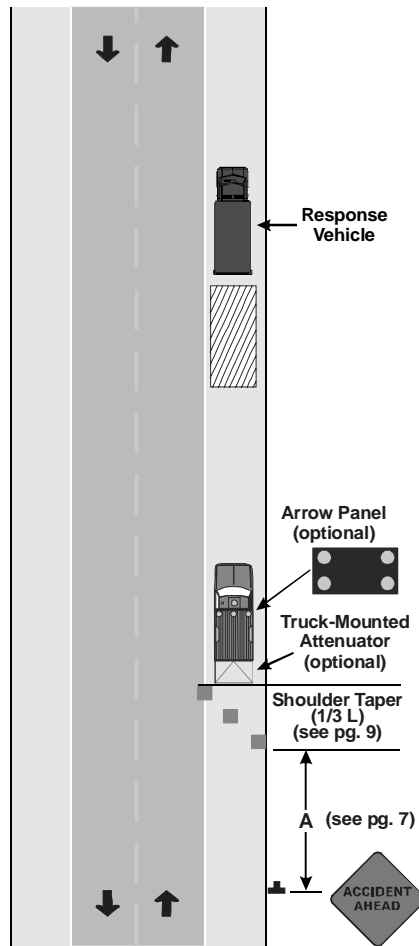


# ONE-LANE, TWO-WAY TRAFFIC TAPER

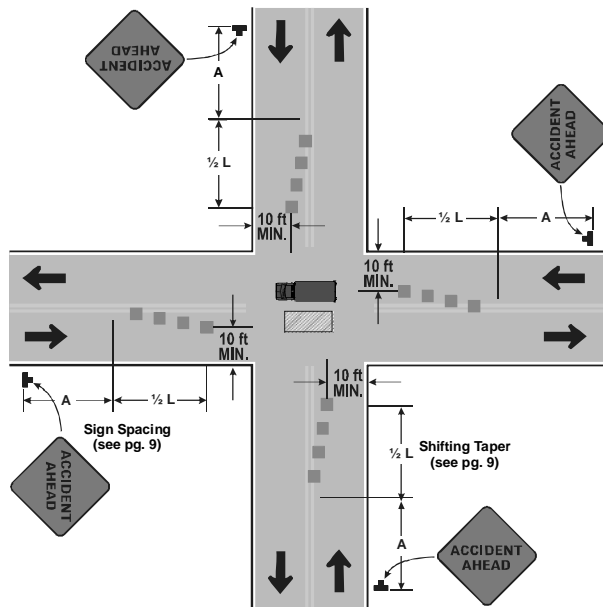


## OPERATIONS ON SHOULDER

Although vehicle hazard warning signals can be used to supplement the rotating lights or strobe lights, they shall not be used instead of rotating lights or strobe lights. If an arrow panel is used for an operation on the shoulder, the caution mode shall be used.

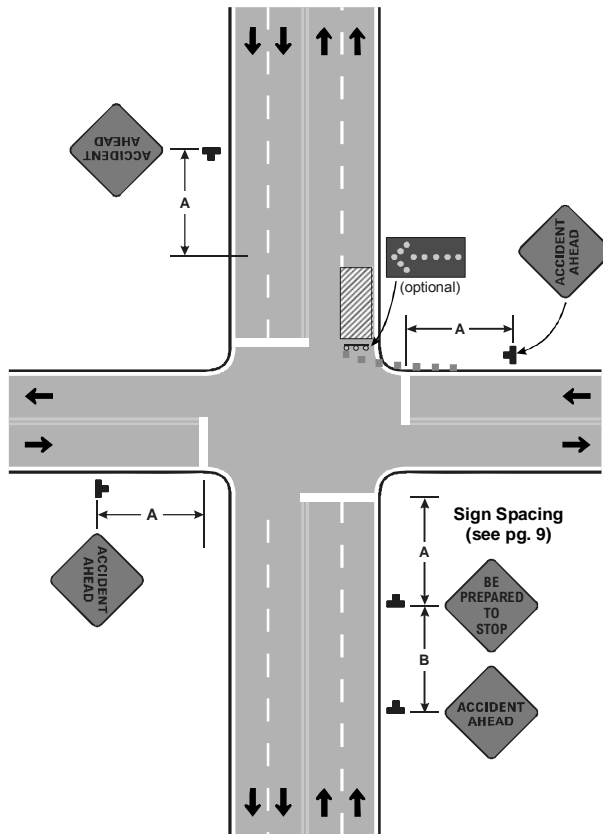


## CLOSURE IN CENTER OF INTERSECTION



## RIGHT LANE CLOSURE ON FAR SIDE OF INTERSECTION

If the work space extends across the crosswalk, the crosswalk should be closed.





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