

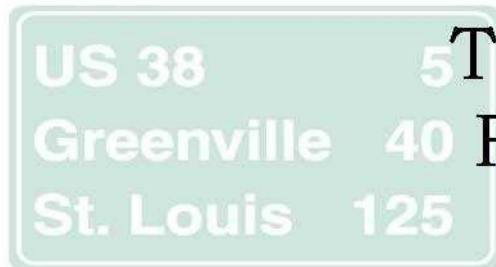


June 2003



Energy Delivery

Utility Work Zone Traffic Control Field Manual



This Utility Work Zone Traffic Control Field Manual has been significantly revised from the Union Electric Customer Services Division Work Zone Traffic Control Guidelines (Green) Booklet. This revision has been compiled by the Energy Delivery Safety Staff in coordination with the Energy Delivery Training Department. Additionally, significant assistance has been provided by the U.S. Department of Transportation Federal Highway Administration. They provided the easy-to-read diagrams which add tremendous value to understanding typical work zone applications.

All information contained within is based on most current technology and government standards, and good safe working practices.

PREFACE

Whenever work is done on or near the roadway, drivers are faced with changing and unexpected traffic conditions. These changes can create hazardous conditions for drivers, workers and pedestrians unless protective measures are taken.

The goal of temporary traffic control in utility roadway Work Zones is maximum safety with minimum disruption to traffic.

In an effort to provide maximum safety to drivers, workers and pedestrians, the federal government passed into law, the Manual on Uniform Traffic Control Devices. Part Six of this manual is directed to the safe and expeditious movement of traffic through work zones and to the safety of the work force performing these operations. Part Six requires that uniform traffic control devices be used in a specific manner to provide the required protection.

This revised booklet, prepared for you by the Energy Delivery Safety Department, is intended to provide you with the basic information needed to comply with the law. Since work area protection can become quite complex, it is well to remember that the Manual should be referred to when additional information is required.

CONTENTS

Chapter I – Overview of General Guidelines

Chapter II – Specifications & Procedures

Chapter III – Typical Application Work Zone Diagrams

CHAPTER I

Overview of General Guidelines

- ♦ Standards
- ♦ Fundamental Principles
- ♦ Stages of Work Zone Traffic Control
- ♦ Tapers
- ♦ One Lane – Two Way Traffic Control (Flagging)
- ♦ Utility Work Zone Traffic Control Devices

STANDARDS

FEDERAL REGULATIONS

All traffic control devices used on utility temporary traffic control operations shall conform to the applicable specifications of the U.S. Department of Transportation MUTCD 2000 (Manual on Uniform Traffic Control Devices) Millennium Edition, dated December 18, 2000, including Errata #1 dated June 14, 2001 and all subsequent revisions. This publication can be found on the internet at <http://mutcd.fhwa.dot.gov>.

STATE REGULATIONS

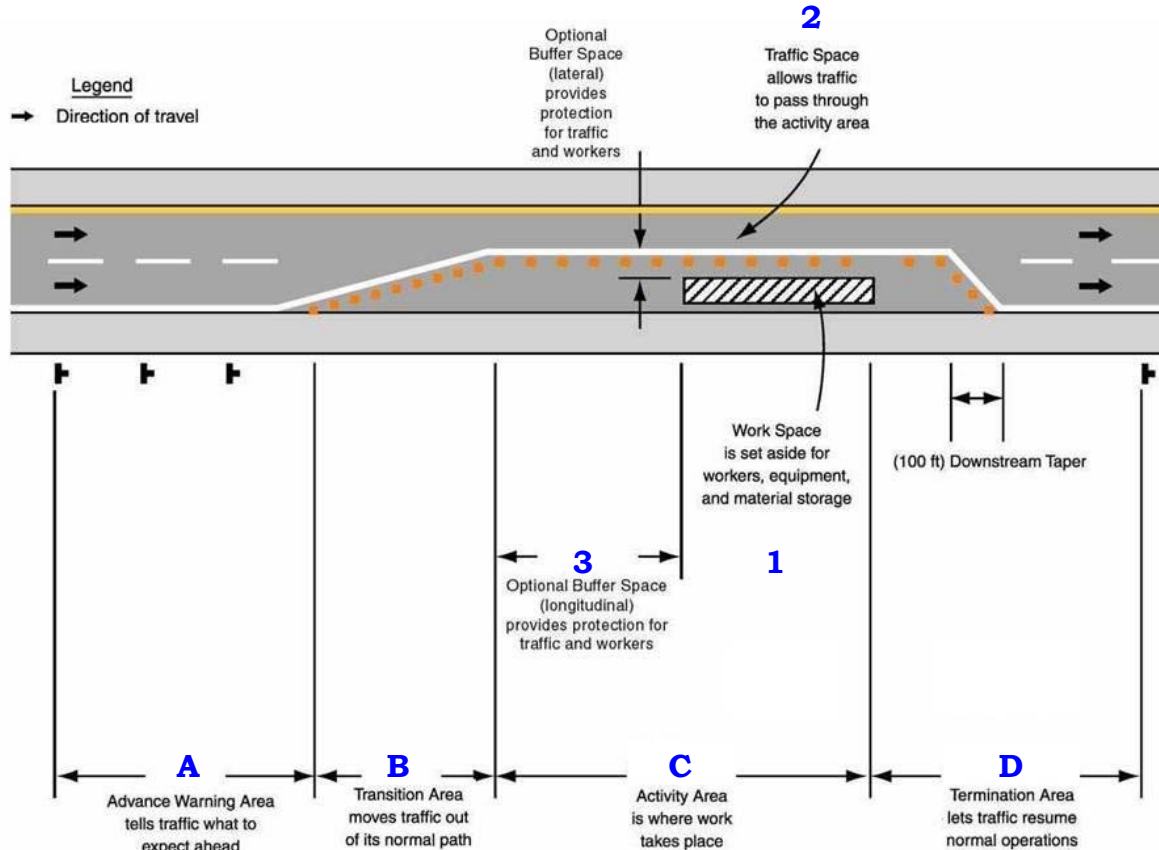
All states must adopt the federal MUTCD as a minimum and can add regulations over and above but must be in “substantial compliance” with the federal manual. Missouri and Illinois have very few differences from the federal regulations – but will be explained where needed.

OSHA

The Occupational Safety & Health Administration (OSHA) regulations also impact work zone traffic control procedures; primarily by requiring that the MUTCD is followed.

FUNDAMENTAL PRINCIPLES

1. “Plan for Safety” Workers should plan ahead for the safety of motorists, pedestrians, and fellow workers.
2. “Keep it Moving” Traffic movement should be inhibited as little as possible.
 - (a) Traffic control should be designed to allow motorists to maintain normal speed when possible.
 - (b) Construction and maintenance time should be minimized to reduce exposure to potential hazards.
3. “Communicate” Road users and pedestrians should be warned, informed and guided in a clear & positive manner.
4. “Monitor” Workers should periodically monitor the effectiveness of the traffic control during their work and make adjustments as needed.
5. “Plan for the Worst” Workers should plan for the possibility of errant vehicles leaving the roadway and impacting the work zone.
6. “Train” Each employee whose actions affect maintenance and construction zone safety should receive training appropriate to the job decisions they will be required to make. The purpose of this booklet is to provide the necessary training.



STAGES of WORK ZONE TRAFFIC CONTROL

Work zones include the entire section of roadway between the first advance warning sign through the last traffic control device, where traffic returns to its normal path and conditions.

A. Advance Warning Stage - Tells traffic what to expect ahead.

B. Transition Stage - Uses a taper to move traffic out of its normal path.

C. Activity Stage - where the actual work takes place; includes the buffer space, work space, and traffic space.

1) **Work Space** - the portion of the roadway closed to traffic and set aside for workers, work vehicles, equipment and material.

2) **Traffic Space** - the portion of the roadway where traffic is routed.

3) **Buffer Space** - provides an additional margin of safety for traffic and workers. Separates the traffic space from the work space and provides recovery area for errant vehicles. Neither work activity nor storage of equipment, vehicles, or material should occur within the buffer space.

- *Longitudinal Buffer Space - separates the transition stage from the work space.*

- *Lateral Buffer Space - separates the traffic space from the work space.*

D. Termination Stage - Advises traffic that they can resume normal driving on a normal path.

TAPERS

Tapers are created using a series of channelizing devices placed to move traffic out of or into its normal path.

The five types of tapers are:

Merge - Shift - Shoulder - Downstream
One Lane Two Way (Flagger)

Merging Taper

- Used to close a lane on a multi-lane roadway and to direct traffic in the closed lane to merge with traffic in the adjacent lane.
- The taper must be long enough to allow drivers of vehicles to adjust their respective speeds and merge into a single lane before the end of the transition.
- The formula used to determine the length of the merger taper depends on the speed of the roadway.

If posted speed is 45 MPH or higher, use:

$$L = W \times S$$

If the posted speed is 40 MPH or lower, use:

$$L = \frac{W \times S \times S}{60}$$

L = Taper length in feet

W = Width of lane offset in feet

S = Speed of traffic in mph

Note: Refer to Table 3-A (page 46) for actual taper lengths, number of channelizing devices needed, and spacing of devices along taper.

Shifting Taper

- Used to move traffic into a different path when a merge is not required.
- It may be used to move traffic a foot or so to clear trucks too wide for shoulder.
- In cases where merger is not required, the minimum length of taper would be $\frac{1}{2} L$.
- Where more space is available, use longer distances.

Shoulder Taper

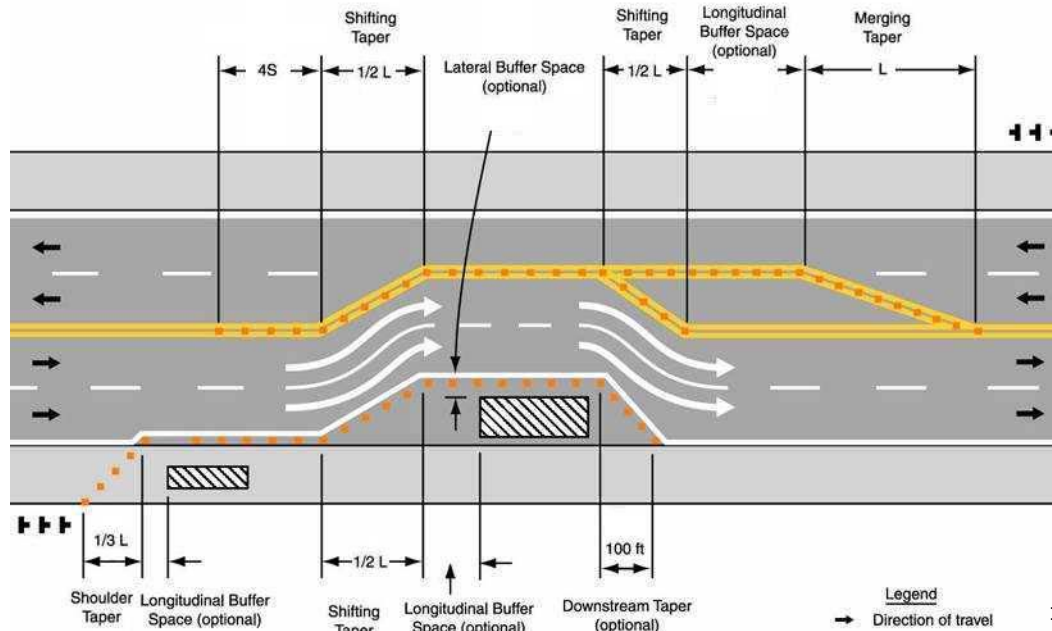
- Used when working in the shoulder area on roads with improved shoulders that may be mistaken for driving lanes.
- It should be considered as a closure of a portion of the roadway. The work area on the shoulder should be preceded by a shoulder taper.
- Shoulder tapers should have a minimum length of $\frac{1}{3} L$ providing the shoulder is not used as a travel lane.
- If the shoulder is used for whatever reason as a travel lane, then a merger or shifting taper should be used, as appropriate.

Downstream Taper

- Used in termination stage to advise driver that access is available to the original lane/path.
- When used, should have a minimum length of approximately 100 ft per lane with devices spaced approximately 20 ft apart.

One Lane – Two Way Tapers (Flagger)

- Used in advance of an activity stage that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction.
- Used to guide traffic into the one-way section, usually under control of a flagger.
- Maximum length of 100 feet with channelizers at approximately 20 foot spacings.



Note: This diagram is for demonstrating tapers *only*—not for proper work zone set-up.

In all five of the tapers, the maximum space between channelizing devices used to form the taper should be a distance in feet equal to the speed limit in miles per hour (30 MPH would equal 30 feet between devices). In short tapers such as "two-way", the spacing between devices may need to be reduced to be meaningful.

ONE LANE – TWO WAY TRAFFIC CONTROL (FLAGGING)

- When Traffic in both directions must use a single lane for a limited distance, and cannot be self-regulated, movements from each end shall be coordinated.
- Self-regulated means:
 - ✓ Work space is short.
 - ✓ Road volume and speed is low.
 - ✓ Drivers can see the roadway beyond the work zone.
- Provisions should be made for alternate one-way movement through the constricted section.
- Control points at each end should be chosen to permit easy passing of opposing lines of vehicles.
- Where a one lane – two way temporary traffic control zone is short enough to allow a flagger to see from one end of the zone to the other, traffic may be controlled by either a single flagger or by a flagger at each end of the section.
- When a single flagger is used, the flagger should be stationed on the shoulder opposite the obstruction or work space, or in a position where good visibility and traffic control can be maintained at all times.
- When good visibility and traffic control cannot be maintained by one flagger station, traffic may be controlled by a flagger at each end of the section.
- Flaggers should be able to communicate orally or with manual signals. *Manual signals should not be mistaken for flagging signals.*
- The use of radios may also be desirable even though visual contact is possible.

Further guidance on flagging is provided in a later section

Reminder: Flaggers are required to wear a high visibility Ameren-approved Flagger's Vest.

UTILITY WORK ZONE TRAFFIC CONTROL DEVICES

A traffic control device (TCD) is a sign, marking, cone, lights or other device used to regulate, warn or guide. In addition, flaggers will be required when a properly constructed traffic control zone cannot provide the motorist with adequate information to travel safely around or through the work area and/or when traffic must be stopped from time to time.

To be effective, a traffic control device should meet five basic requirements:

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

Some typical utility work zone traffic control devices include:

warning lights	floodlights
vehicle strobes	cones
arrow display	barricades
flagger vest	flagger paddle signs

CHAPTER II

Specifications & Procedures

- ♦ Traffic Control Plans
- ♦ Installation & Removal Procedures
- ♦ Traffic Control Device Specifications & Procedures
- ♦ Flagging Procedures
- ♦ Worker Safety
- ♦ Pedestrian Safety
- ♦ Emergency Operations
- ♦ Night & Low Visibility Operations

TRAFFIC CONTROL PLANS

The states of Missouri and Illinois require that utility companies receive approval from their respective state Departments of Transportation (MoDOT and IDOT) anytime that utility work will involve one or more lane closures on state roads and highways. Usually, short duration emergency work is allowed without approval, but if the work is of a large-scale nature or may have a significant impact to motorists (e.g. delay of 15 minutes or more), contact should still be made to their respective Public Affairs Specialists. Please refer to the following points of contact for specific guidelines and approval.

MoDOT Work-Zone Coordination Contacts

State Traffic Engineer	(573) 526-0117
Transportation Planning	(573) 526-8053
Statewide Work Zone Coordinator	(573) 751-4006
Northwest District Work Zone Coordinator	(816) 387-2419
North Central District Work Zone Coordinator	(660) 385-8202
Northeast District Work Zone Coordinator	(573) 248-2418
Kansas City District Work Zone Coordinator	(816) 622-0427
Central District Work Zone Coordinator	(573) 522-6805
St. Louis District Work Zone Coordinator	(314) 340-4558
Southwest District Work Zone Coordinator	(417) 629-3322
Springfield District Work Zone Coordinator	(417) 895-7627
South Central District Work Zone Coordinator	(417) 469-6284
Southeast District Work Zone Coordinator	(573) 472-5310

IDOT Work-Zone Coordination Contacts

DISTRICT 2

(815) 284-2271
District Engineer
819 Depot Avenue
Dixon, Illinois 61020-3546

Counties: Boone, Bureau, Carroll, DeKalb, Henry,
JoDaviess, Lee, Ogle, Rock Island, Stephenson,
Whiteside, Winnebago

DISTRICT 3

(815) 434-6131
District Engineer
700 East Norris Drive
Ottawa, Illinois 61350-0697

Counties: Ford, Grundy, Iroquois, Kankakee,
Kendall, LaSalle, Livingston, Marshall, McLean,
Putnam, Woodford

DISTRICT 4

(309) 671-3333
District Engineer
401 Main
Peoria, Illinois 61602-1111

Counties: Fulton, Henderson, Knox, McDonough,
Mercer, Peoria, Stark, Tazewell, Warren

DISTRICT 5

217) 465-4181
District Engineer
Rt. 133 West, P.O. Box 610
Paris, Illinois 61944

Counties: Champaign, Clark, Coles, Cumberland,
DeWitt, Douglas, Edgar, Macon, Moultrie, Piatt,
Shelby, Vermillion

DISTRICT 6

(217) 782-7301
District Engineer
126 East Ash
Springfield, Illinois 62704-4766

Counties: Adams, Brown, Cass, Christian, Hancock,
Logan, Macoupin, Mason, Menard, Montgomery,
Morgan, Pike, Sangamon, Schuyler, Scott

DISTRICT 7

(217) 342-3951
District Engineer
400 West Wabash
Effingham, Illinois 62401-2699

Counties: Clay, Crawford, Edwards, Effingham,
Fayette, Hamilton, Jasper, Jefferson, Lawrence,
Marion, Richland, Wabash, Wayne, White

DISTRICT 8

(618) 346-3110
District Engineer
1100 Eastport Plaza Drive
Collinsville, Illinois 62234-6198

Counties: Bond, Calhoun, Clinton, Greene, Jersey,
Madison, Monroe, Randolph, St. Clair, Washington

DISTRICT 9

(618) 549-2171
District Engineer
State Transportation Building
P.O. Box 100
Carbondale, Illinois 62903-0100

Counties: Alexander, Franklin, Gallatin, Hardin,
Jackson, Johnson, Massac, Perry, Pope, Pulaski,
Saline, Union, Williamson

AMEREN ENERGY DELIVERY LANE CLOSURE NOTIFICATION FORM

Date(s) of Closure: _____

County: _____ Route: _____

Direction: NB EB SB WB

Lane Type: Thru Lane Exit Ramp Entrance Ramp Right Turn Lane Left Turn Lane 2-Way Turn Lane

From: _____ Cross Street Interchange Mile Marker

To: _____ Cross Street Interchange Mile Marker

Closure Begins No Earlier Than: _____ Closure Ends No Later Than: _____

Which Lanes are Closed? 1 2 3 4 5 6 7 8 (Lanes number left to right from the median or centerline to the right shoulder. i.e. On rural I-70, lane "1" is the left and lane "2" is the right lane)
(circle all that apply)

Type of Work Being Performed: Lighting Utility Pole Construction Utility Pole Maintenance
(circle one) Man-Hole Work Other

Work Performed By: _____

Permit Project: Contractor: _____ Foreman: _____ Phone #: _____

Permit Specialist: _____ Permit #: _____

Public Affairs: Name: _____ Contact Person: _____ Phone #: _____

Traffic Control to be Used: Signing Barrels Cones Barricades TMA's
(circle all that apply) Flashing Arrows Flag Person Law Enforcement Chng. Message Boards

INSTALLATION & REMOVAL PROCEDURES

NOTE: No work shall begin until proper installation of traffic control. As work progresses, periodically monitor traffic flow and adjust if necessary.

Installation

1. Drive through the proposed work zone.
2. Park the work vehicle in a safe area.
3. Set up advance warning signs starting with the initial sign the motorists will see.
4. Set out channelizers for the taper and buffer space laterally along the curb or edge of roadway.
5. Set up taper, then buffer, by walking each channelizers into position in the lane while watching traffic upstream.
6. Observe flow of traffic and evaluate effectiveness. Adjust if necessary.
7. If acceptable, begin operation.

Removal

1. Remove in reverse order or installation
2. Remove buffer and taper, starting with channelizers nearest to work zone and working upstream.
3. Pick up advance warning signs, ending with the initial sign setup.

TRAFFIC CONTROL DEVICE SPECIFICATIONS & PROCEDURES

The MUTCD requires that uniform traffic control devices be used in the same manner no matter where you are located in the country. Using the same type, size, and color devices in a similar manner across the country avoids confusing the motorist and provides greater safety in the work zone.

SIGNS

3 Types: Regulatory, Warning, and Guide

- All signs used at night shall be retro-reflective.
- When illuminated, light source should be shielded to protect drivers from glare. Street and Highway lighting is not regarded as meeting the requirements for illumination.
- Should be located (at least) on the right-hand side of the roadway. May be placed on both the left & right sides of the roadway or within roadway itself.
- Usually mounted on portable supports (no less than 1 foot above the traveled roadway) for short-term stationary, short-duration and mobile operations.
- Sign supports shall be crash-worthy - in other words, tested to not strike the windshield area of a colliding vehicle.
- When standard orange flags or flashing warning lights are used in conjunction with signs, they shall not block the sign face.
- Signs shall be properly maintained for cleanliness, visibility, and correct positioning. Signs that have lost significant legibility shall be replaced.

Regulatory Signs

Inform motorists of traffic laws, regulations and legal requirements.

- Shall be authorized by the public agency or official having jurisdiction.
- Shall conform to part 2 of the MUTCD.
- Generally rectangular, with a black legend and border on a white background, except STOP, YIELD, DO NOT ENTER, WRONG WAY and one way arrow signs.
- If different from those normally in effect, the existing permanent signs shall be temporarily removed or covered.

Warning Signs

Warn motorists of hazardous conditions on or adjacent to a roadway.

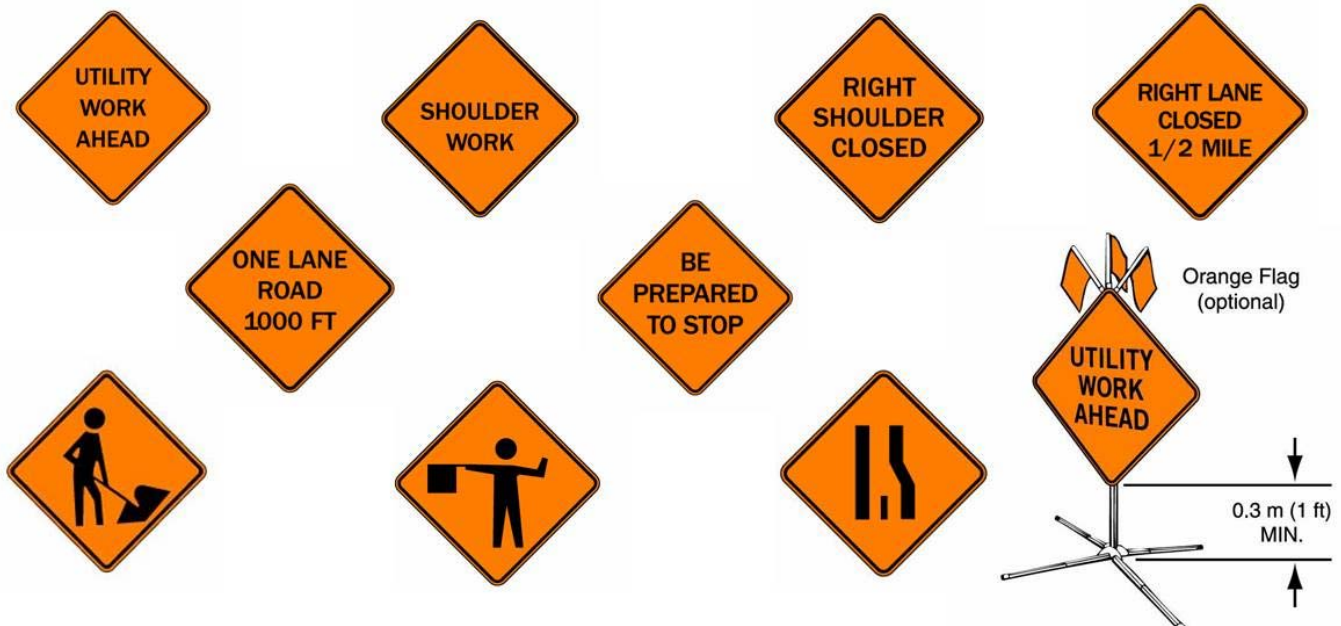
- Shall be diamond shaped with a black legend or an orange background.

- Warning signs should be placed in advance of the work zone to properly alert drivers of possible hazards so they have sufficient time to adjust speed or take other appropriate action.
- All Ameren warning signs are 48 x 48 inches.
- Should be placed at varying distances in advance of the work zone, depending on the roadway type, condition, and speed.
- TABLE 3-D shows the spacing of warning signs for four general roadway types in the Typical Application Work Zone Diagrams.

Guide Signs

Guide drivers through a detour or provide other special information. Guide signs are not normally used for Ameren Energy Delivery Operations due to relatively short & uncomplicated work zones.

Typical Utility Warning Signs Used at Ameren



CHANNELIZING DEVICES

Lightweight, portable, yieldable (usually plastic) devices used to warn and alert drivers in or near the traveled way, to protect workers in the work zone, and to guide and direct drivers and pedestrians safely past the hazards.

- Devices include but are not limited to cones, drums, or barricades.
- Devices used for channelization should provide a smooth and gradual transition in moving traffic from one lane to another, onto a bypass or detour, or in reducing the width of a lane.
- They should be constructed and ballasted so as not to inflict undue damage to a vehicle that inadvertently strikes them.
- When used for tapers, the spacing of channelizing devices should not exceed a distance equal to 1 times the speed limit in mph.

- When used for tangent channelization, the spacing of channelizing devices should not exceed a distance equal to 2 times the speed limit in mph.
- When channelizing devices have the potential of leading motor vehicle traffic out of the intended traffic space, the channelizing devices should be extended a distance of 2 times the speed limit in mph beyond the end of the transition area.
- Should be kept clean, visible and properly positioned at all times.
- Shall be replaced if damaged or have lost a significant amount of retro-reflectivity and effectiveness.

Traffic Cones

- Traffic cones are a tapered cone shape with a square flat base.
- Predominately bright orange in color.
- Made of material that can be struck without damaging vehicles on impact.

- Traffic cones come in two sizes:

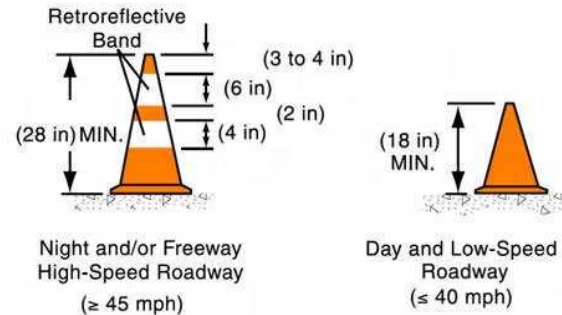
28 inches or taller

- Used on high-speed highways (greater than 45 mph) and on all roadways during hours of darkness.
- When used at night, they must be reflectorized.
- They should have six inch wide white reflectorized band not more than four inches from the top of the cone.
- They should also have a four inch wide white reflectorized band, a minimum of two inches below the six inch band.

18 inches

- Used on low-speed roadways (less than 40 mph) during daylight hours, unless road conditions make them difficult to see. In cases of this type, the taller 28 inch cone should be used.
- To ensure easy compliance and to not have to stock both sizes, 18 inch traffic cones are NOT used at Ameren.

Traffic cones are easily stacked and require very little space on trucks. Workers can easily carry and distribute several cones at a time making them more desirable than barricades. On windy days, two cones can be stacked together to help keep the orange flag in the top hole. As a reminder, cones should never be used as an advance-warning device. Cones are not designed to replace signs and by themselves do not provide work area protection.

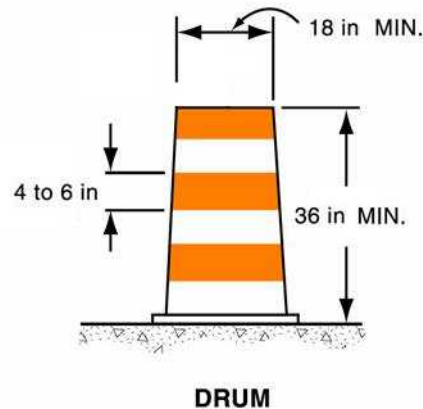


CONES

Drums

- Made of resilient plastic, used for warning or channelization, are highly visible, and command driver respect.
- Constructed of lightweight, flexible and deformable materials.
- A minimum of 36" in height
- A minimum of 18" in width, regardless of orientation.
- Marked with horizontal, circumferential, alternating orange and white retro-reflective stripes 4 to 6 in wide.
- A minimum of two orange and two white stripes
- Non-retroreflective spaces between the horizontal orange and white stripes shall be maximum 3 in wide.
- Closed tops that prevent collection of debris.
- Should not be weighted to an extent that would make them hazardous to motorists, pedestrians, or workers.

- Should have drainage holes in the bottom so water will not accumulate and freeze, causing a hazard to motorists.
- Shall not be made of metal.
- Shall not be used with ballast placed on top of the drum.



LIGHTING DEVICES

- Supplement retroreflectorized signs and channelizing devices at night.
- Three types commonly used by Ameren: floodlights, flashing warning beacons and warning lights.

1. Floodlights –

- Used to illuminate flagger stations, equipment crossings, and other areas at night or where existing light is not adequate for the work to be performed safely.
- Shall not produce a disabling glare for approaching road users.
- Adequacy of placement and elimination of glare should be determined by driving through and observing from each direction after initial floodlight setup, at night and periodically.

2. Flashing Warning Beacons

("Hazard Beacons" or "Strobes")

- Flashing yellow light, minimum diameter 8 in, used at points of special hazards to alert drivers' attention.
- During normal daytime operations, may be rotating dome or strobe lights on vehicles.
- May be installed at locations where work activity requires an obstruction to remain in the roadway at night.
- Should be operated 24 hours per day.
- Although vehicle hazard warning lights are permitted to be used to supplement rotating or strobe lights, they shall not be used instead of rotating or strobe lights.

3. Warning Lights ("Barricade Hazard Warning Lights")

Note: Warning Lights are NOT the same as truck-mounted directional arrow panels.

- Portable, lens directed, enclosed lights that supplement retroreflectorization on signs and channelizing devices in order to attract driver's attention, identify a hazard or delineate the roadway.
- Three Types:
 - Type A Low-Intensity Flashing (night)
 - Type B High-Intensity Flashing (day and night)
 - Type C Steady-Burn (night)
- Color of the light emitted shall be yellow
- Shall have a minimum mounting height of 30 in to the bottom of the lens.

- Type A Low Intensity Flashing warning lights may be mounted on channelizers or signs and are intended to warn drivers of a hazard.

Not for daytime use.

Shall not be used for delineation

- Type B High-Intensity Flashing warning lights are mounted on warning signs or other supports and warn of extremely hazardous conditions that require lights in daylight and dark.

Are designed to operate 24 hours per day.

Shall not be used for delineation, as they would obscure the vehicle path.

- Type C Steady-Burn warning lights are used at night or in low light conditions to delineate the edge of the traveled way on tapers, lane changes, lane closures, etc.
- When used to delineate a curve, Type C warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.
- Type A Low-Intensity Flashing warning lights and Type C Steady Burn warning lights shall be maintained so as to be visible on a clear night from a distance of 3,000 ft.
- Type B High-Intensity Flashing warning lights shall be maintained so as to be visible on a sunny day, when viewed without the sun directly on or behind the device from a distance of 1,000 ft.

- When warning lights are used, they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

Barricades

Barricades are rarely used at Ameren and for that reason will not be covered in this Field Manual. Information on their use may be found in Section 6F.55 of the Manual on Uniform Traffic Control Devices (MUTCD). The Energy Delivery Safety Department maintains a copy of this publication and can also be found on the internet at

<http://mutcd.fhwa.dot.gov>.

ARROW PANELS—An arrow panel is a sign with a matrix of elements capable of flashing or sequential displays. This sign provides additional warning and directional information to assist in merging and controlling road users through or around a temporary traffic control zone.

NOTE: An arrow panel is a supplemental device and should be used only in combination with appropriate signs, barricades, and/or other traffic control devices.

Arrow Panel Specifications

- Lighting elements shall be yellow; shall be dimmed min. 50% at night, flash rate 25-40 FPM.
- Panel mounted 7 feet from bottom to road or, on vehicle, as high as practical.
- Four Types:
 1. Type A Low speed urban streets; 48" x 24", 12 elements min., 1/2 mile legibility distance.
 2. Type B Moderate speed, maintenance or mobile operations; 60" x 30", 13 elements min., 3/4 mile legibility distance.
 3. Type C High speed, high volume traffic; 96" x 48", 15 elements min., 1 mile legibility distance.
 4. Type D on vehicles, arrow shaped, 48" long x 26" wide, 1/2 mile legibility, 12 elements min.

1. At least one of the three following modes shall be provided:

Flashing Arrow



Sequential Arrow



Sequential Chevron



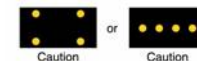
2. The following mode shall be provided:

Flashing Double Arrow



3. The following mode shall be provided:

Flashing Caution

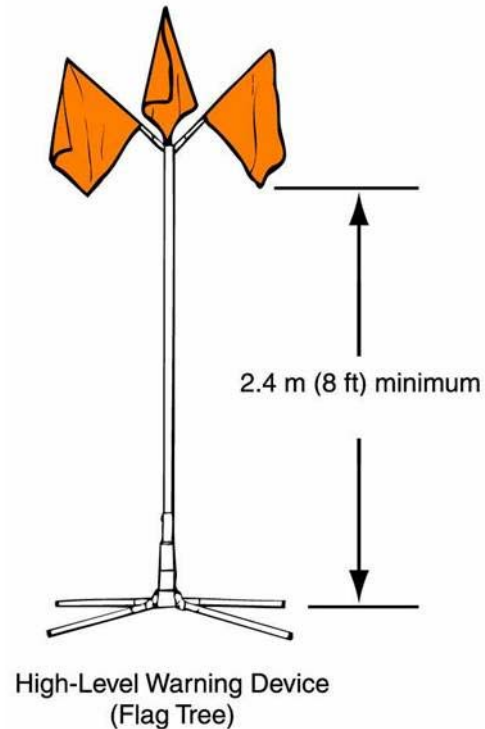


Arrow Panel Application

- An arrow panel in the arrow or chevron mode shall be used only for stationary or moving lane closures on multilane roadways.
- An arrow panel shall be used only in the caution mode for shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway.
- For stationary lane closing, the arrow panel should be located on the shoulder at the beginning of the shift or merge taper.
- Where the shoulder is narrow, the arrow panel should be located in the closed lane.
- Type A, B, and C arrow panels shall have solid rectangular appearances. Type D arrow panels shall conform to the shape of the arrow.
- All arrow panels shall be finished in non-reflective black. The arrow panel shall be mounted on a vehicle, a trailer, or other suitable support.
- When arrow panels are used to close multiple lanes, a separate arrow panel shall be used for each closed lane.
- A single arrow panel shall not be used to shift traffic laterally more than one lane.
- For mobile operations where a lane is closed, the arrow panel should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.
- For a stationary lane closure, the arrow panel should be located on the shoulder at the beginning of the shifting or merging taper.
- Where the shoulder is narrow, the arrow panel should be located in the closed lane.

HIGH-LEVEL WARNING DEVICES ("Flag Tree") - Optional

- A telescoping mast that displays warning flags and warning lights in urban, high volume traffic situations to warn motorists of short-term operations.
- Supplements other traffic control devices.
- Is designed to be seen over the top of vehicles.
- Shall consist of a minimum of two flags with or without a Type B, high intensity, flashing warning light.
- The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be no less than 8 feet.
- The flags shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color.
- An appropriate warning sign may be mounted below the flags.



FLAGGING PROCEDURES

Function

- Flagging should only be employed when required to control traffic or when all other methods of traffic control are inadequate to warn and direct drivers.
- Flagging procedures provide guidance to road users alternately traversing a work zone activity that reduces the traveled way to a single lane.

When is Flagging NOT Required?

- If traffic can be self-regulating, flagging is not required.
- Self-regulating means:
 - ✓ Work space is short.
 - ✓ Road volume and speed is low.
 - ✓ Drivers can see the roadway beyond the work zone.

Requirements and Equipment

- The state of Illinois requires flaggers to be certified. Missouri does not.
- Since a flagger is responsible for human life, they should be selected carefully and possess the following minimum qualifications:
 - ✓ Average intelligence
 - ✓ Good physical condition (including sight and hearing)
 - ✓ Alert & Courteous
 - ✓ Possess a sense of responsibility for the safety of the public and crew.
 - ✓ Neat appearance.
- Flaggers, when used, are required to stop traffic intermittently as needed or to maintain continuous traffic past a work site at reduced speeds to protect the work crew.

- The flagger must at all times be clearly visible to approaching traffic for a distance sufficient for his safety and to permit proper response by the motorist to the flagger's instructions.

High Visibility Clothing

- Flaggers are required to wear a high visibility Ameren-approved Flagger's Vest. This vest shall be retroreflective.

Hand Signaling Devices

- The two most common hand-signaling devices used by flaggers to control traffic are the Stop/Slow paddle and the red flag.
- The paddle bearing the clear message "Stop" on one side and "Slow" on the other provides more positive guidance than a flag and should be the primary hand signaling device.
- A flag should be limited to emergency

situations or at locations which can best be controlled by a single flagger.

- The free edge of the flag should be weighted so it will hang vertically in a heavy wind.
- Proper use of the Stop/Slow sign and the flag are illustrated in Figure 2-A.

Flagger Stations

- Stations for flaggers shall be located far enough in advance of the work area to allow traffic sufficient distance to reduce speed or stop.
- This distance is related to speed limit of roadway and the physical condition at the site -- usually 200 to 300 feet is desirable. In areas where speeds are low and streets closely spaced, the distance may be decreased.
- The flagger should stand on the shoulder adjacent to the traffic or in the barricaded lane.

- When an obstruction such as a truck parked in a traffic lane exists, the flagger may stand on the shoulder opposite the obstruction to be effective.
- Under no circumstances should a flagger stand in a lane being used by traffic.
- The flagger should always stand alone so as not to confuse motorists.
- The flagging stations should be protected and preceded by proper advance warning signs.
- At night, the flagging station should be adequately illuminated.
- On short closures, where adequate sight distance is available for safe handling of traffic (but not self-regulated), the use of one flagger may be sufficient.
- At a "spot" obstruction such as a truck, the movement may be self-regulating or one flagger may be able to regulate the traffic.
- When traffic in both directions must, for a limited distance, use a single lane, provisions should be made for alternate one-way movement through the constricted area.
- When the one-lane section is of any length, two flaggers may be required to control the alternate flow of traffic.
- If the two flaggers cannot see each other, some means of communication such as two-way radios must be used to determine when to hold or release traffic.

NOTE: Hand signaling with a flag should only be done in an emergency. See “EMERGENCY OPERATIONS” for flagging in an emergency

- ◆ To stop road users, the flagger shall face road users and aim the STOP paddle face toward traffic 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 the shoulder level toward approaching traffic.
- ◆ To direct stopped road users to proceed, the flagger shall face road users 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 for traffic to proceed.
- ◆ To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward traffic in a stationary position with the arm extended horizontally away from the body. To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users may motion up and down with the free hand, palm down.



**To Stop
Traffic**



**Traffic
Proceed**



**To Alert
& Slow
Traffic**



Figure 2-A

WORKER SAFETY

Maximum worker safety can best be obtained by the application of proper traffic control techniques by qualified persons using good judgment and common sense. The following are some additional factors to consider.

Training - All workers should be trained in how to work next to motor vehicle traffic in a way that minimizes their vulnerability. In addition, workers with specific traffic control responsibilities will be trained in traffic control techniques, device usage and placement.

Worker Clothing - Workers exposed to vehicular traffic while working on or adjacent to streets and highways, such as those workers serving as flaggers shall wear a high visibility Ameren – approved Flagger's Vest. This vest shall be retroreflective.

Speed Reduction - Reducing speed of motor vehicle traffic, mainly through regulatory speed zoning, funneling, use of law enforcement officials, lane reduction, or flaggers should be considered.

Road Closure - If alternate routes are available to handle detoured traffic, the road may be closed temporarily. This may facilitate quicker project completion and further reduce worker vulnerability.

Remove Devices - All temporary traffic control devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate shall be removed or covered.

Positive Guidance - In short-duration, short term and mobile work spaces where visible permanent devices are inconsistent with intended travel paths, devices that highlight or emphasize the approach path should be used.

Pavement Markings - Be aware that motorists will follow roadway pavement markings when they are confused or unable to see clearly. Use of additional devices may help resolve conflicts between pavement markings and the desired temporary path or motorist action.

Minimize Exposure - All discussions and planning should take place off the roadway, not in traffic lanes.

High Level Warning - Adjust the height of the warning mast so that visibility will not be impaired or obstructed by trees, shrubbery, parked cars, or moving traffic. Where necessary, two or more warning masts equipped with flags and/or warning lights may be used at different levels for maximum visibility. Where motorists cannot see the work area from the vicinity of the initial sign because of hills, curves or other obstructions, place a mast with flags and flashing light at this location, in addition to other standard devices.

Inspect the Work Zone - Check warning flags periodically to be sure that they are not wrapped around their supports. Also inspect barricade lights or flashers to see they are visible and flashing properly. A good test for the effectiveness of your work zone is to drive through it yourself, in addition to observing traffic, to determine if there is an orderly transition.

Manhole Work - Be sure to place tools and equipment at the work space in a position to prevent them from being pushed into the manhole. Also, when entering or leaving manholes, face the direction of oncoming traffic. If manhole guards or barricades are to be temporarily stored near the work location after a day's work, secure them to a post, pole, or trailer where they will be least likely to cause interference. Do not secure manhole guards to fire hydrants.

PEDESTRIAN SAFETY

- Advance notification of sidewalk closures shall be provided.
- Pedestrians should not be led into direct conflicts with work site vehicles, equipment or operations.
- Rope off all work areas with a barricade tape or equivalent and place tape or equivalent to designate a safe pedestrian walkway around obstructions, such as ditches, holes, tool carts, trailers, or piles of dirt on sidewalks.
- Pedestrians should be provided with a safe, convenient travel path that replicates as nearly as possible the standard sidewalk or footpath.
- Consideration should be made to separate pedestrian movements from both work site activity and motor vehicle traffic.
- Pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway.
- Whenever it is feasible, closing off the work site from pedestrian intrusion may be preferable to channelizing pedestrian traffic along the site with temporary traffic control devices.
- When working underground, on private property, in pedestrian lanes or parkways, close all holes in the earth before leaving the location. If this is impracticable, fence the area with a safety fence or equivalent to prevent small children or animals from falling into the excavation.

EMERGENCY OPERATIONS

- Can occur at any time of day or night.
- May be caused by storm damage.
- May involve customer disruptions of utility service.
- Work operation usually involves a small or single-person crew and a work vehicle for a short period of time.
- The work vehicle should be equipped with a yellow flashing light, a limited number of portable signs and channelizing devices in good condition, and equipment for flaggers in the event they are needed.
- The extent of traffic control may be less than longer term construction or maintenance, yet the safety of pedestrians, motorists, and workers should be provided.
- Emergency operations may utilize a minimum number of traffic control devices.
- Generally one sign per direction, flashing vehicle lights, cones, flags, and /or high level warning devices.
- For extensive emergency operations, additional devices should be placed as soon as possible that are consistent with the typical work zone traffic control treatments.
- During an emergency situation involving a lane closure on a multilane roadway:
 - a flashing arrow display should be placed as soon as possible
 - The specific state DOT shall be contacted to ensure proper communication.
- A flagger or other appropriate device, such as signs, flashing beacons, etc. can be used until the arrow display can be placed.

EMERGENCY FLAGGING PROCEDURES

If no STOP/SLOW paddle sign is available, the following methods of signaling with a red 24" x 24" flag should be used:

- To Stop Road Users - The flagger shall face road users and extend the flag staff horizontally across the road users' 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.
- To Direct Stopped Road Users to Proceed - The flagger shall stand parallel to the road user movement and with flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

- To Alert or Slow Traffic - The flagger shall face road users 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.



**To Stop
Traffic**



**To Alert &
Slow Traffic**



**Traffic
Proceed**

NIGHT & LOW VISIBILITY OPERATIONS

- Nighttime operations require the use of floodlights to illuminate the work area. Place the lights so that they will light the work area but not cause a glare in the eyes of oncoming motorists from either direction.
- All workers shall wear proper retroreflective clothing. At a minimum, this clothing shall be an Ameren-approved Flagger's Vest.
- In low visibility situations (fog, rain, dark days, etc.) or at night, additional warning devices may be needed:
 1. Type B Flashing warning lights at the initial warning sign and at additional signs.
 2. Reflectorized drums with Type A Flashing warning lights, when used alone, in place of cones.
 3. Reflectorized drums with Type C Steady Burn lights, in place of cones, when used in series to delineate the edge of the traveled way.
 4. Use the proper reflective signs, cones and other device.

Chapter III

Typical Application Work Zone Diagrams

- ◆ Three Most Common Factors

- ◆ General Guidelines for Selection Criteria

WZD-1	Work Outside of Shoulder
WZD-2	Work on Shoulder
WZD-3	Shoulder Work with Minor Encroachment
WZD-4	Lane Closure on Urban Street, Self Regulating
WZD-5	Work in Center of Low Volume Urban Street
WZD-6	Lane Closure at Corner of Intersection, Flagger Control
WZD-7	Lane Closure Near Side of Intersection

- ◆ Criteria Tables & Reference Indexes

- ◆ Work Zone Diagrams

WZD-8	Right Lane Closure Far Side of Intersection
WZD-9	Left Lane Closure Far Side of Intersection
WZD-10	Multiple Lane Closure at Intersection
WZD-11	Closure in Center of Intersection
WZD-12	Lane Closure on Two-Lane Road Using Flaggers
WZD-13	Interior (Left) Lane Closure on Multilane Street
WZD-14	Temporary Road Closure

Each traffic control zone is different because of variables such as speed, volume, location of work, pedestrians, and intersections. As one or more of the variables change, the needs of the work zone change.

- The following Typical Application Work Zone Diagrams (WZD) cover the most common situations within the utility industry. The typical diagrams will usually need to be altered to fit the condition of a particular work area.
- Information and layouts in this handbook represent minimum requirements. When difficult situations or potentially hazardous conditions are encountered, layouts may be modified to provide a greater degree of safety.
- Other devices may be added to supplement the devices shown in the typical applications, while others may be deleted. The sign spacing and taper lengths may be increased to provide additional time or space for driver response.
- Safety in short-duration operations should not be compromised by using fewer devices simply because it's time-consuming.

The Three factors most commonly used are:

WORK DURATION

WORK LOCATION

ROADWAY TYPE

WORK DURATION

Generally, the longer the worker and work site is present in traffic, the more controls and devices are needed.

- Long-term stationary - More than 3 days
- Intermediate-term stationary - More than one daylight period up to 3 days, or more than 1 hour nighttime
- Short-term stationary - 1 to 12 hours, daytime
- Short duration - 1 to 60 minutes (1 hour)
- Mobile - Work that moves intermittently or continuously

WORK LOCATION

Generally, the closer the work is to traffic, the more devices and controls are needed.

- Work can take place in the following locations:
- Outside the shoulder
- On the shoulder with no encroachment
- Within the median
- Within the traveled way

ROADWAY TYPE

Roadway type combines the consideration of traffic speed and volume. Generally, the higher the speed and/or volume, the more controls and devices are needed.

- Urban Streets - Low traffic volumes with low speeds; need fewer but more closely spaced devices.
- Urban Arterial Roads - Low speeds, but require more devices because of higher traffic volumes and closer spacing of such design features as intersections.
- Intersections - High, intermittent volumes; low to moderate speeds and unique, complex situations such as pedestrian crosswalks, vehicle turns, etc.
- Rural two-lane Roadways - Low volumes and high speeds.

**Table 3-A. TAPER LENGTH FOR LANE CLOSURES
DISTANCE (L)**

Speed Limit M.P.H.	Taper Length Lane Width in feet			Number of Devices	Space Between Devices*
	10	11	12		
20	70	75	80	5	20
25	105	115	125	6	25
30	150	165	180	7	30
35	205	225	245	8	35
40	270	295	320	9	40
45	450	495	540	13	45
50	500	550	600	13	50
55	550	605	660	13	55
60	600	660	720	13	60
65	650	715	780	13	65
70	700	770	840	13	70

* Note:

- When used for **tapers**, the spacing of channelizing devices should not exceed a distance equal to 1 times the speed limit in mph.
- When used for **tangent channelization**, the spacing of channelizing devices should not exceed a distance equal to 2 times the speed limit in mph.

Table 3-B. FORMULA FOR TAPER LENGTH “L”

For speed limits of 40 mph or less:

$$L = W \times S \times S / 60$$

For speed limits of 45 mph or greater:

$$L = W \times S$$

Where:

L = Taper length in feet

W = Width of lane offset in feet

S = Speed of traffic in mph

Table 3-C. TAPER LENGTH FOR WORK ZONES


















<u>Type of Taper</u>	<u>Taper Length</u>
Upstream Tapers:	
• Merging Taper	L Minimum
• Shifting Taper	1/2 L Minimum
• Shoulder Taper	1/3 L Minimum
• Two-Way Taper	100 Feet Maximum
Downstream Taper (Optional)	100 Feet Per Lane

Table 3-E. MEANING OF LETTER CODES ON WORK ZONE DIAGRAMS

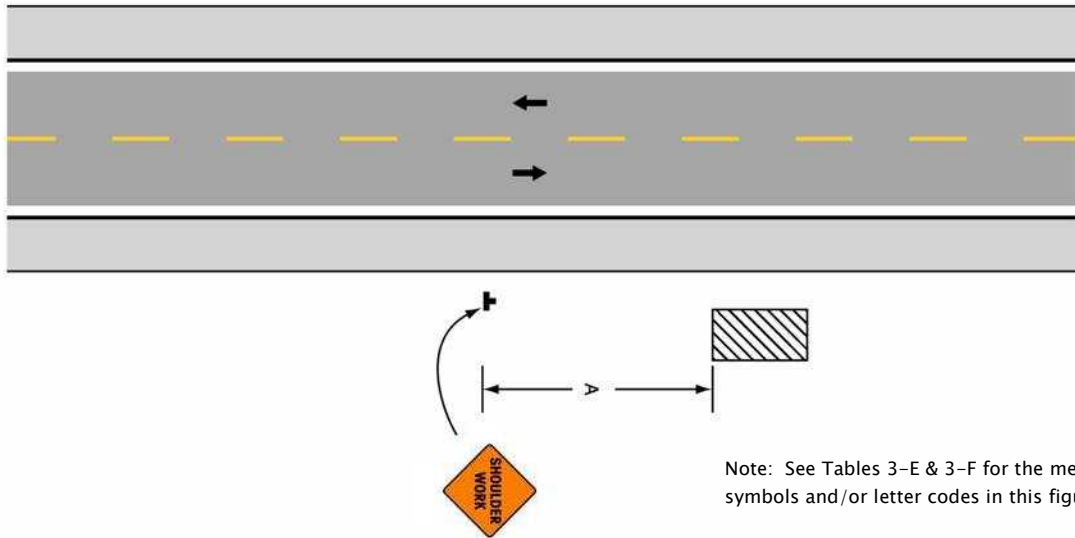
Road Type	Distance Between Signs		
	A	B	C
Urban (low speed*)	100'		
Urban (high Speed*)	350'		
Rural	500'		

* Speed category to be determined by highway agency

Table 3-F. MEANING OF SYMBOLS ON WORK ZONE DIAGRAMS

	Arrow panel		Sign (Shown facing left)
	Arrow panel support or trailer		Temporary barrier
	Channelizing device		Temporary barrier with warning lights
	Direction of traffic		Surveyor
	Direction of temporary traffic detour		Traffic or Pedestrian signal
	Flagger		Truck-mounted attenuator
	High-level warning device (Flag tree)		Type III Barricade
	Luminaire		Crash Cushion
	Pavement markings that should be removed for a long-term project		

WZD-1 WORK OUTSIDE OF SHOULDER

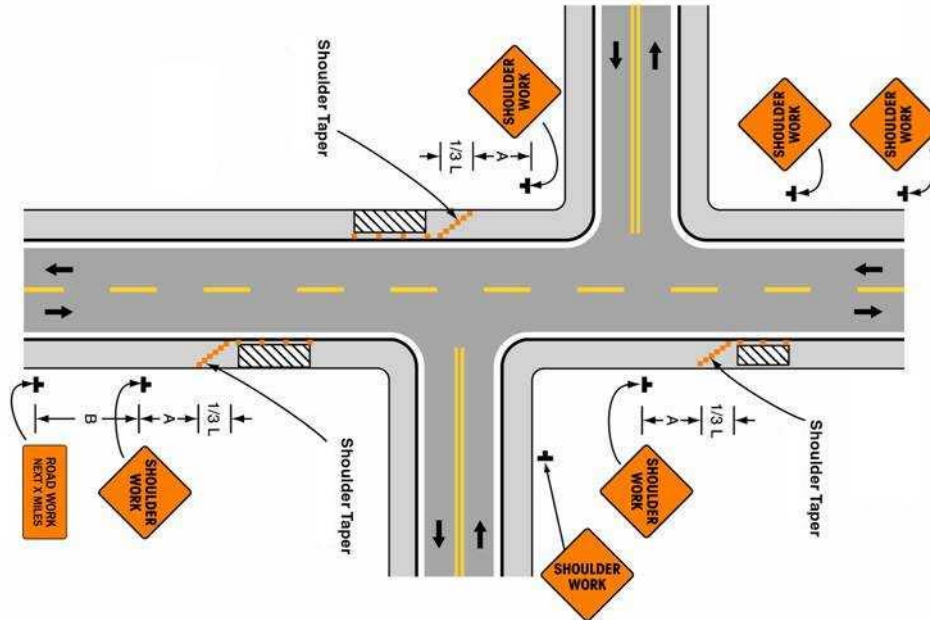


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes in this figure.

WORK OUTSIDE OF SHOULDER

- ◆ Sign may be omitted if the work space is behind a barrier, more than 24 in behind the curb, or more than 15 ft from the edge of any roadway.
- ◆ If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.
- ◆ For short-term, short-duration operations, all signs and channelizing devices may be eliminated if a vehicle with activated rotating lights or strobe lights is used.
- ◆ 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.

WZD-2 WORK ON SHOULDERS (Worse-case scenario)

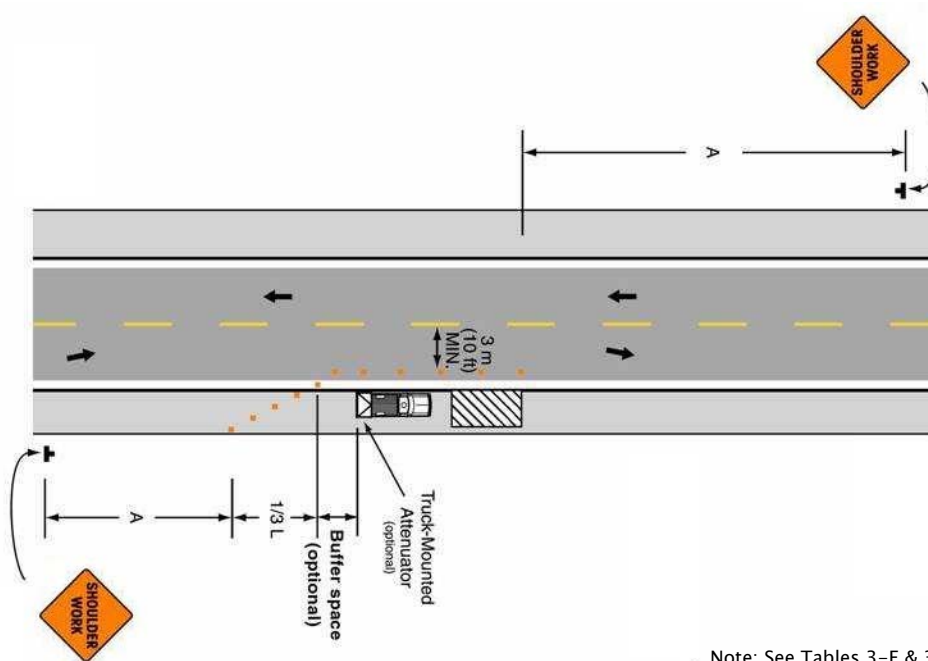


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

WORK ON SHOULDERS

- ◆ WORKER symbol or UTILITY WORK AHEAD may be used instead of SHOULDER WORK signs.
- ◆ A SHOULDER WORK sign should be placed on the left side of a divided or one-way roadway only if the left shoulder is affected.
- ◆ For short-duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated rotating lights or strobe lights is used.
- ◆ 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.

WZD-3 SHOULDER WORK WITH MINOR ENCROACHMENT

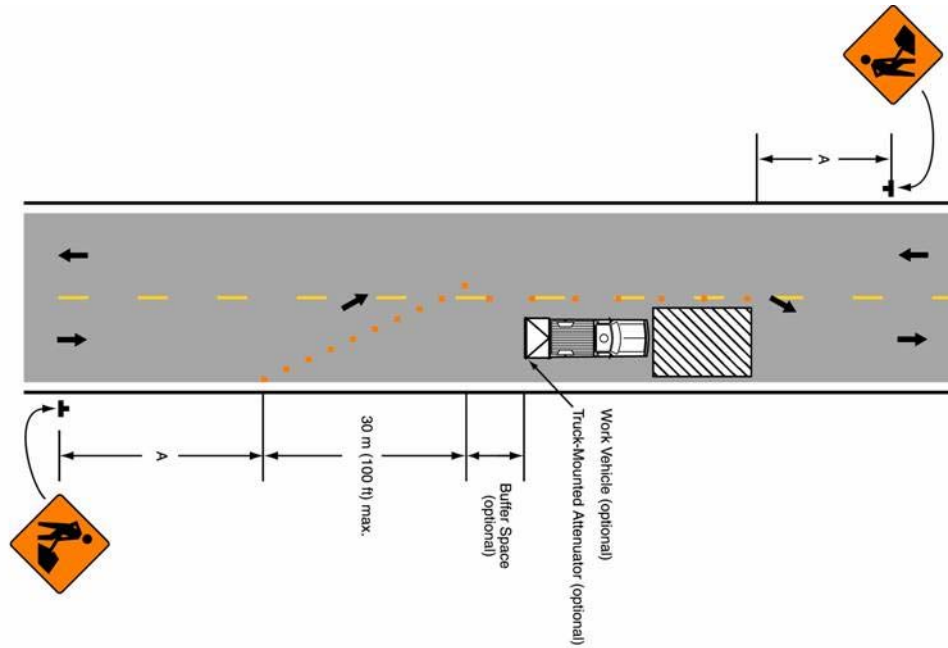


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

SHOULDER WORK WITH MINOR ENCROACHMENT

- ◆ All lanes should be a minimum of 10 ft in width as measured to the near face of the channelizing devices.
- ◆ Where the opposite shoulder is suitable for carrying motor vehicle traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 10 ft is maintained.
- ◆ Additional advance warning may be appropriate, such as ROAD NARROWS sign.
- ◆ For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated rotating lights or strobe lights is used.
- ◆ WORKER symbol or UTILITY WORK AHEAD may be used instead of SHOULDER WORK signs.
- ◆ 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.

WZD-4 LANE CLOSURE ON URBAN STREET, SELF-REGULATING

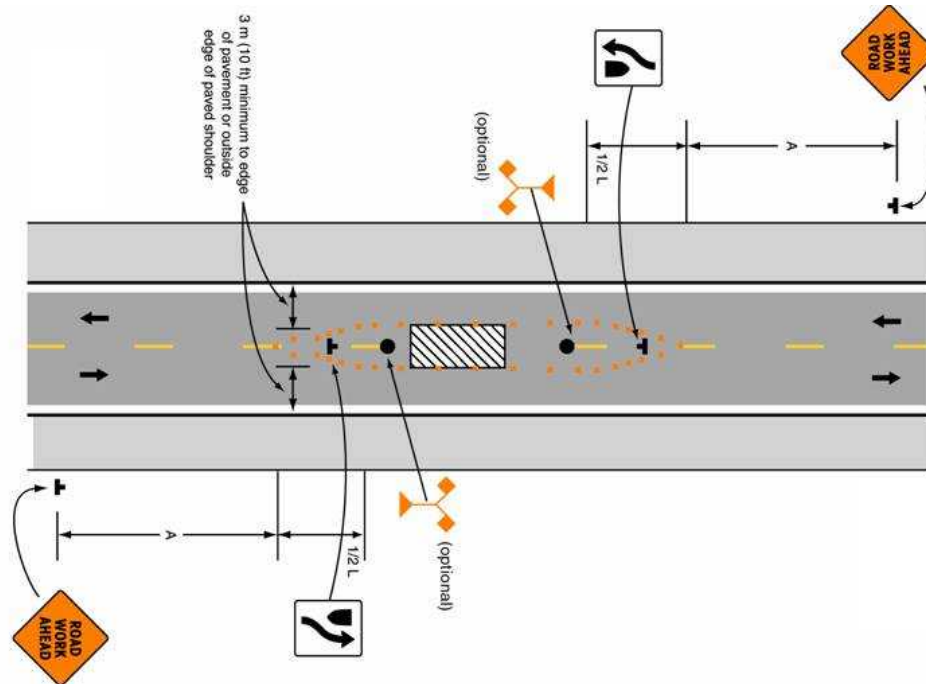


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

LANE CLOSURE ON URBAN STREET, SELF-REGULATING

- ◆ This temporary traffic control shall be used only for low-volume, low-speed facilities.
- ◆ Where the work space is short, where drivers can see the roadway beyond, and where volume is low, motor vehicle traffic may be self regulating.
- ◆ Where motor vehicle traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in WZD-12.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

WZD-5 WORK IN CENTER OF LOW VOLUME URBAN STREET

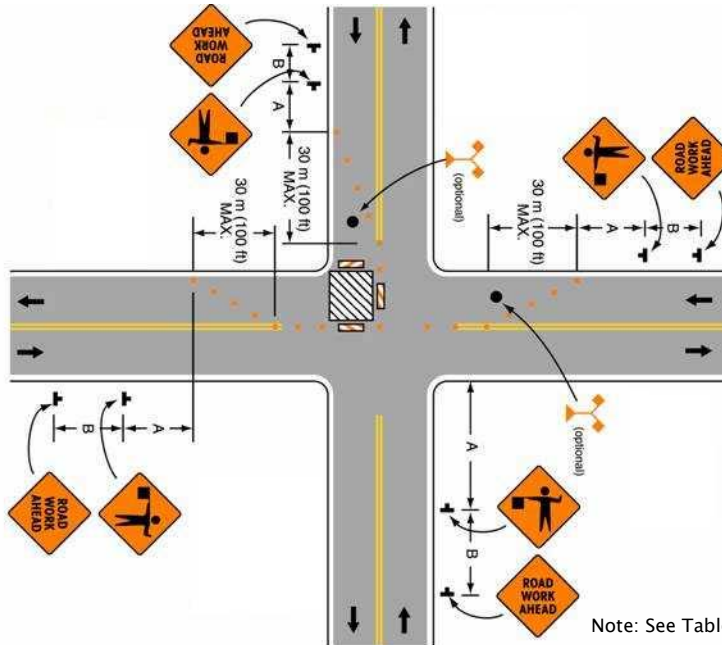


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

WORK IN CENTER OF LOW VOLUME URBAN STREET

- ◆ The lanes on either side of the center work space should have a minimum width of 10 ft as measured from the near edge of the channelizing devices to the edge of pavement or the outside edge of paved shoulder.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- ◆ A work vehicle displaying rotating lights or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.
- ◆ 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.

WZD-6 LANE CLOSURE AT CORNER OF INTERSECTION, FLAGGER CONTROL

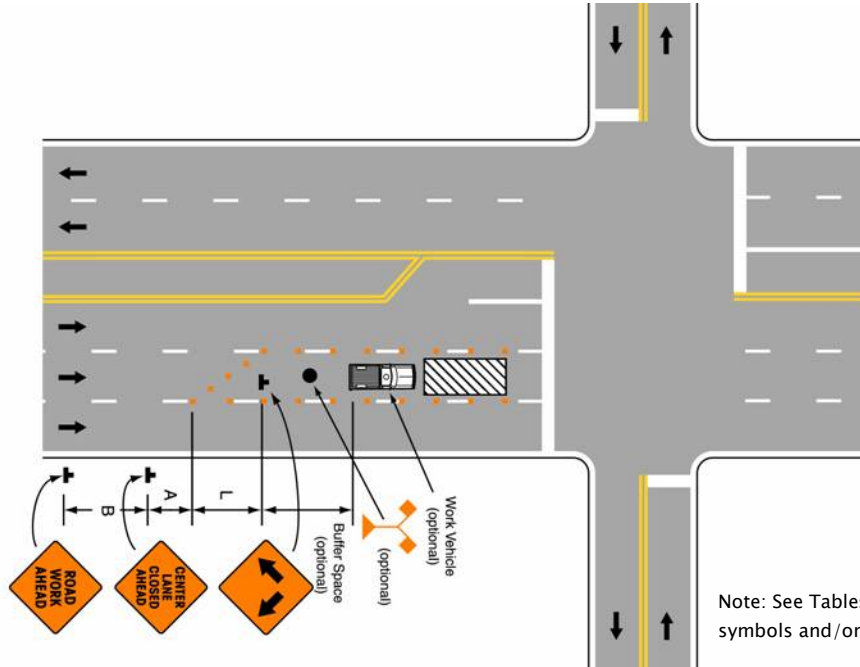


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

LANE CLOSURE AT CORNER OF INTERSECTION, FLAGGER CONTROL

- ◆ The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through motor vehicle traffic should be directed to other roads or streets.
- ◆ Depending on road user conditions, flagger(s) or uniformed law enforcement should be used to direct road users within the intersection.
- ◆ ONE LANE ROAD AHEAD signs may also be used to provide adequate advance warning.
- ◆ A BE PREPARED TO STOP sign may be added to the sign series. When used, the BE PREPARED TO STOP sign should be located before the flagger symbol sign.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- ◆ For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying rotating lights or strobe lights is positioned in the work space.
- ◆ 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.

WZD-7 LANE CLOSURE NEAR SIDE OF INTERSECTION

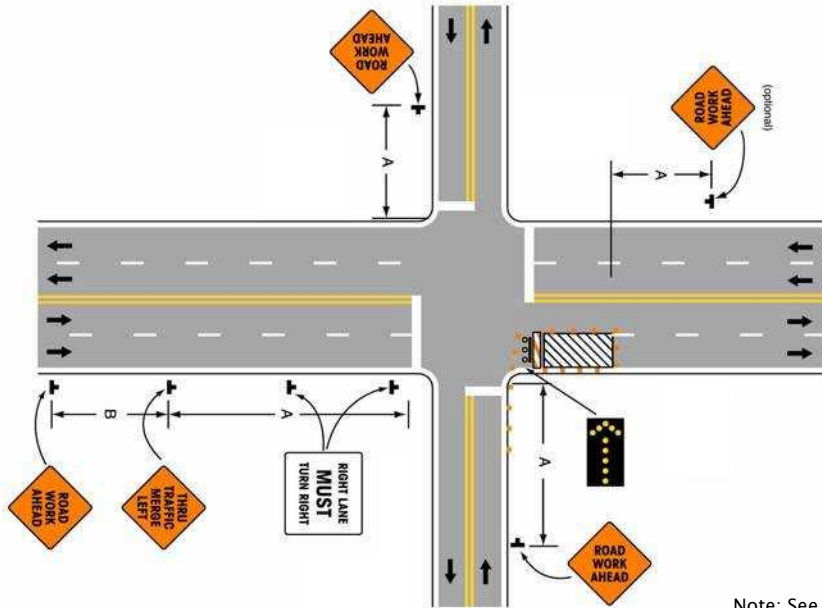


Option: An arrow panel may be used in Flashing Double Arrow mode.

LANE CLOSURE NEAR SIDE OF INTERSECTION

- ◆ The merging taper shall direct motor vehicle traffic into either the right or left lane, but not both.
- ◆ In this typical application a left taper is used so that right-turn movements will not impede through motor vehicle traffic. However, the reverse should be true for left-turn movements.
- ◆ If the work space extends across the crosswalk, the crosswalk should be closed.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- ◆ A work vehicle with rotating lights or strobe lights may be used with the high-level warning device.
- ◆ 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

WZD-8 RIGHT LANE CLOSURE FAR SIDE OF INTERSECTION

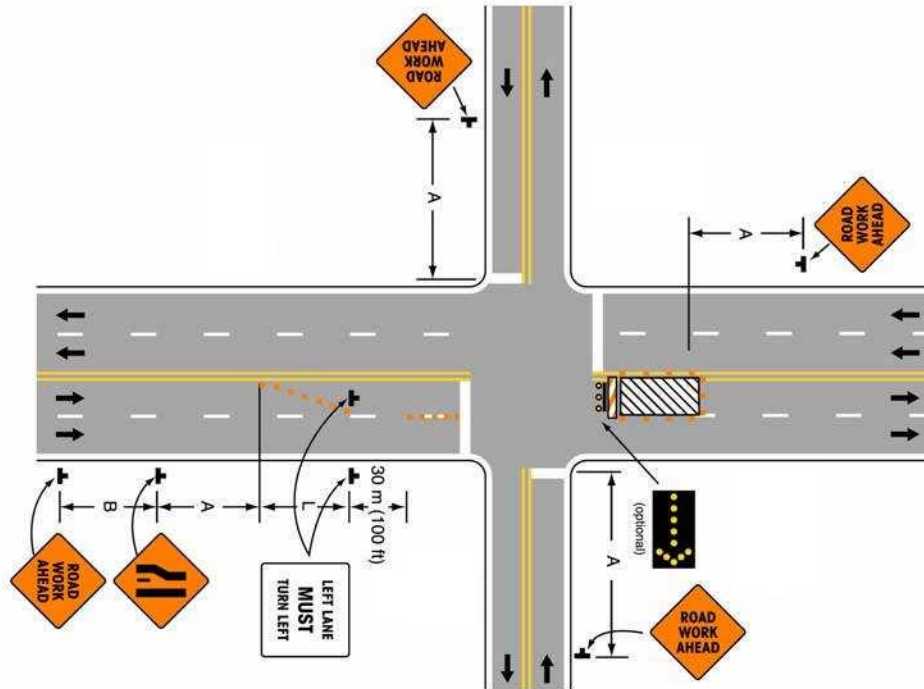


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

RIGHT LANE CLOSURE FAR SIDE OF INTERSECTION

- ◆ If the work space extends across the crosswalk, the crosswalk should be closed.
- ◆ The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection.
- ◆ For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through motor vehicle traffic.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

WZD-9 LEFT LANE CLOSURE FAR SIDE OF INTERSECTION



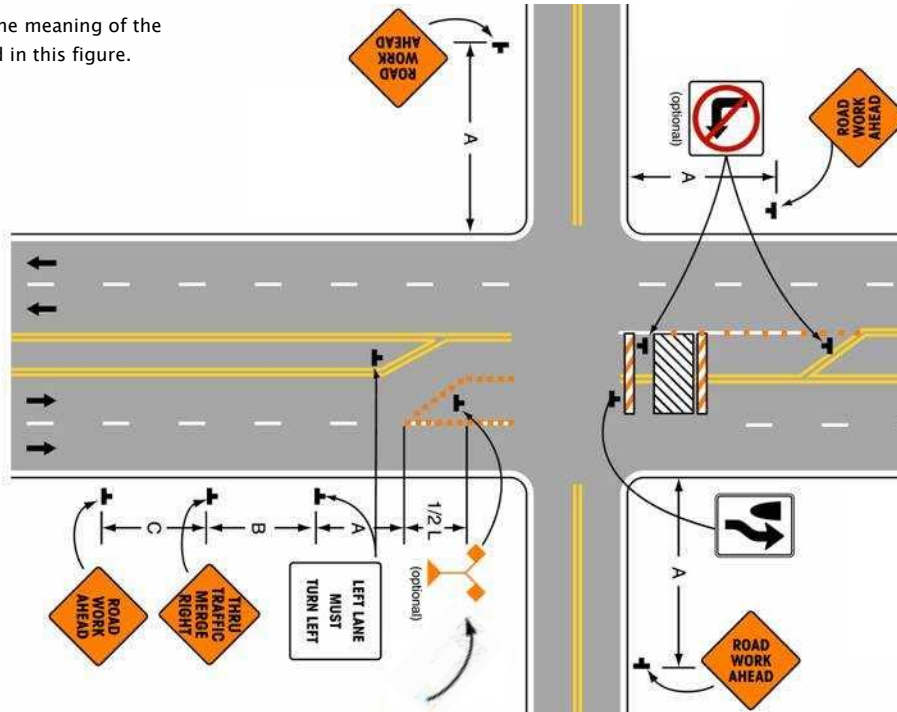
Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

LEFT LANE CLOSURE FAR SIDE OF INTERSECTION

- ◆ If the work space extends across the crosswalk, the crosswalk should be closed.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- ◆ The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection.
- ◆ For intersection approaches reduced to a single lane, left-turning movements may be allowed by creating a turn bay for left turns only, as shown.
- ◆ By first closing off the left lane and then reopening it as a turn bay, an island is created with channelizing devices that allow the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.
- ◆ An alternative to creating a turn bay is to prohibit left lane turns closing the left turn lane. No LEFT TURN sign shall be used in this case.

WZD-10 MULTIPLE LANE CLOSURE AT INTERSECTION

Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

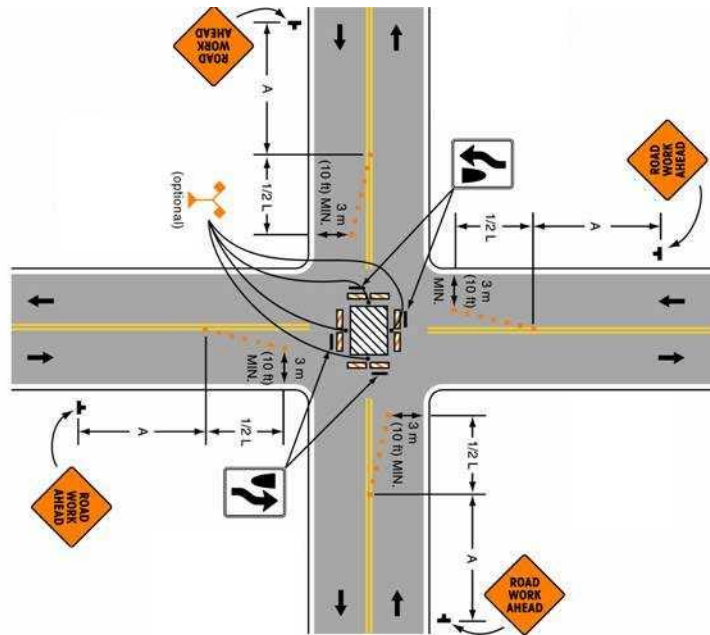


Option: An arrow panel may be used in Flashing Double Arrow mode.

MULTIPLE LANE CLOSURE AT INTERSECTION

- ◆ If the work space extends across the crosswalk, the crosswalk should be closed.
- ◆ If the left through lane is closed on the near-side approach, the LEFT LANE MUST TURN LEFT sign should be placed in the median to discourage through motor vehicle traffic from entering the left-turn bay.
- ◆ The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

WZD-11 CLOSURE IN CENTER OF INTERSECTION



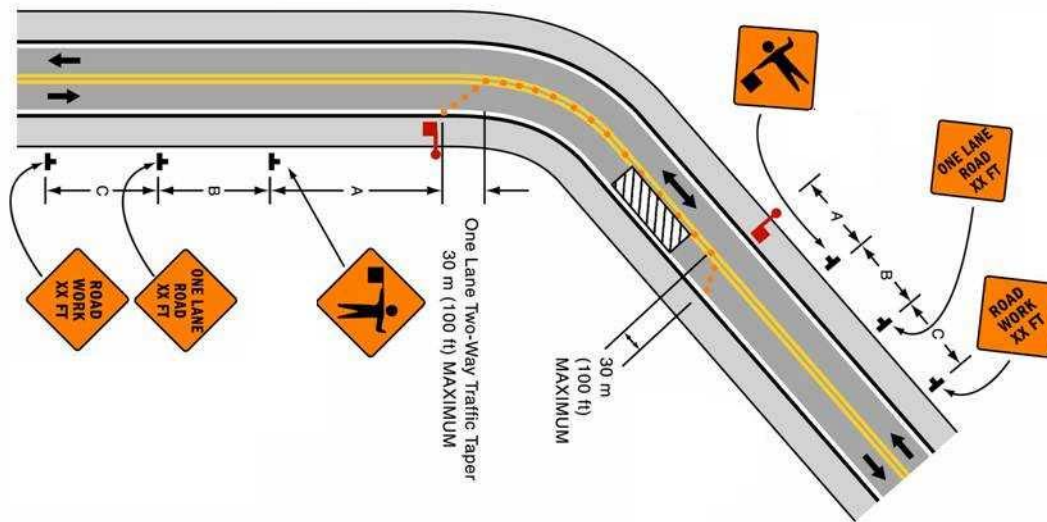
Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

CLOSURE IN CENTER OF INTERSECTION

- ◆ A high-level warning device should be placed in the work space, if there is sufficient room.
- ◆ All lanes should be a minimum of 10 ft in width as measured to the near face of the channelizing devices.
- ◆ Flashing warning lights and/or flags may be used to call attention to advance warning signs.
- ◆ Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles. Left turns may be prohibited as required by geometric conditions.
- ◆ For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying rotating lights or strobe lights is positioned in the work space.
- ◆ 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.

WZD-12 LANE CLOSURE ON TWO-LANE ROAD USING FLAGGERS

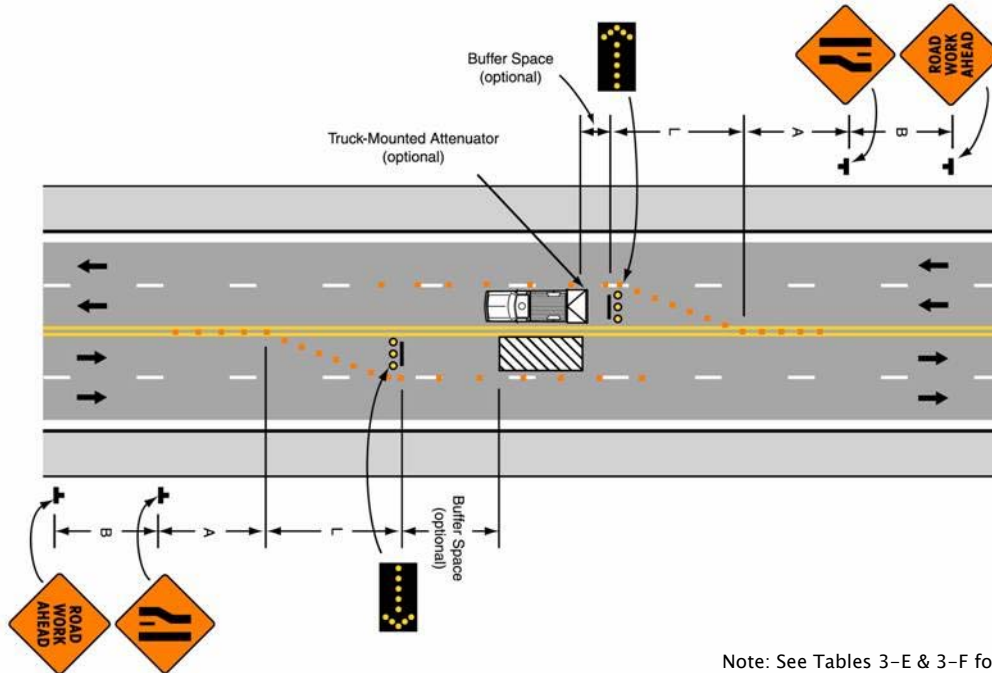
Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.



LANE CLOSURE ON TWO-LANE ROAD USING FLAGGERS

- ◆ For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used.
- ◆ The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short duration operations.
- ◆ Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.
- ◆ Channelizing devices should be extended to a point where they are visible to approaching road users.
- ◆ Floodlights should be provided as needed to mark flagger stations at night.
- ◆ When used, the BE PREPARED TO STOP sign should be located between the Advance Flagger sign and the ONE LANE ROAD sign.
- ◆ When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the temporary traffic control zone should be made for keeping flaggers informed as to the activation status of these warning devices.
- ◆ A flagger or a law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 15 ft (4.5 m) of the highway-rail grade crossing, measured from both sides of the outside rails.
- ◆ When a highway-rail grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.
- ◆ When a highway-rail grade crossing exists within the activity area, drivers operating on the left side of the normal centerline should be provided with comparable warning devices as for drivers operating on the right side of the normal centerline.
- ◆ Early coordination with the railroad company should occur before work starts.

WZD-13 INTERIOR (LEFT) LANE CLOSURE ON MULTILANE STREET

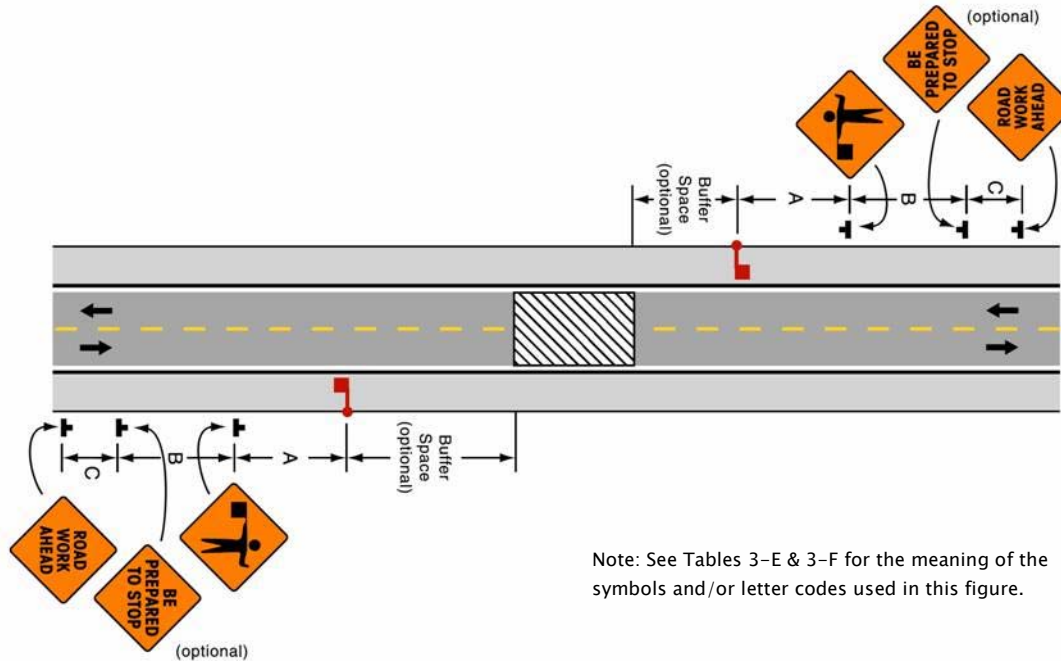


Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

INTERIOR (LEFT) LANE CLOSURE ON MULTILANE STREET

- ◆ This information applies to low-speed, low-volume urban streets. Where speed or volume is higher, additional signing such as LEFT LANE CLOSED AHEAD should be used between the signs shown.
- ◆ When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the temporary traffic control zone should be extended so that the transition area precedes the highway-rail grade crossing.
- ◆ Early coordination with the railroad company should occur before work starts.
- ◆ When a lane is closed on a multilane road, a transition area containing a merging taper shall be used.
- ◆ When only the left lane is closed on undivided roads, channelizing devices shall be placed along the centerline as well as along the adjacent lane.

WZD-14 TEMPORARY ROAD CLOSURE



Note: See Tables 3-E & 3-F for the meaning of the symbols and/or letter codes used in this figure.

TEMPORARY ROAD CLOSURE

- ♦ Conditions represented are a planned closure not exceeding 20 minutes during the day-time. Local regulations may require permits for any road closure.
- ♦ The flagger(s) shall follow the procedures noted in the Flagging Procedures of this Manual.
- ♦ A law enforcement officer and/or a changeable message sign may be used.
- ♦ A BE PREPARED TO STOP sign may be added to the sign series.
- ♦ When used, the BE PREPARED TO STOP sign should be located before the flagger symbol sign.

SUMMARY

- Safety is primary. Use whatever controls are necessary to be sure traffic, pedestrians and workers are not at risk.
- Signs need to be seen to be obeyed. Increase the size or height of signs to make them more visible. Portable signs shall be at least 1 foot above the roadway.
- Increase the length of the warning area when traffic is backed up, when there is a curve, hill or other obstruction, and on high-speed, high-volume roads.
- Allow room for a buffer space for additional protection of traffic and workers.
- The work zone should be as short as reasonable, according to what must be accomplished against driver delay and the potential for traffic incidents. Additional safety and warning is needed when traffic is diverted into lanes normally used by opposing traffic.
- Channelizing devices should break or collapse when hit. Do not use concrete or other materials that may be hazardous on devices. Do not use rigid stay bracing for barricades.
- All devices used at night should be reflectorized or illuminated.
- If warning lights are to be used, use steady burning lights for channelization and flashing lights for warning.
- Periodically inspect the devices. Repair or replace any damaged or missing devices. All devices shall be clean.
- Keep accurate records. If a traffic incident occurs, make a note of it including whether or not any control devices were involved and what devices were used before and after the accident.
- Do not lie to the public. Remove or cover all signs or devices that are not needed.

Ameren-Approved Flagger's Vests

Size	Stock Number
• Medium	4925306
• Large	4925305
• X-Large	4925307
• XX-Large	4925308
• 3X-Large	4925309
• 4X-Large	4925310
• 5X-Large	4925311



Ameren Traffic Control Devices

Device	Stock Number
• Stop / Slow Sign w/ Handle	1602099
• Safety Traffic Cone (28")	1602137
• Roll-up Sign Storage Bag	8502205
• Traffic Warning Sign Stand	8532097
• Traffic Warning Signs:	
✓ Right Lane Closed Ahead	8332096
✓ Right Lane Merging (<i>no words</i>)	8532416
✓ Left Lane Merging (<i>no words</i>)	
✓ Utility Work Ahead (<i>can be substituted for Road Work Ahead</i>)	8532093
✓ One Lane Ahead	8532095
✓ Be Prepared to Stop	8532133
✓ Flagger Symbol (<i>no words</i>)	8532094
✓ Shoulder Work	8532418
✓ Right Shoulder Closed	8532415
✓ Worker Symbol (<i>no words</i>)	8532417



Other equipment if not listed may be added to stock or rented on a case-by-case bases.