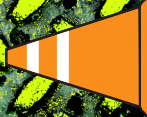




UNIVERSITY OF KENTUCKY

College of Engineering
Kentucky Transportation Center

Guidelines for Emergency Traffic Control



GUIDELINES FOR EMERGENCY TRAFFIC CONTROL

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The contents of the guide do not reflect the official views or policies of the Kentucky Transportation Center, the Kentucky Transportation Cabinet, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation.

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”).
- Advises responders to “Size-Up” traffic control and begin action within 15 minutes of arrival.
- Permits use of “Flourescent Pink” background/black letters for signs in incident traffic control zones.
- Recommendations on use of Emergency Vehicle Lighting.

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 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

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		
		1	2	3
2	81%	35%	0%	N/A
3	83%	49%	17%	0%
4	85%	58%	25%	13%
5	87%	65%	40%	20%
6	89%	71%	50%	26%

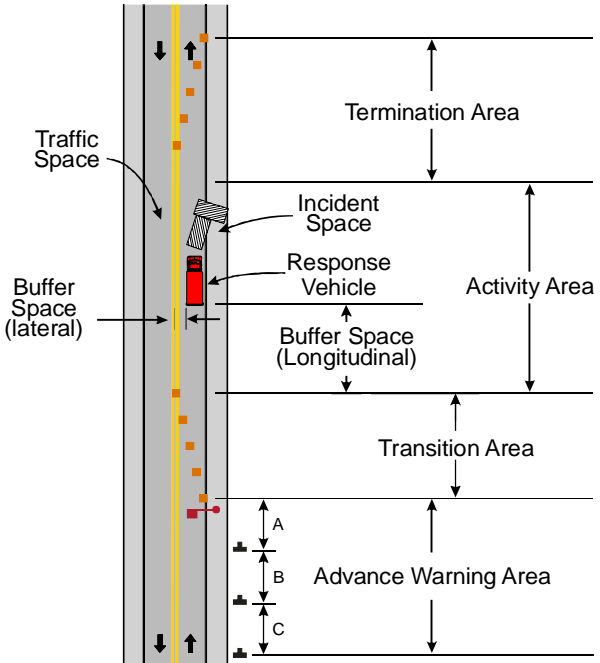


Percent Capacity Available (Highway Capacity Manual 2000)

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.

Merging Taper Length (L)*

Speed Limit (MPH)	Lane Width (feet)			Spacing Between Devices (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 spacing between devices 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 the incident.

- 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 ¹ (feet)	Distance Between Signs (A, B, C) (feet)			Taper Length				Cone Spacing ³ (feet)	
		Urban	Rural	Expressway	One-lane,		Merging (L) ² (feet)			
					Two-way	10' Lane	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	500		550	605	660	55
65	645			A: 1,000 B: 1,500 C: 2,640			650	715	780	65

¹When 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.

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

³Note 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.

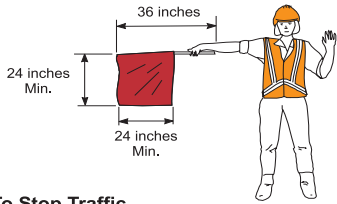
Flags:

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 Let
Traffic Proceed



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

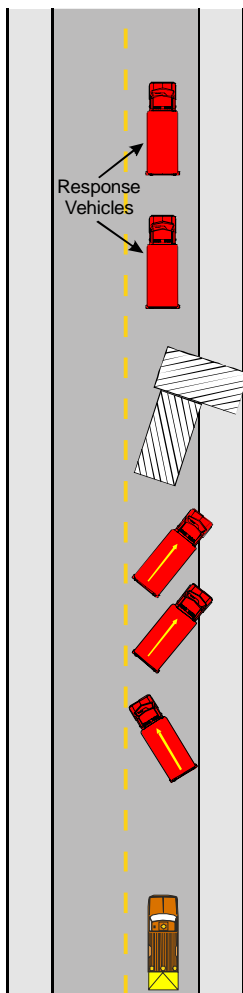
The diagrams on the following pages represent examples of the application of principles and procedures for safe and efficient TTC for traffic incidents. The layouts represent minimum requirements. It is not possible to include illustrations to cover every situation which will require work area protection. 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.

	Arrow Panel
	Traffic Cone
	Direction of Traffic
	Flagger
	Sign (Shown facing left)
	Incident Space
	Response Vehicle
	Shadow Vehicle (attenuator optional)

RESPONSE VEHICLE MANAGEMENT

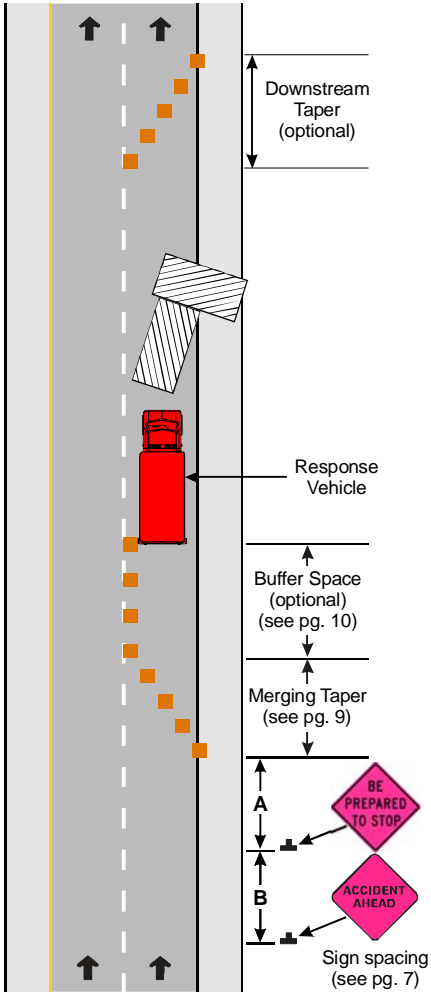
“Safe Parking Using a Shadow Vehicle”

- ❑ 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



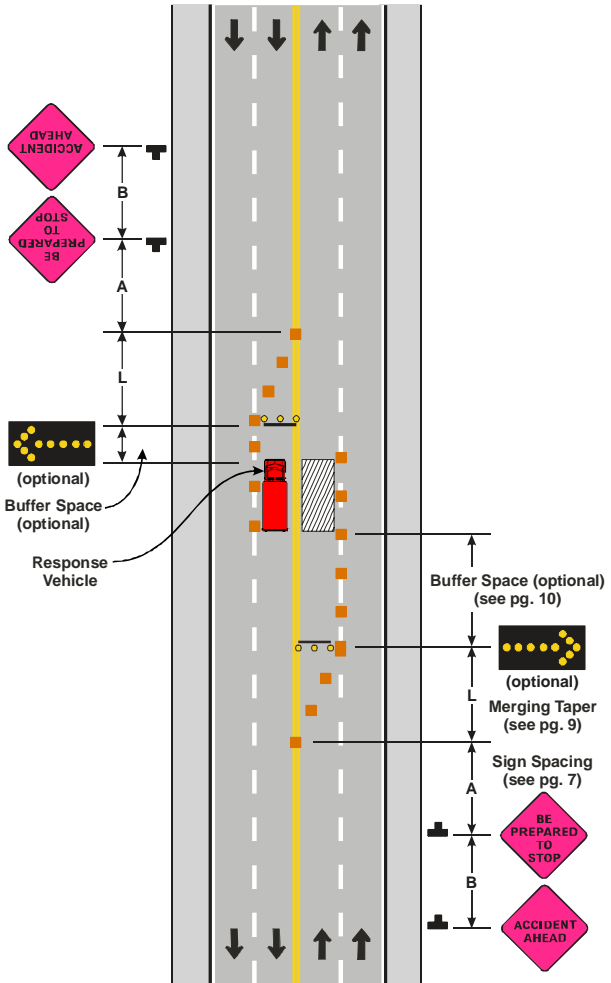
MERGING TAPER

(on a multi-lane road - one lane closed)

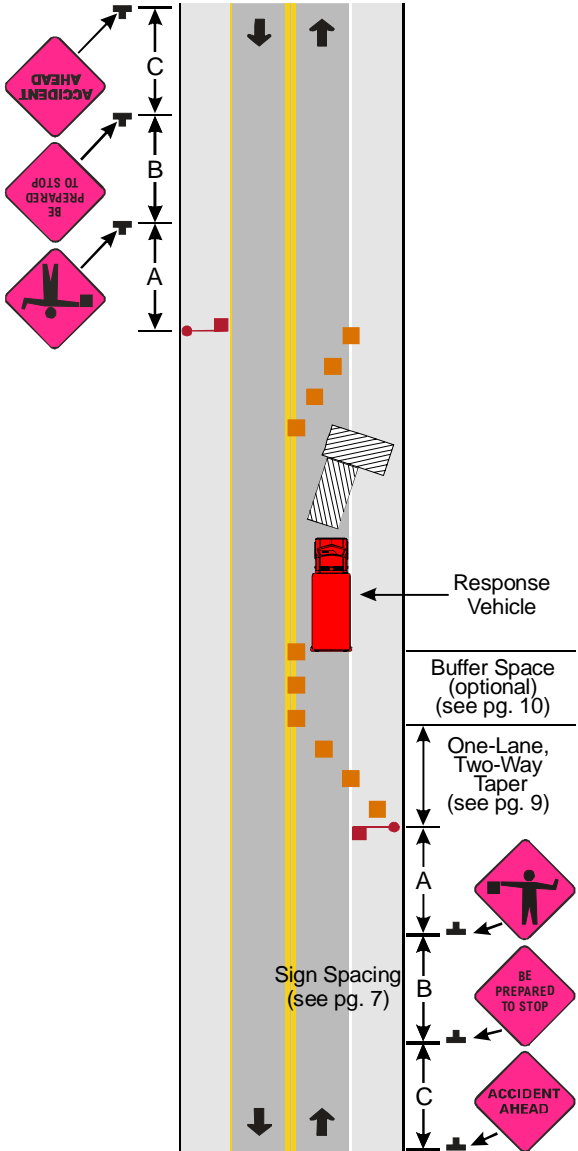


MERGING TAPERS

(on a multi-lane road - interior lane closed)

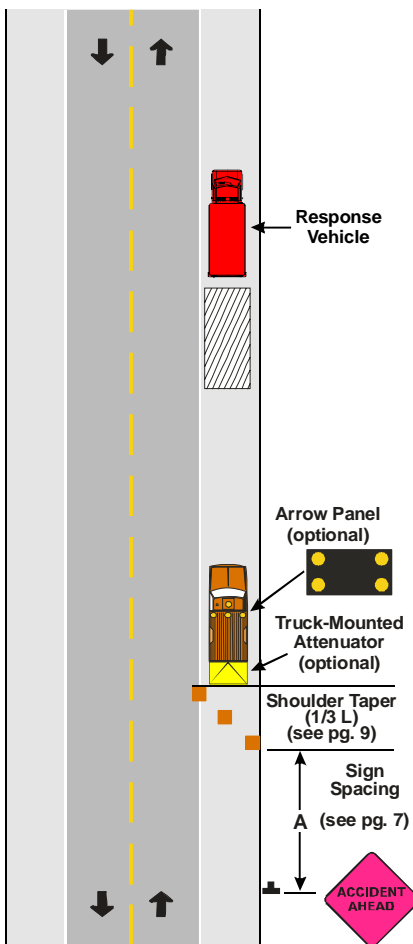


ONE-LANE, TWO-WAY TRAFFIC TAPER

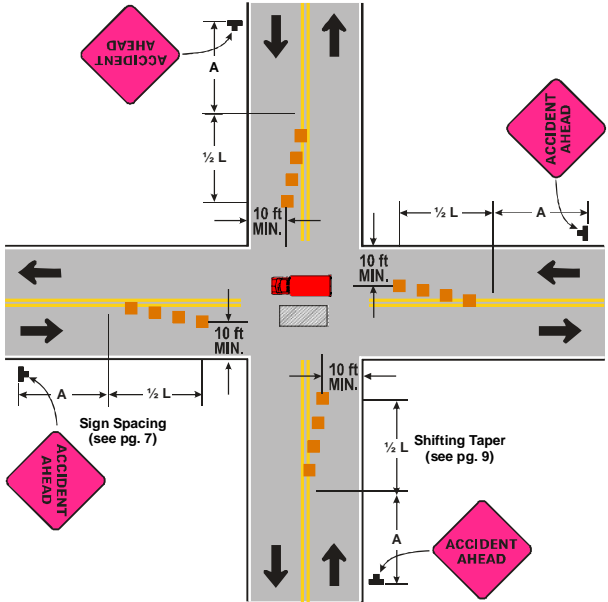


OPERATIONS ON SHOULDER

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.

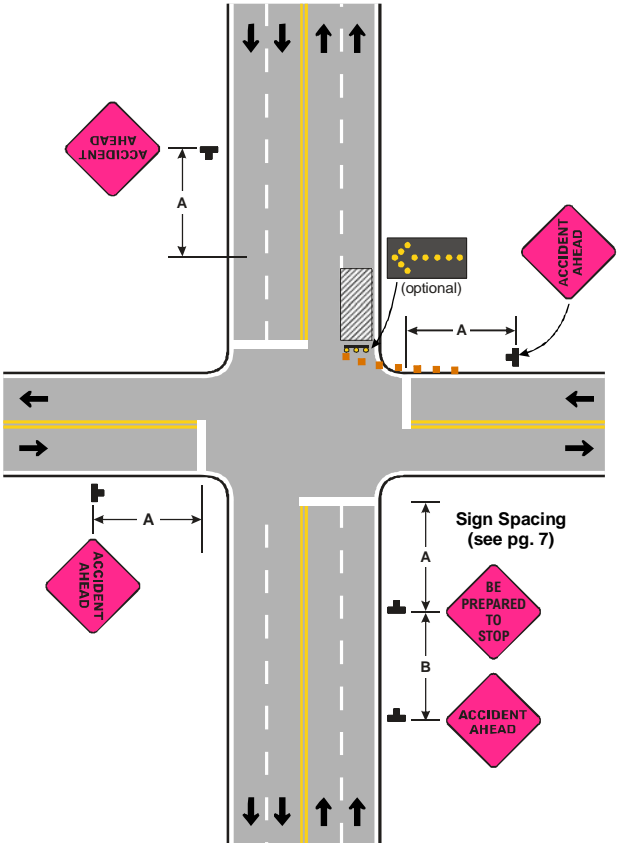


CLOSURE IN CENTER OF INTERSECTION



RIGHT LANE CLOSURE ON FAR SIDE OF INTERSECTION

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



KENTUCKY QUICK CLEARANCE LAW

KRS 189.580

FOUR BASIC COMPONENTS:

- 1) Driver Stop - Driver must stop in a way that does not hamper traffic.
- 2) Driver Removal - Driver involved in a minor incident with no injuries is required to remove the vehicle from the lanes of traffic.
- 3) Authority Removal - Safety or peace officers have the authority to remove a vehicle that is blocking traffic.
- 4) Authority Tow - Safety or peace officers have the authority to have a vehicle towed or cargo removed from the roadway if it is in the interest of public safety.

This law is applicable to interstates and parkways.



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