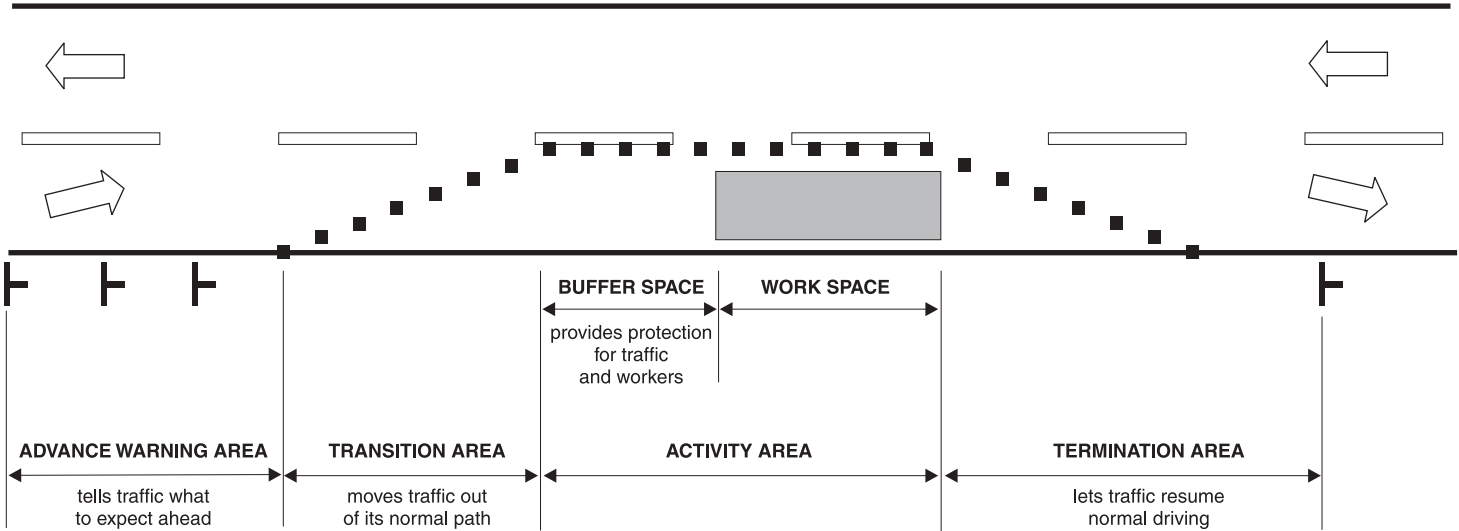




# Iowa Work Zone Safety Guidelines for Utilities

Revised June 2000

# Work Zone Traffic Control Components



## Introduction

This handbook generally represents minimum requirements for typical situations. It is not intended as a substitute for engineering judgment and may need to be altered to fit the conditions of a particular site. All traffic control used must be in compliance with the Manual on Uniform Traffic Control Devices (MUTCD), which contains information in addition to what is in this guide. **For work zones on primary or interstate roadways, please consult the Iowa DOT area maintenance supervisor.** Proper traffic control must be used when utility operations, or other types of road or street construction, may interfere with the movement of traffic. Appropriate measures must be taken to protect drivers, workers and pedestrians.

Part VI of the MUTCD is the national standard for all traffic control devices used during construction, maintenance and utility activities and can be purchased from American Traffic Safety Services Association (ATSSA). The federal MUTCD has been adopted as the Iowa Manual pursuant to requirements of Section 321.252 of the Code of Iowa. This guide is intended for use when utility work is being performed on a public roadway. It contains basic principles, a description of the standard traffic control devices used in work areas, guidelines for the application of the devices, and typical application diagrams. More detailed information concerning proper flagging is contained in the Iowa Flagger's Handbook and video. (Available from: Office of Finance, Iowa DOT, 800 Lincoln Way, Ames, Iowa, Attn: Cashier, phone 515-239-1588)

This handbook was developed by the Iowa Department of Transportation in cooperation with the Iowa Association of Municipal Utilities, Mid-American Energy, Alliant Energy, Cedar Falls Utilities, Iowa Electric Utility Safety and Training Association, and the Federal Highway Administration. (Available from: Office of Finance, Iowa DOT, 800 Lincoln Way, Ames, Iowa, Attn: Cashier, phone 515-239-1588)

## Fundamental Principles

The principles that have been shown to enhance the safety of motorists and workers in the vicinity of construction and maintenance work areas include the following:

1. Traffic safety in work zones should be an integral and high priority element of every project from planning through design and construction.
2. Traffic movement should be inhibited as little as practicable.
3. Drivers and pedestrians should be guided in a clear and positive manner when approaching and traveling through work zones.
4. To ensure acceptable levels of operation, routine inspection of traffic control elements should be performed. All traffic control devices shall be removed, covered or turned when no longer needed.
5. The maintenance of roadside safety requires constant attention during the life of the work zone because of the potential increase in hazards.
6. Each person whose actions affect work zone traffic control should receive training appropriate to his/her job.
7. There must be adequate legislative authority for the implementation and enforcement of needed traffic control measures.
8. Maintaining good public relations is necessary.

# Signs

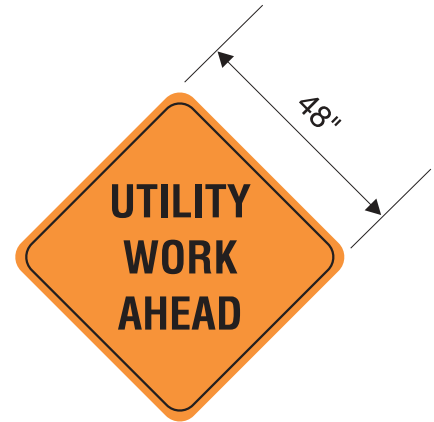
## Types

Signs are classified as regulatory, warning or guide.

1. Regulatory signs impose legal restrictions and may not be used without permission of the road authority (Example – Road Closed). They are typically rectangular in shape with black lettering on a white background. Other regulatory signs include STOP, YIELD, DO NOT ENTER, KEEP RIGHT, and WRONG WAY signs.
2. Warning signs give notice of conditions that are potentially hazardous to traffic. They are typically diamond-shaped. Work zone warning signs have a black legend on an orange background.
3. Guide signs commonly show destination, directions, and distances. Directional signs and street name signs in detours may have a black legend on an orange background.

## Sizes

The sign size of 48 inches by 48 inches is standard for all utility approach warning signs. The sign size of 36 inches by 36 inches is minimally adequate in urban areas, but 24 inches by 24 inches is only permitted in areas with speeds of 25 mph or less. When regulatory or guide signs are used, the size requirements given in the MUTCD must be followed.



**48" X 48" Standard**

## Work Zone Traffic Control Components

The work zone traffic control includes the entire section of roadway from the first advance warning sign through the last traffic control device where traffic returns to its normal path and conditions. Most temporary traffic control zones can be divided into four areas: The advance warning area, the transition area, the activity area, and the termination area. These four areas that constitute a temporary traffic control zone are described in the order that drivers encounter them. (The traffic control zone is shown inside the front cover.)

### Advance Warning Area

In the advance warning area, drivers are informed of what to expect. The advance warning may vary from a single sign or flashing lights on a vehicle to a series of signs in advance of the temporary traffic control zone transition area. On freeways and expressways, where driver speed is generally in the higher range (45 mph or more), signs may be placed from 500 feet to one-half mile or more before the temporary traffic control zone. The true test of adequacy of sign spacing is to evaluate how much time the driver has to perceive and react to the condition ahead. In this regard, the use of speed, roadway condition and related driver expectancy must be considered in order to derive a practical sign spacing distance. Effective placement of warning signs for urban and rural locations is as follows:

#### Urban

Warning sign spacing in advance of the transition area normally range (in feet) from four to eight times the speed in miles per hour (mph), with the high end of the range being used when speeds are relatively high. For example, in a 25 mph area, the minimum distance of the warning sign from the work area should be 100 feet ( $25 \text{ mph} \times 4 = 100 \text{ feet}$ ). When two or more advance signs are used on higher-speed streets such as major arterials, the advance warning area should extend a greater distance.

## Rural

Rural roadways are characterized by higher speeds. Spacing for the placement of warning signs is substantially longer – the distance in feet being from eight to twelve times the speed (mph). Two or more advance warning signs are normally used in these conditions. The advance warning area should extend 1,500 feet or more in open highway conditions.

Advance warning is normally not needed when the activity area is sufficiently removed from the driver's path that it does not interfere with traffic.

## **Transition Area**

When redirection of the driver's normal path is required, traffic must be channelized from the normal path to a new path. This redirection is intended to occur at the beginning of the transition area. In mobile operations, this transition area moves with the work space. Transition areas usually involve strategic use of tapers. (See table inside back cover.)

## **Activity Area**

The activity area is an area of roadway where the work takes place. It is composed of the work space and the traffic space, and may contain one or more buffer spaces.

### Work Space

The work space is that portion of the roadway closed to traffic and set aside for workers, equipment and material. Work space may be fixed, or may move as work progresses. Long-term work spaces are usually delineated by channelizing devices or shielded by barriers to exclude traffic and pedestrians.

### Traffic Space

The traffic space is the portion of the roadway on which traffic is routed through the activity area.

## Buffer Space

The buffer space is an optional but highly recommended feature in the activity area that separates traffic flow from the work activity or a potentially hazardous area and provides recovery space for an errant vehicle. Neither work activity nor storage of equipment, vehicles or material should occur in this space. Buffer spaces may be positioned longitudinally and laterally with respect to the direction of traffic flow.

- Longitudinal Buffer Space

The longitudinal buffer space may be placed in the initial portion of a closed lane in advance of the work space. When a protection vehicle is placed in advance of the work space, only the space upstream of the vehicle constitutes the buffer space.

The longitudinal buffer space should be used where a closed lane separates opposing traffic flows. Typically, it is formed as a traffic island and defined by channelizing devices.

A guide for the length of longitudinal buffer space is shown in Table 1. The length may be adjusted to satisfy individual agency needs.

| Speed* (mph) | Length (feet) |
|--------------|---------------|
| 20           | 35            |
| 25           | 55            |
| 30           | 85            |
| 35           | 120           |
| 40           | 170           |
| 45           | 220           |
| 50           | 280           |
| 55           | 335           |
| 60           | 415           |
| 65           | 485           |
| 70           | 585           |

\*Posted speed, off-peak 85<sup>th</sup> percentile speed prior to work starting, or the anticipated operating speed in mph.



- Lateral Buffer Space

The lateral buffer space may be used to separate the traffic space from the work space, or a potentially hazardous area such as an excavation or pavement drop-off. A lateral buffer space also may be used between two travel lanes, especially those carrying opposing flows. The width of the lateral buffer space should be determined by engineering judgment.

- Incident Management Vehicle Storage Space

When work occurs on a high-volume, highly congested facility in an urban area, it is optional to allow space to store emergency vehicles (e.g. tow trucks) to respond quickly to traffic incidents. The storage space is typically provided at the beginning or end of the work space, or both. An emergency vehicle storage area should not extend into any portion of the buffer space.

### **Termination Area**

The termination area is used to return traffic to the normal traffic path. The termination area extends from the downstream end of the work area to the END UTILITY WORK signs, if posted. Conditions may be such that posting of END UTILITY WORK signs is not helpful; however, the enforcement of a double fine for work zone traffic violations requires that the area be marked for beginning and end. Use of this sign is otherwise optional.

## Typical Regulatory Signs

Because regulatory signs impose legal obligations on all drivers, they shall be authorized by the public body or official having jurisdiction. Typical regulatory signs are shown below.



The SPEED LIMIT sign shall display the limit established by law, or by regulation, after an engineering and traffic investigation has been made.



The KEEP RIGHT sign may be used at the ends of medians, parkways, loading islands and refuge islands, at traffic islands, and at underpass piers where traffic is required to keep to the right.



The KEEP RIGHT symbol sign may be used as an alternate to the word message sign.



The STOP sign is intended for use where traffic is required to stop. It shall be octagonal with white message and border on a red background.



The ROAD CLOSED sign may be used where the roadway is closed to traffic except contractors' equipment or officially authorized vehicles.

## Typical Warning Signs

Typical warning signs used in work zones are shown below.



The UTILITY WORK AHEAD sign may be used in advance of maintenance or minor construction projects in the roadway or on the shoulder. A ROAD WORK AHEAD sign may be used as an alternate sign.



The ONE LANE ROAD AHEAD sign should be used where traffic from opposing directions must alternately use the same single lane.



The RIGHT LANE CLOSED AHEAD sign should be used to notify drivers that the right lane(s) on a multilane highway is closed. The LEFT overlay plate is available for left lane closures.



The worker symbol sign may be used to advise motorists of maintenance or public utility work in or near the roadway. The word message sign WORKERS may be used as an alternate to the worker symbol sign.



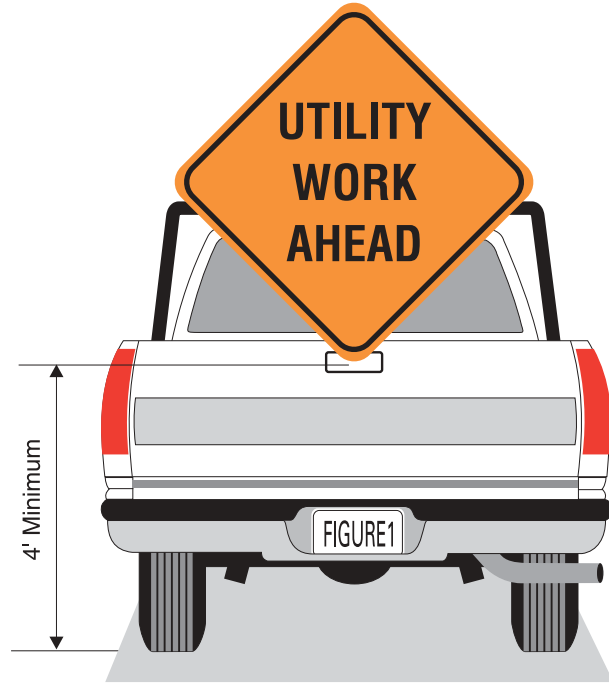
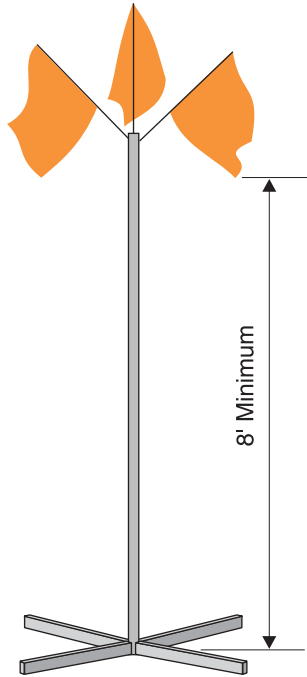
The flagger symbol sign should be used in advance of a flagger station to control traffic. The word message sign FLAGGER AHEAD may be used as an alternate to the flagger symbol sign.

## **Sign Supports**

Fixed sign supports should be used on work that occupies a location more than 12 hours. Portable supports are more practical for short-term projects. Following are illustrations of height and lateral locations of signs on fixed supports, and methods of mounting other than posts. Signs mounted on barricades, or temporary supports, may be at lower heights than on fixed supports but the bottom of the sign is not to be less than one foot above the pavement.

Figures 1, 2 & 3 are shown on the following pages.

**Figure 1**



**Portable and Temporary Mountings**

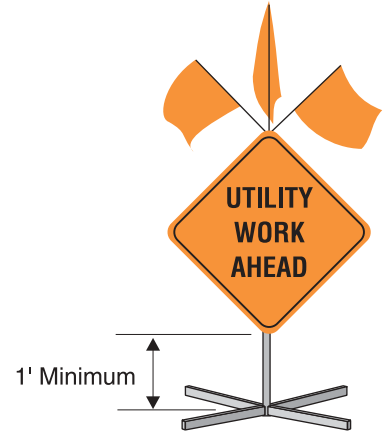
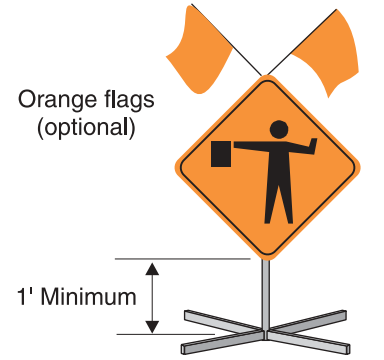
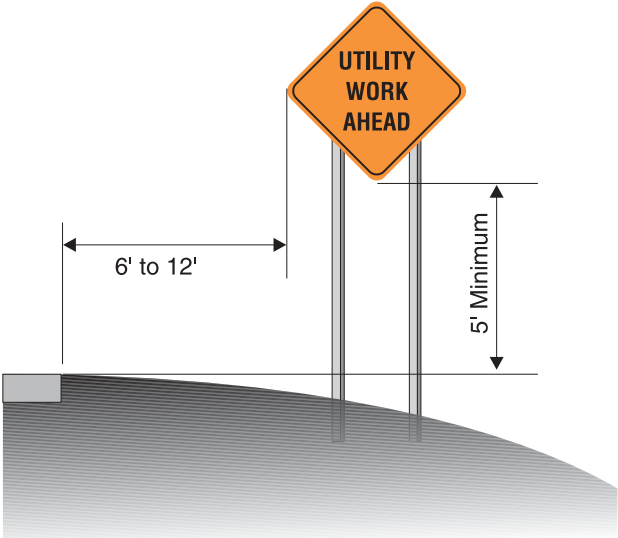
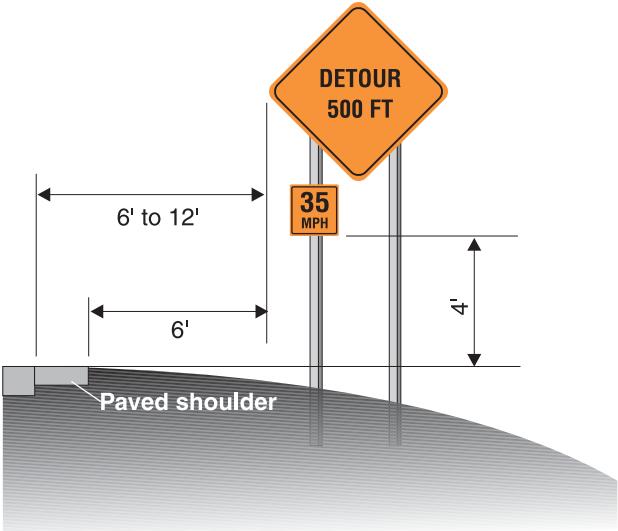


Figure 2



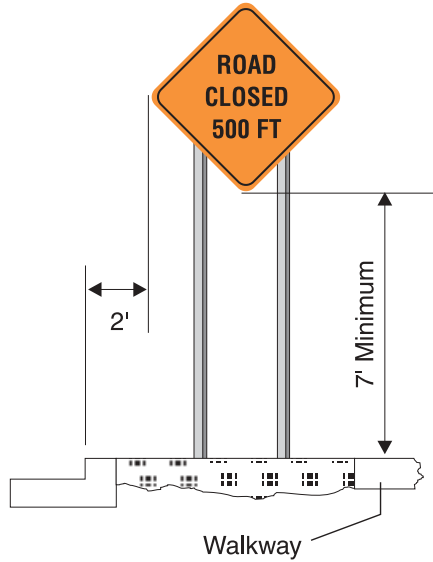
Roadside Sign  
Rural District

Rural

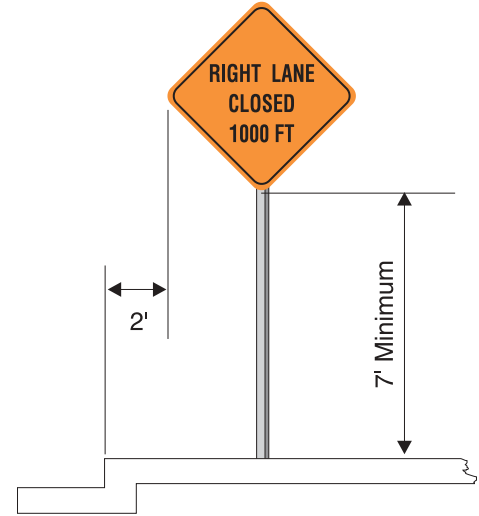


With Advisory  
Speed Plate

Figure 3



**Roadside Sign  
Urban District**



**Roadside Sign  
Urban District**

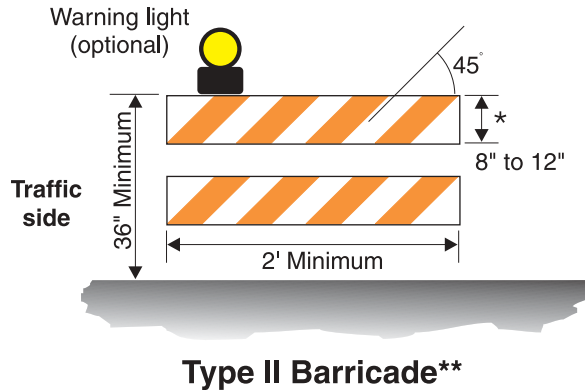
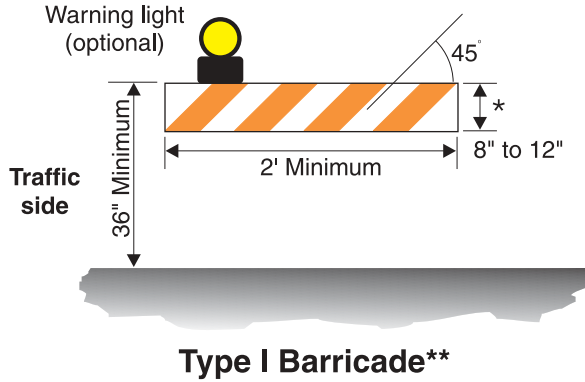
Urban

## Channelizing Devices

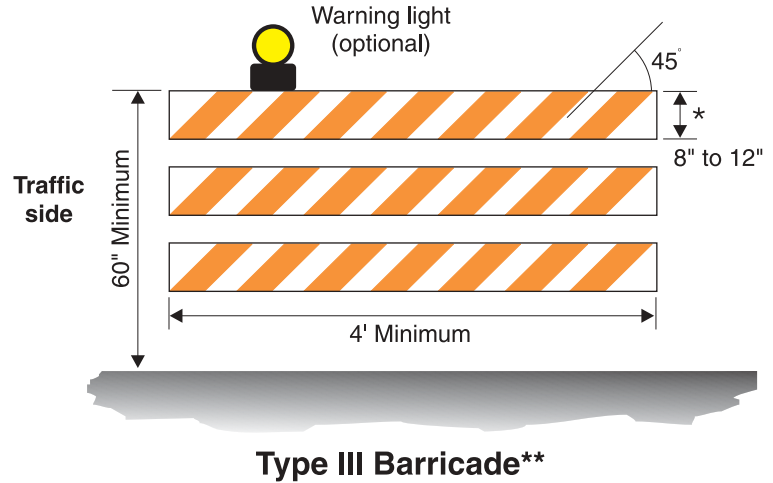
Channelizing devices are used to warn and direct traffic away from or around a work area. Type I barricades are normally used where traffic is to be maintained on conventional roads or urban streets and arterials, with a Type II barricade used on high-speed roadways. Type III barricades are erected at the point of closure where a road section is closed to traffic. Typical channelizing devices are shown in the following Figures 4 & 5 (MUTCD VI-10). The minimum cone height is 18 inches, while 28 inches is the minimum height of cones to be used on roadways with speed limits 45 mph or greater, and on all roadways at night. Cones shall be retroreflective for nighttime use. Metal drums shall not be used.

Spacing of channelizing devices in a two-way (flagger) traffic taper should be 10 feet to 20 feet, with a minimum of five channelizing devices. Spacing in the tangent area beyond the taper should not exceed twice the posted speed limit in feet.





**Figure 4**

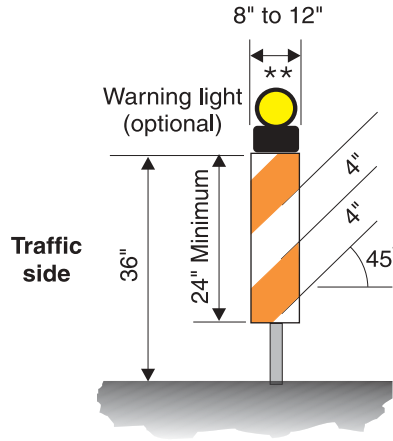


\* Nominal lumber dimensions are satisfactory for barricade rail width dimensions.

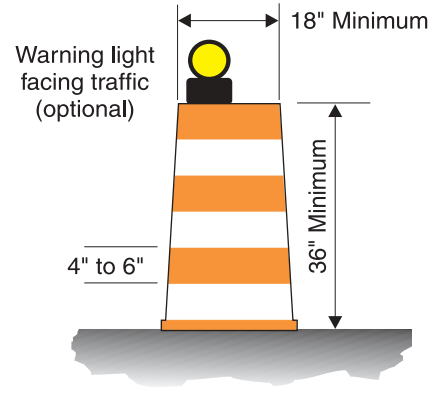
\*\* Rail stripe widths shall be six inches except where rail lengths are less than 36 inches, then four inch stripes may be used.

The sides of barricades facing traffic shall have retroreflective rail faces with Type III or IV sheeting (ASTM D4956.)

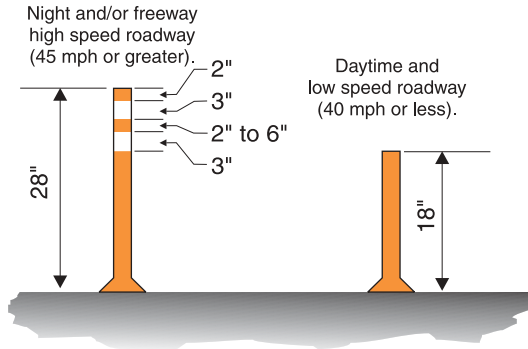
Figure 5



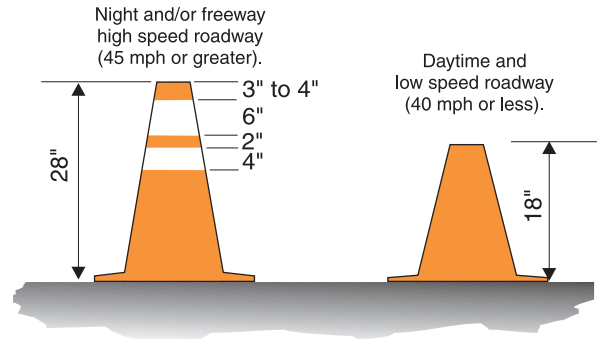
Vertical Panel



Drum



Tubular Markings



Cones

## Lighting Devices

### Warning lights

The principal types and uses of warning lights are:

1. Flashing lights are used to warn of an isolated hazard. (Type A)
2. High intensity flashing lights are used on advance warning signs day and night. (Type B)
3. Steady-burn lights may be used in a series to channelize traffic. (Type C)

### Vehicle flashing lights

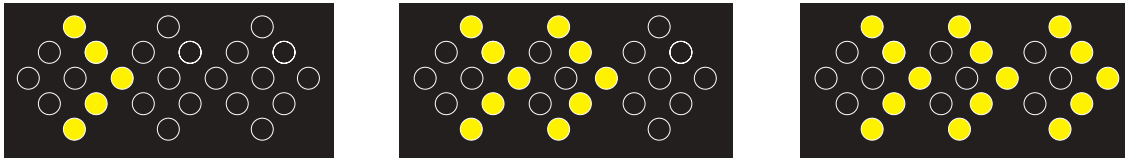
Work vehicles in or near the traffic area should be equipped with flashing lights, such as a yellow rotating beacon or strobe light.

Light bars (sometimes called Arrow Stix™) have been installed on many utility and maintenance vehicles. The light bar is effective in the caution (neutral) mode to get the attention of motorists. However, it does not meet the requirements for a flashing arrow panel and should not be used as one.

## Arrow Panel

An arrow panel is a sign with a matrix of elements. The matrix, capable of either flashing or sequential displays, is intended to provide additional warning and directional information to assist in merging and controlling traffic through or around a temporary traffic control zone. An arrow panel should be used in combination with appropriate signs, barricades or other traffic control devices. Only the chevron mode is permissible for lane closures.

An arrow panel shall be used as described in MUTCD, Part VI, Section 6F-3.



## **Nighttime Operations**

All traffic control devices shall be reflectorized when used at night. Workers shall wear reflectorized vests. When a barricade is used alone, it is desirable to add a flashing light. If a flagger is used, the flagger station should be adequately illuminated.

## Hand-Signaling Control

### Hand-signaling devices

The sign paddle bearing the message STOP or SLOW provides motorists with more positive guidance than flags and should be the primary hand-signaling device. Sign paddles should be at least 24 inches wide with letters at least eight inches high. The sign should be on a pole so that it is at least six feet from the road surface. Flags shall be red in color. (24 inches square and weighted). Flag use should be best limited to emergency situations and at low-speed and/or low volume locations that can be controlled by a single flagger.

### Flaggers

A flagger should possess the following minimum qualifications:

1. Average intelligence.
2. Good physical condition, including sight and hearing.
3. Mental alertness.
4. Courteous but firm manner.
5. Neat appearance.
6. Sense of responsibility for safety of public and crew.

Flaggers should be properly trained in the correct methods of signaling and display good decision-making and judgment capabilities. The flagger must be clearly visible to approaching traffic. This can be accomplished by wearing appropriate clothing (reflectorized vest and hat), and by staying clear of other workers or signs or barricades. Refer to Iowa [Flagger's Handbook](#) for more details.

### **Communication**

When two or more flaggers are used, one shall be designated as lead flagger. They can communicate verbally or visually if they are close enough and visible to each other. Where the end of a one-lane section is not visible from the other end, the flaggers may maintain control by means of a relay flagger or radio or field telephone. Other methods include: 1) using an official car to follow the last vehicle through the work site; or 2) using a pilot car to guide the traffic through a hazardous or complicated work site.

## Hand-signaling Procedures

The following methods of signaling with sign paddles should be used:

1. **To stop traffic.** The flagger shall face traffic and extend the STOP sign paddle held in a stationary position with the arm extended horizontally away from the body. The free arm is raised with the palm toward approaching traffic. (See Figure 6 on page 24.)
2. **When it is safe for traffic to proceed.** The flagger shall face traffic with the SLOW sign paddle held in a stationary position with the arm extended horizontally away from the body. The flagger motions traffic ahead with the free hand. (See Figure 7 on page 25.)
3. **When it is desired to alert or slow traffic.** The flagger shall face traffic with the SLOW sign paddle held in a stationary position with the arm extended horizontally away from the body. (See Figure 8 on Page 26.) The flagger may motion up and down with the free hand, palm down.

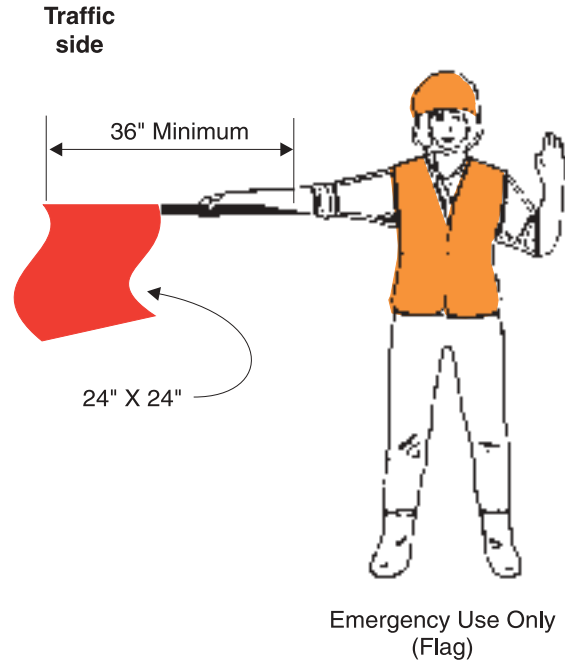
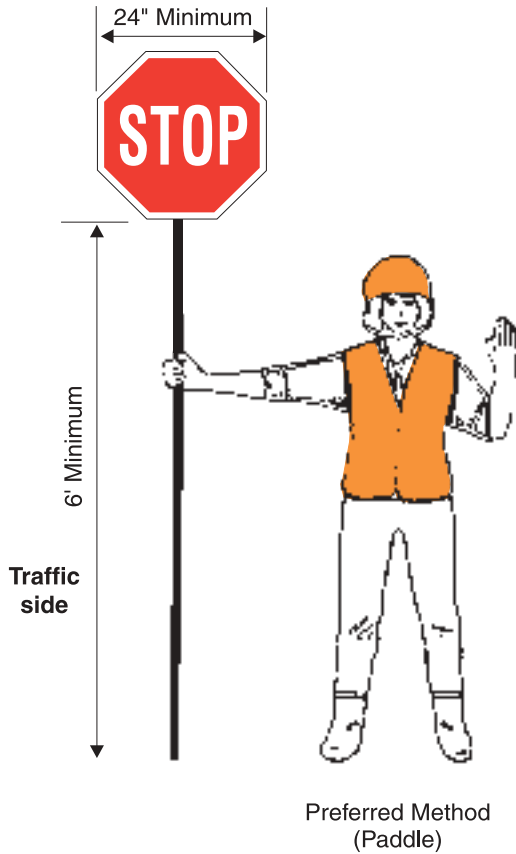
The following methods of signaling with a flag should be used:

1. **To stop traffic.** The flagger shall face traffic and extend the flag horizontally across the traffic lane in a stationary position so that the full area of the flag is visible hanging below the staff. For greater emphasis, the free arm may be raised with the palm toward approaching traffic. (See Figure 6 on page 24.)



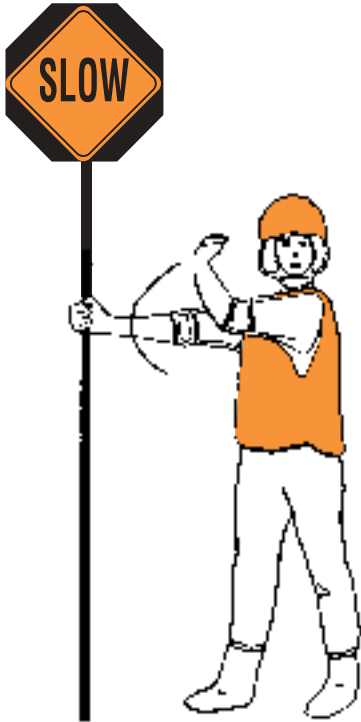
2. **When it is safe for traffic to proceed.** The flagger shall stand parallel to the traffic movement, and with flag and arm lowered from view of the driver, motion traffic ahead with the free arm. Flags shall not be used to signal traffic to proceed. (See Figure 7 on page 25.)
  
3. **When it is desired to alert or slow traffic.** When it is desirable to alert or slow traffic by means of flagging, the flagger shall face traffic and slowly wave the flag in a sweeping motion of the extended arm from the shoulder level to straight down without raising the arm above the horizontal position. (See Figure 8 on page 26.)

Figure 6

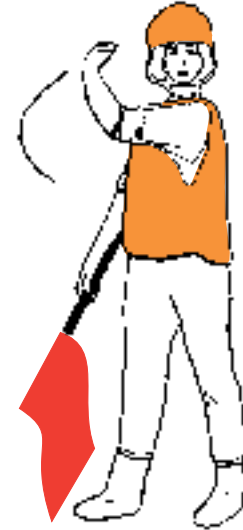


To Stop Traffic

Figure 7



Preferred Method  
(Paddle)



Emergency Use Only  
(Flag)

**Traffic Proceed**

Figure 8



Preferred Method  
(Paddle)



Emergency Use Only  
(Flag)

To Alert and Slow Traffic

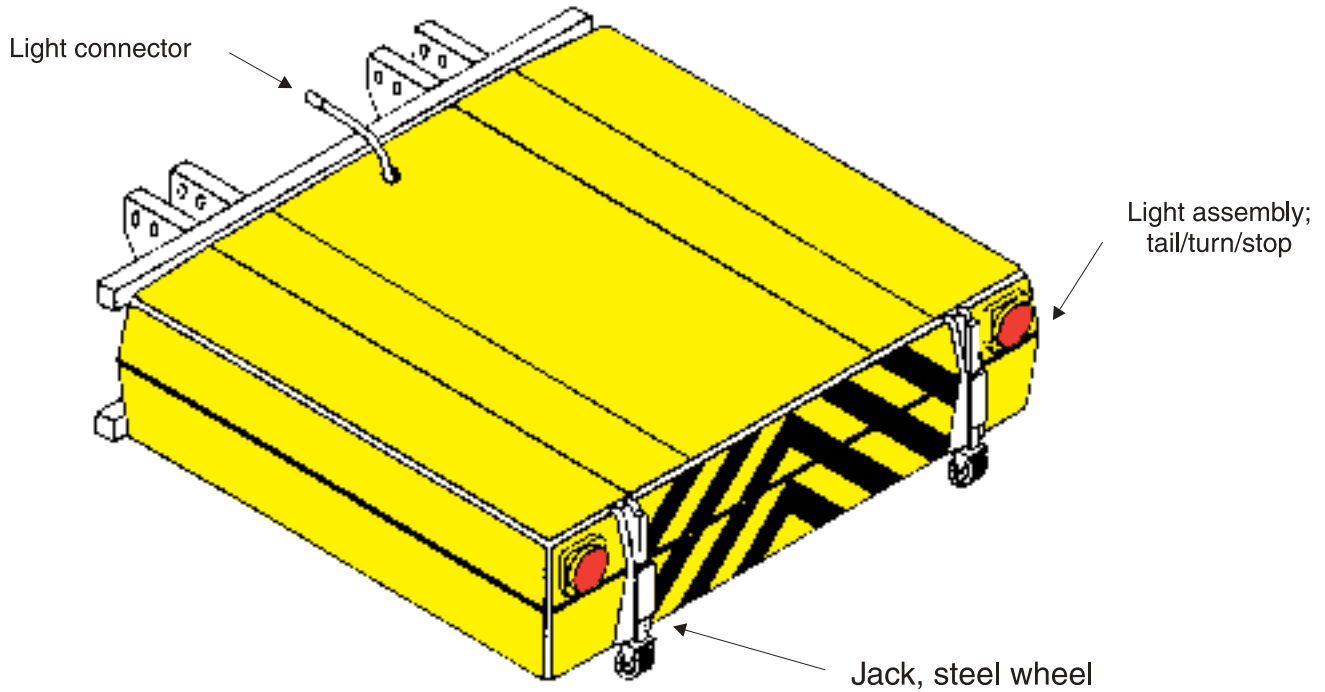
## Truck-mounted Attenuators

Trucks or trailers are often used as protective vehicles to protect workers or work equipment from errant vehicles. These protective vehicles are normally equipped with flashing arrows, changeable message signs and/or flashers, and must be located properly in advance of the workers and/or equipment they are protecting. However, these protective vehicles may themselves cause injuries to occupants of the errant vehicles if they are not equipped with truck-mounted attenuators (TMAs).

TMAs capable of absorbing the impact of errant vehicles can be attached to the rear of these protective vehicles to reduce the severity of rear-end crashes. There is a variety of TMA designs available.

The protective truck must be positioned a sufficient distance from the workers or equipment being protected to allow for appropriate vehicle roll-ahead, but not so far that the errant vehicles will travel around the vehicle and strike the workers/equipment. The attenuator should be in the full down-and-locked position. For stationary operations, the truck's parking brake should be set and, when possible, the front wheels turned away from the work site. Turning the front wheels should be based on specific conditions at the site so the after-impact trajectory is into a safe area.

**Figure 9**



**Typical Truck-Mounted Attenuator**

## Traffic Control Plan Selection Guide

| LOCATION OF WORK  | DURATION OF WORK*                         |           |
|---|---|-----------|
|   | Short-term Stationary<br>Short Duration** | Mobile*** |
| Shoulder<br>All roadways  |   |           |
| Minor encroachment (minimum 20-foot traveled way)<br>with utility work zone on two-lane road without centerline | UT-1                                      |           |
| Minor encroachment with utility work zone on marked   | UT-2                                      |           |

\* For intermediate or long-term work see MUTCD.

\*\* Short-term stationary: 1 to 12 hours, one location.

Short-duration: work that occupies a location up to 1 hour.

\*\*\* Mobile work that moves intermittently or continuously.

## Traffic Control Plan Selection Guide

| LOCATION OF WORK  | DURATION OF WORK*                         |           |
|---|---|-----------|
|   | Short-term Stationary<br>Short Duration** | Mobile*** |
| Within traveled way<br>Gravel road                                  |   |           |
| One lane closed on two-lane gravel roadway                          | UT-3                                      |           |
| Within traveled way<br>Rural Two-lane                               |   |           |
| Major encroachment on residential street<br>or rural gravel roadway | UT-4                                      |           |
| Lane closure less than ¼-mile in length                             | UT-5                                      |           |
| Temporary road closure  | UT-6                                      |           |
| Mobile operations on two-lane road                                  |   | UT-7      |



## Traffic Control Plan Selection Guide

| LOCATION OF WORK   | DURATION OF WORK*                          |           |
|--|--|-----------|
|  | Short-term Stationary<br>Short Duration ** | Mobile*** |
| Within traveled way<br>Urban street                                |  |           |
| Utility work zone in middle of two-lane urban street               | UT-8                                       |           |
| Major encroachment on residential street or rural gravel road      | UT-4                                       |           |
| Major encroachment with utility work zone<br>on centerlined street | UT-9 (one flagger)<br>UT-10 (two flaggers) |           |
| Residential cul-de-sac   | UT-11                                      |           |
| Street closing at intersection of four-lane and two-lane streets   | UT-12                                      |           |
| Lane closure on undivided highway                                  | UT-13                                      |           |

# UT-1

## Typical Application: Minor Encroachment With Utility Work Zone on Two-lane Road Without Centerline

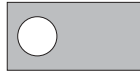
Notes:

1. Sign required only when sight distance is restricted (typically a no-passing zone in the work space).
2. Flagger protection not required, provided bi-directional traffic can move freely at reduced speed through the work space.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light

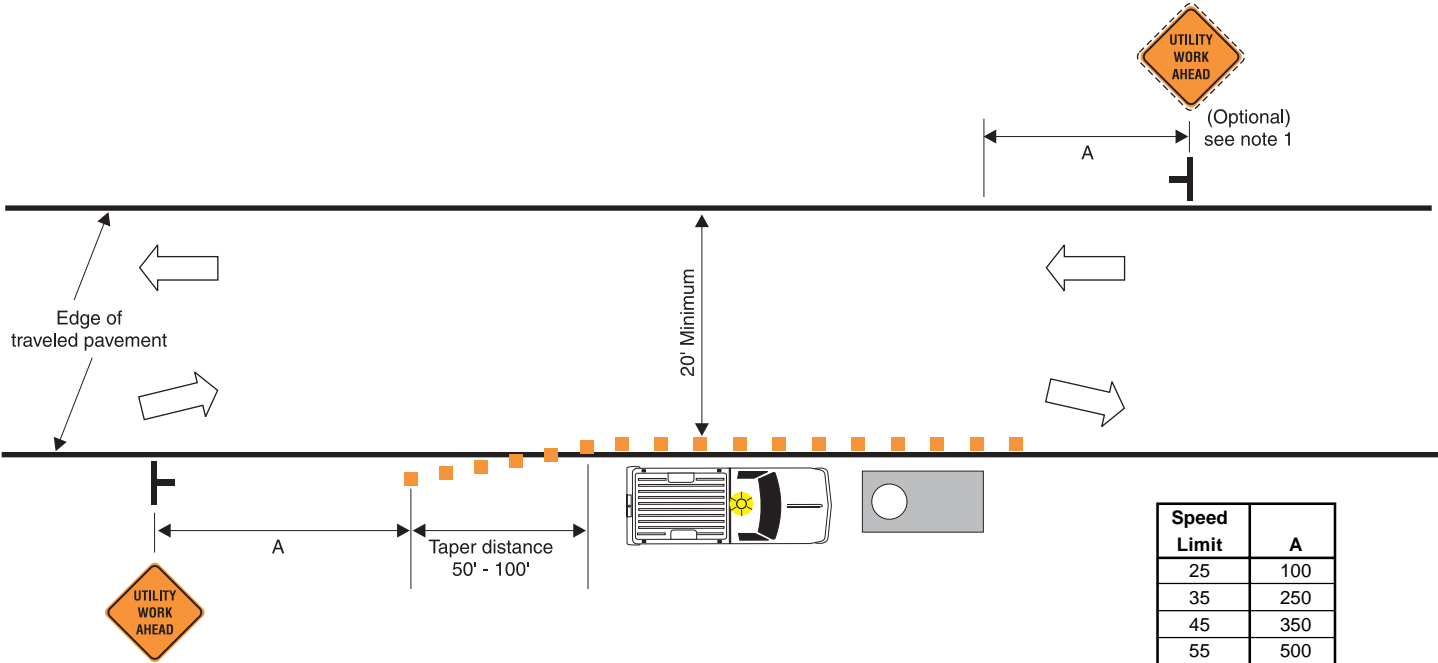


Channelizing  
device

### Symbols key

# UT-1

## Typical Application: Minor Encroachment With Utility Work Zone on Two-lane Road Without Centerline



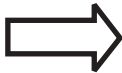
| Speed Limit | A   |
|-------------|-----|
| 25          | 100 |
| 35          | 250 |
| 45          | 350 |
| 55          | 500 |

**UT-2**  
**Typical Application: Minor Encroachment With**  
**Utility Work Zone on Marked Centerline Two-lane Road**

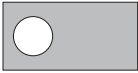
**NOTE:**

- 1. The lane encroachment should permit a remaining lane width of 10 feet or the lane should be closed. However, 9 feet is acceptable for short-term use on a low-volume, low-speed roadway for traffic that does not include commercial vehicles.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light

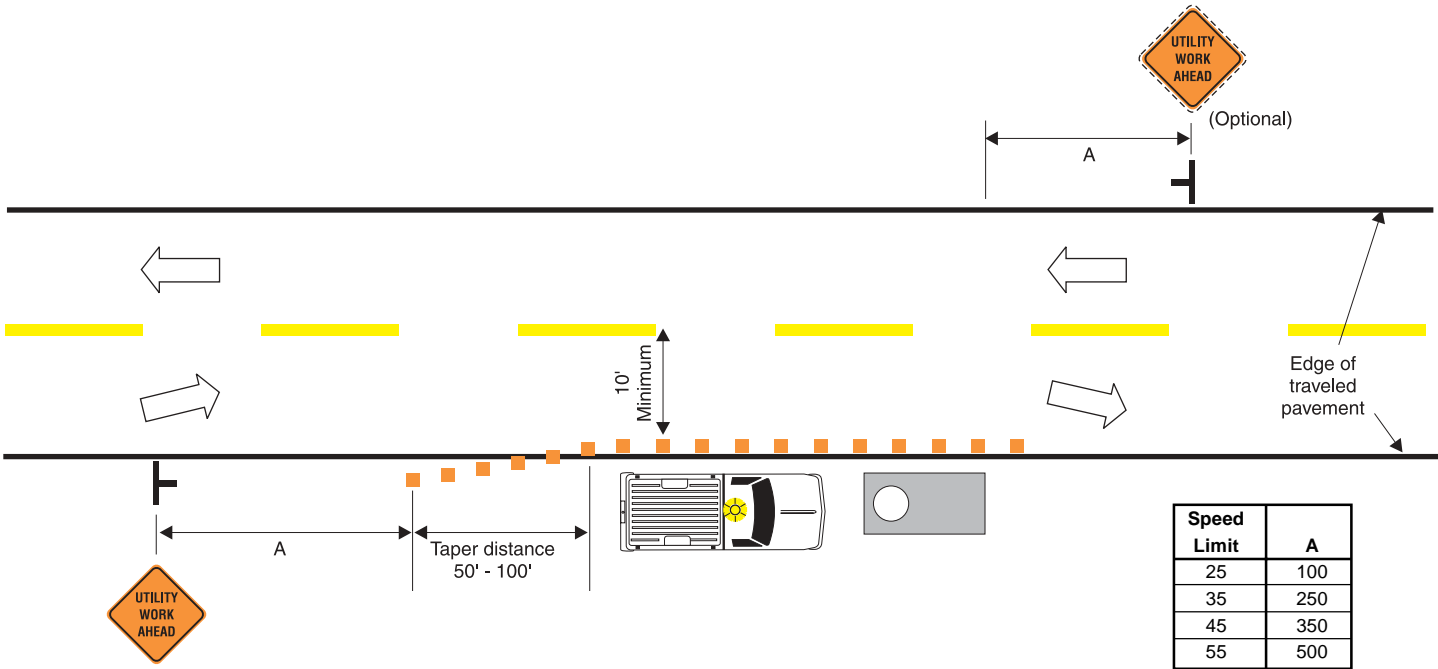


Channelizing  
device

**Symbols key**

# UT-2

## Typical Application: Minor Encroachment With Utility Work Zone on Marked Centerline Two-lane Road



## UT3

### Typical Application: One Lane Closed of a Two-lane Gravel Roadway

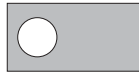
#### NOTES:

1. Conditions represented are for work that requires closing traffic lane during daylight hours only.
2. This layout is intended for traffic volumes of less than 2,000 vehicles per day.
3. No parking on opposite shoulder with 500 feet of work space.
4. Traffic in the open lane shall be allowed to flow freely.
5. A flagger shall be required if visibility is less than ¼-mile or the work space is in an area of restricted sight distance.
6. Cone spacing will vary with speed.
7. If traffic volume is more than 15 vehicles in any given 15 minutes, a flagger is required.
8. The lane encroachment should permit a remaining lane width of 10 feet or the lane should be closed. However, 9 feet is acceptable for short-term use on low-volume, low-speed roadway for traffic that does not include longer and heavy commercial vehicles.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light



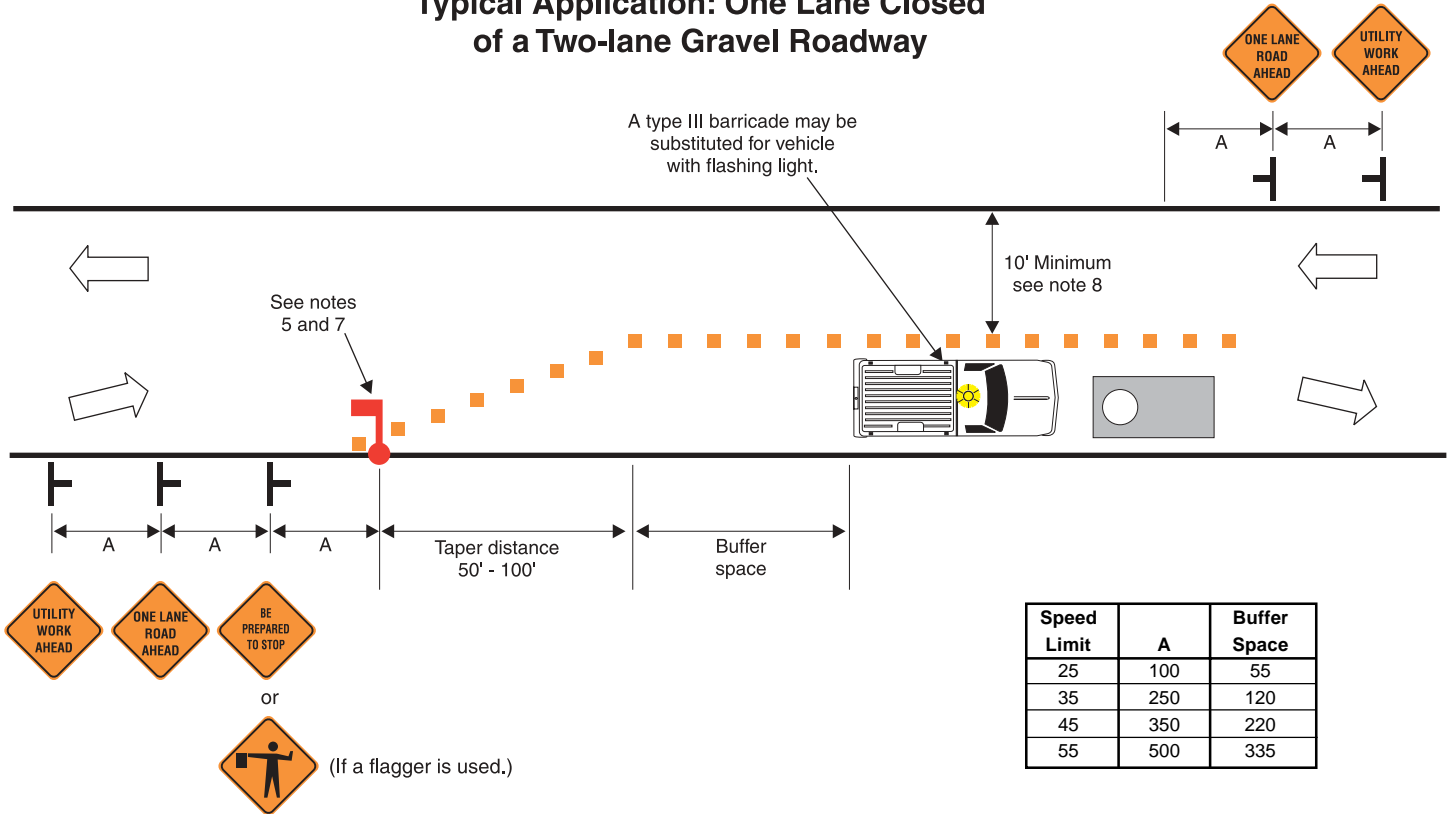
Channelizing  
device



Flagger

### Symbols key

# UT-3 Typical Application: One Lane Closed of a Two-lane Gravel Roadway



**UT-4**  
**Typical Application: Major Encroachment on Residential Street  
or Rural Gravel Roadway  
While Working From Vehicle**

**NOTES:**

1. Conditions represented are for work that requires closing a traffic lane during daylight hours only.
2. No parking for work vehicles on opposite shoulder within 500 feet of work area.
3. A flagger may be required if visibility is restricted or potential traffic conflict exists.
4. A two-foot safety zone is required between the cones and the truck when access to the truck is necessary and the side is exposed to traffic.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Warning sign



Flashing  
vehicle light



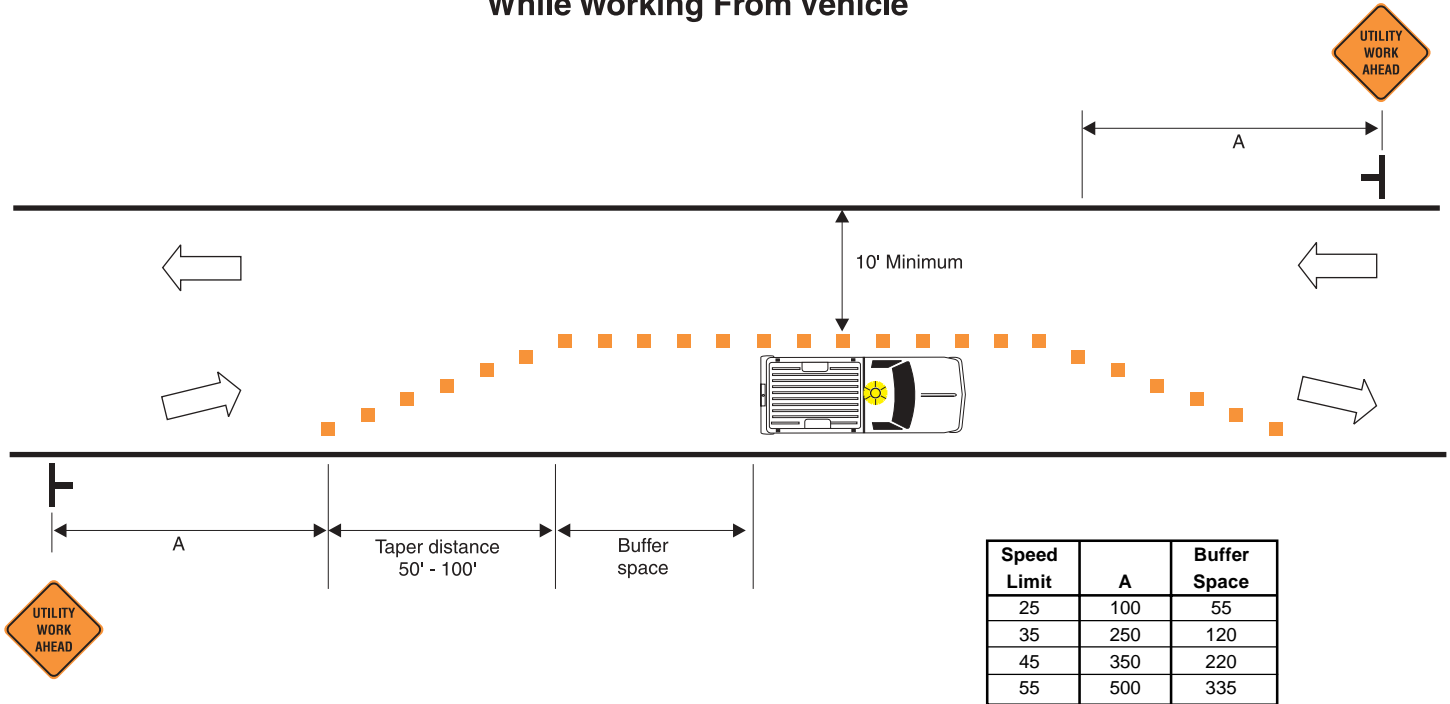
Channelizing  
device

**Symbols key**



## UT-4

### Typical Application: Major Encroachment on Residential Street or on Rural Gravel Roadway While Working From Vehicle



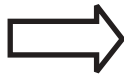
## UT-5

### Typical Application: Traffic Control for Lane Closure Less Than ¼ Mile In Length (Rural)

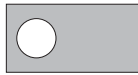
#### NOTES:

1. Conditions represented are for work that requires closing a traffic lane during daylight hours only.
2. No parking for work vehicles on opposite shoulder within 500 feet of work area.
3. Spacing of channelizing devices in a taper should be 10 to 20 feet. A minimum of five devices are to be used in a taper.
4. Speed limit refers to the legally established speed limit.
5. In general, spacing of channelizing devices through a work space shall be as follows:
  - (a) 20 feet where horizontal curve radius is less than 300 feet.
  - (b) 50 feet where horizontal curve radius is from 300 feet to 1,000 feet.
  - (c) 120 feet for all other cases.
  - (d) An additional channelizing device shall be placed in the closed lane in advance of each coreout or hole that exists in the roadway surface of the work space.
6. The flagger shall stop the first vehicle from the position shown, then cross traffic lane to stop other vehicles.
7. Additional flaggers shall be stationed at intersections or crossings within the work space to prevent vehicles from entering against the flow of traffic.
8. Individual channelizing devices may be omitted during work hours in areas where placement interferes with the work. Channelizing devices in taper required at all times.
9. The length of the work area may change as much as ½ mile, for a short time, to improve the flagger's sight distance.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light

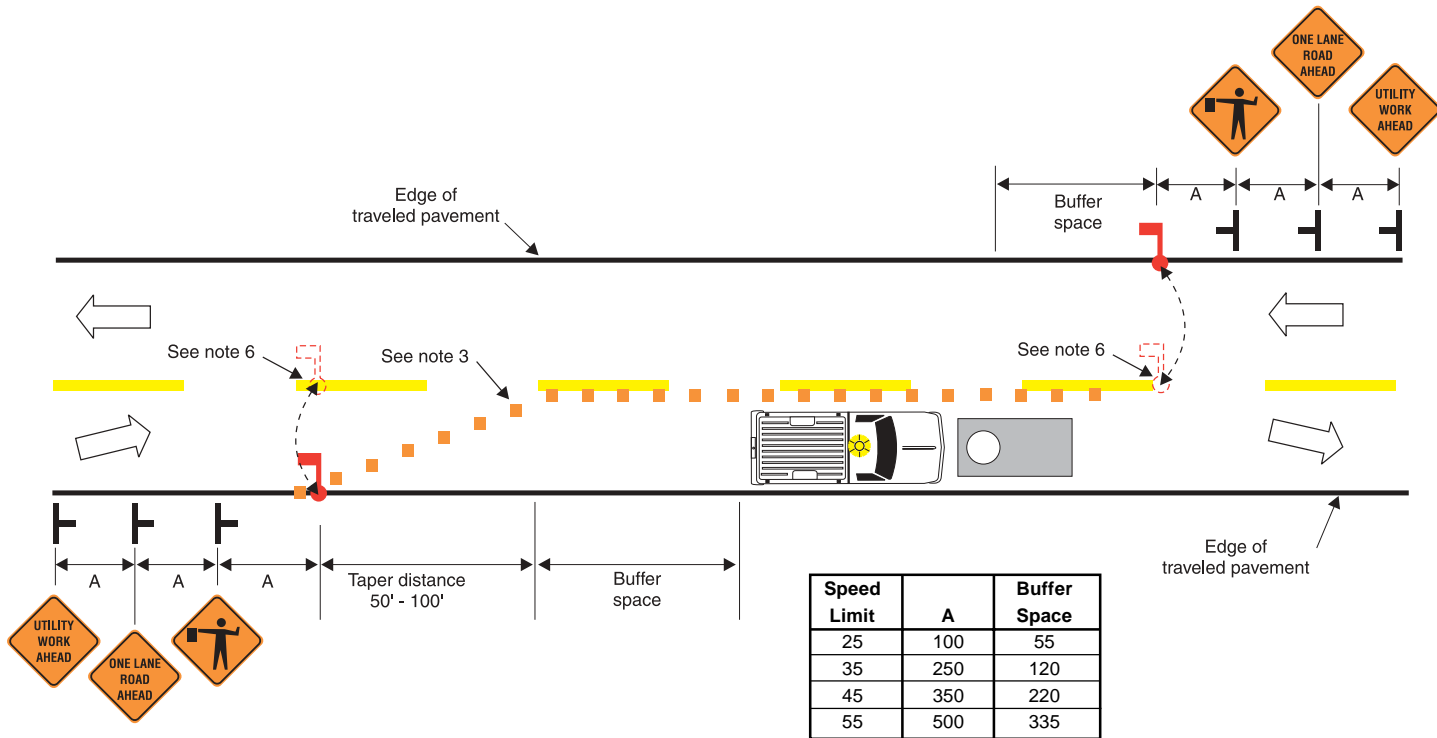


Channelizing  
device



Flagger

## UT-5 Typical Application: Traffic Control for Lane Closure Less Than 1/4 Mile in Length (Rural)



## UT-6

### Typical Application: Temporary Road Closure

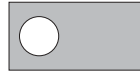
#### NOTES:

1. Use of this layout requires contact with road authority and emergency services.
2. Conditions represented are for work that requires closings during daylight hours only.
3. This application is intended for a planned temporary closing not to exceed 15-20 minutes.
4. The flaggers shall stop the first vehicle from the position shown, then move to the centerline to stop approaching traffic.
5. For high-volume roads, a police patrol car and/or a changeable message sign may be added.
6. Distance from flagger to flagger sign may be increased to provide space for anticipated number of vehicles to be stopped.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



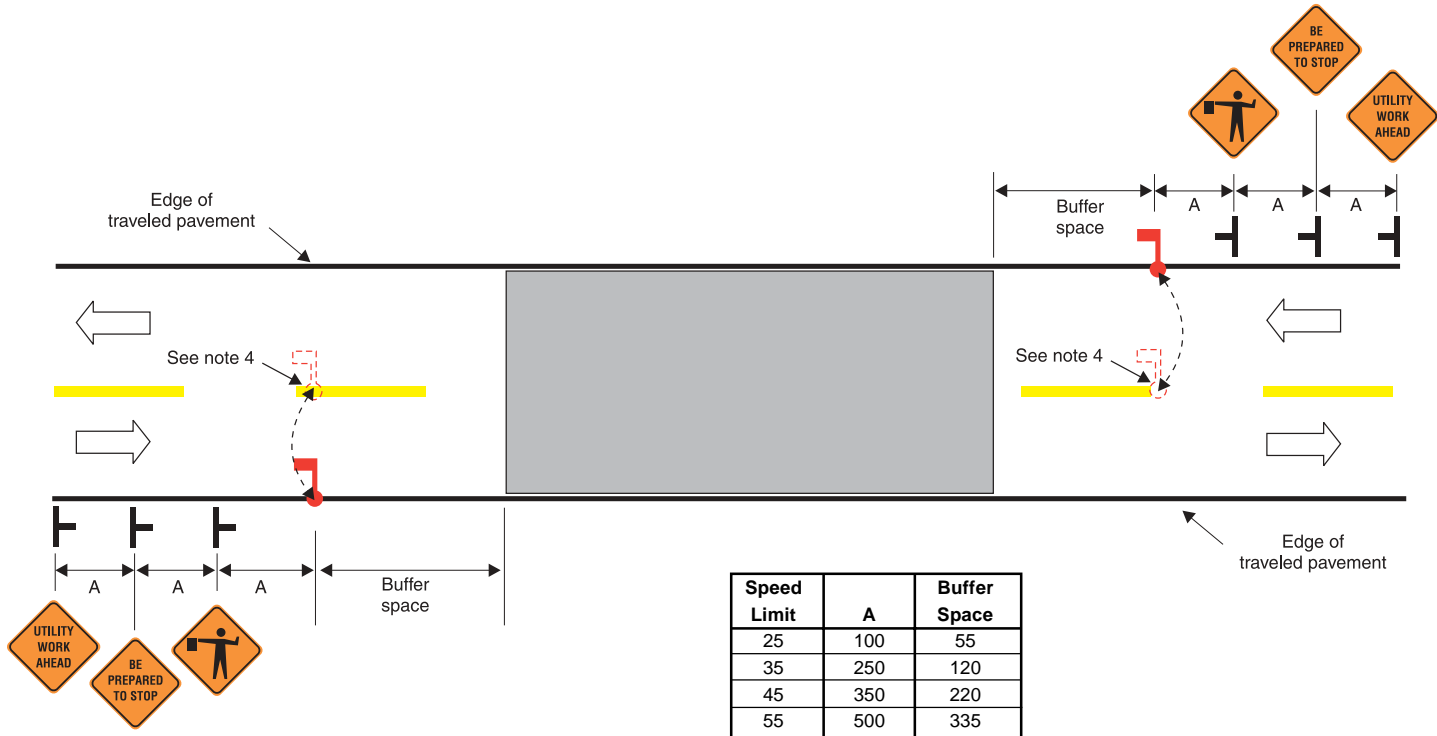
Warning sign



Flagger

#### **Symbols key**

## UT-6 Typical Application: Temporary Road Closure



Sign spacing should be increased on higher volume roadways.

## UT-7

### Typical Application: Mobile Operations on Two-lane Road

#### NOTES:

1. Where practicable, and when needed, the work and protection vehicles should pull over periodically to allow traffic to pass. If this cannot be done frequently, as an alternative, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.
2. The distance between the work and protection vehicles may vary according to terrain, paint drying time, and other factors. Protection vehicles are used to warn traffic of the operation ahead. Whenever adequate stopping sight distance exists to the rear, the protection vehicle should maintain the minimum distance and proceed at the same speed as the work vehicle. The protective vehicle should slow down in advance of curves or hills that restrict sight distance.
3. Additional protection vehicles to warn and reduce the speed of oncoming or opposing traffic may be used. Police patrol cars may be used for this purpose.
4. A truck-mounted attenuator (TMA) should be used on the protection vehicle and may be used on the work vehicle.
5. The work vehicle shall be equipped with beacons, and the protection vehicle shall be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign. Protection and work vehicles should display flashing or rotating beacons both forward and to the rear.
6. Vehicle-mounted signs shall be mounted with the bottom of the sign, at a minimum height of four feet above the pavement. Sign legends shall be covered or turned from view when work is not in progress.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Warning sign



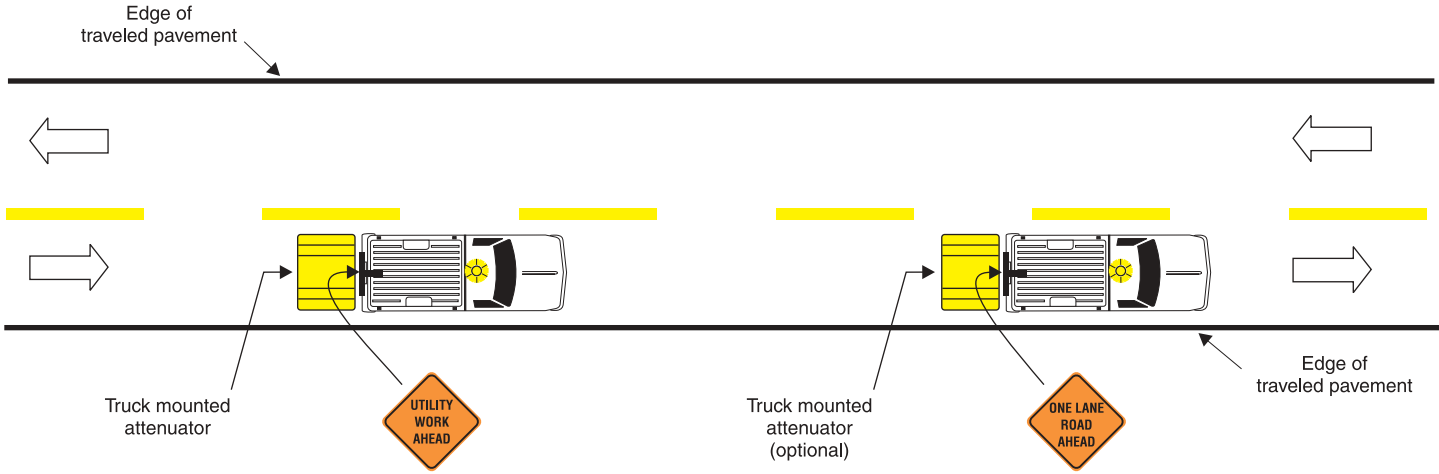
Truck mounted  
attenuator



Flashing  
vehicle light

### Symbols key

# UT-7 Typical Application: Mobile Operations on Two-lane Road

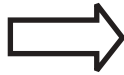


## UT-8 Typical Application: Utility Work Zone In Middle of Two-lane Urban Street

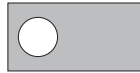
### NOTES:

1. 28-inch retroreflective cones required for use at night.
2. Street parking should be removed within limits of work area.
3. The lane encroachment should permit a remaining lane width of 10 feet or the lane should be closed. However, nine feet is acceptable for short-term use on low-volume, low-speed roadways for traffic that does not include heavy commercial vehicles.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light

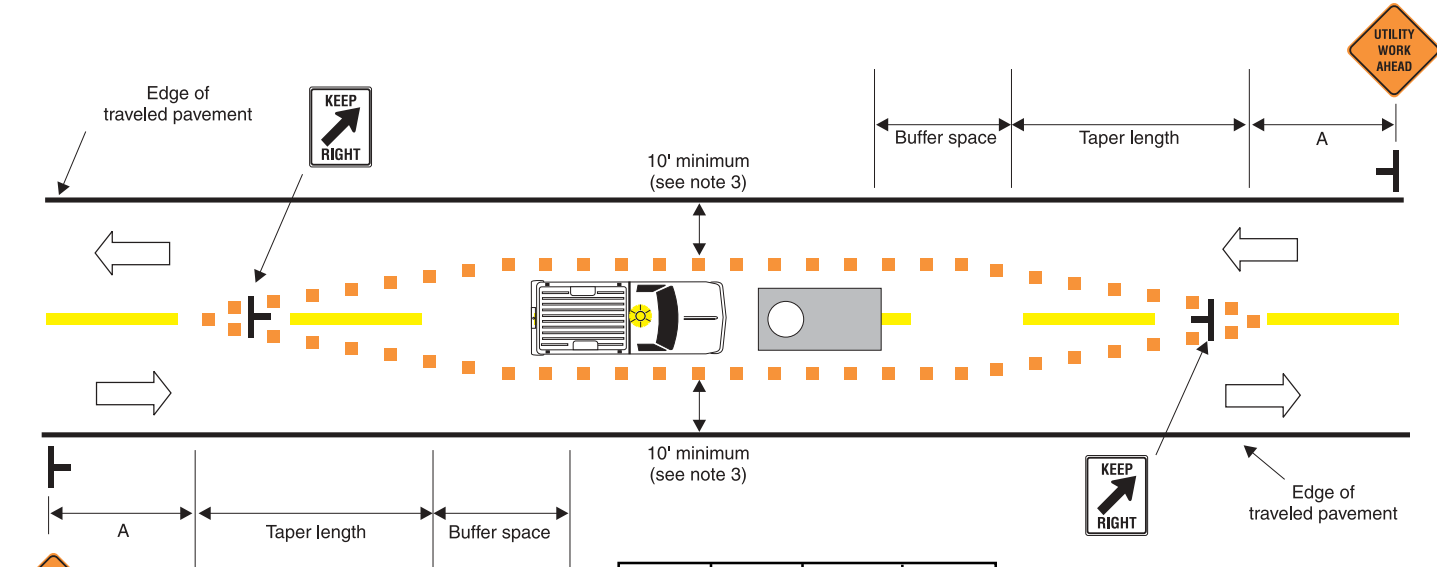


Channelizing  
device

### Symbols key



## UT-8 Typical Application: Utility Work Zone in Middle of Two-lane Urban Street



| Speed Limit | A    | Taper Length | Buffer Space |
|-------------|------|--------------|--------------|
| 25          | 100  | 25           | 55           |
| 35          | 500  | 45           | 120          |
| 45          | 700  | 90           | 220          |
| 55          | 1000 | 110          | 335          |

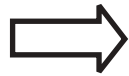
## UT-9

### Typical Application: Major Encroachment With Utility Work Zone on Marked Centerline Street

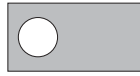
#### NOTES:

1. This layout is intended for traffic volumes less than 2,000 vehicles per day.
2. No parking on opposite shoulder within 500 feet of work area.
3. Traffic in the open lane shall be allowed to flow freely. The flagger shall stop the first vehicle in the closed lane from the position shown, then cross the traffic lane to stop other vehicles.
4. A second flagger and sign shall be required:
  - (a) if the flagger's view of approaching traffic in the open lane is less than  $\frac{1}{4}$  mile or the work site is in an area of restricted sight distance (such as a "No Passing Zone"); or
  - (b) if excessive traffic delays are encountered.If second flagger is needed, use UT-10 Typical Application.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light



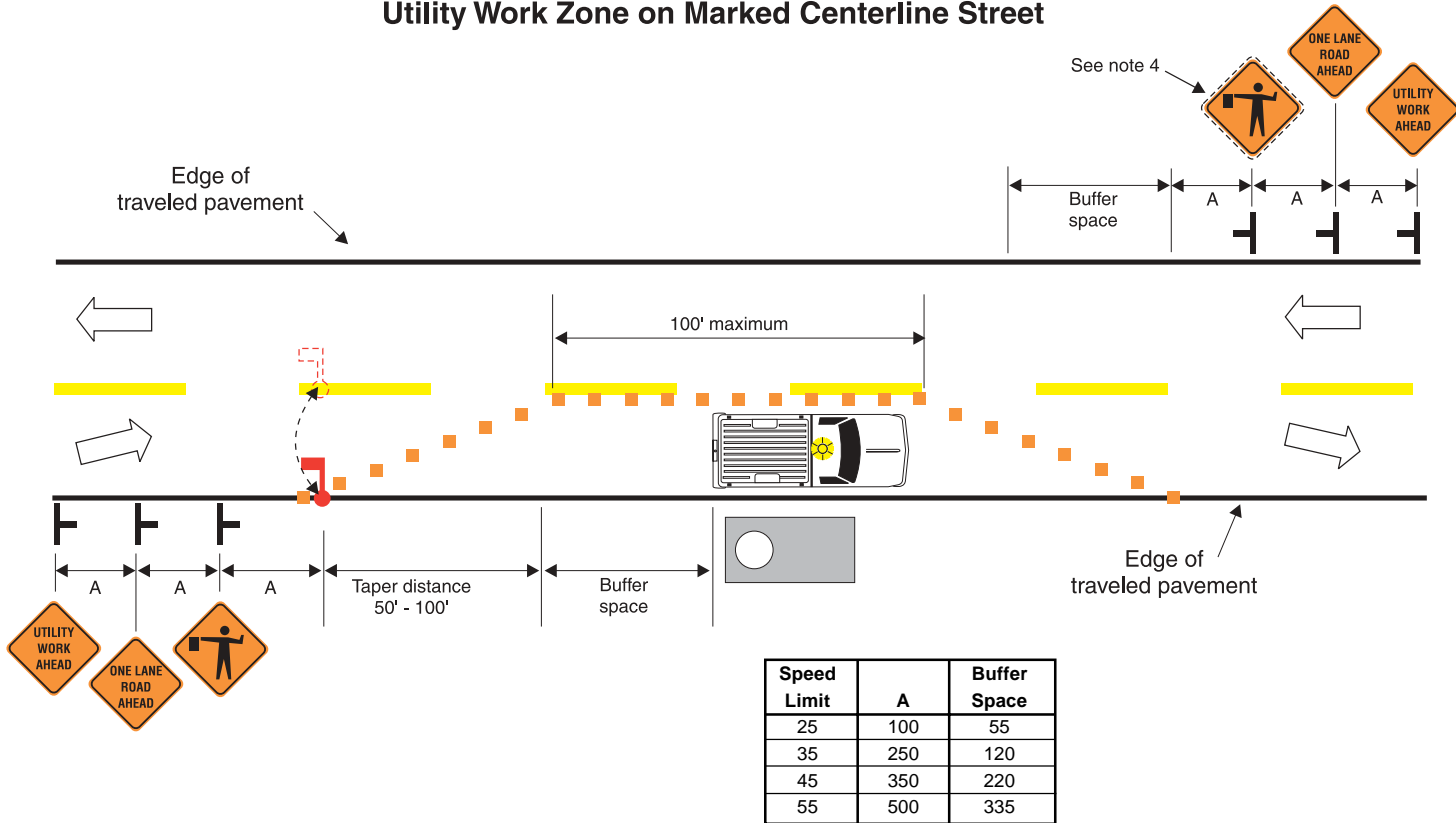
Channelizing  
device



Flagger

### Symbols key

## UT-9 Typical Application: Major Encroachment With Utility Work Zone on Marked Centerline Street



# UT-10

## Typical Application: Major Encroachment With Utility Work Zone on Marked Centerline Street (Urban)

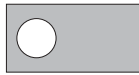
### NOTES:

1. Conditions represented are for daylight hours only.
2. No parking on opposite shoulder within 500 feet of work area.
3. The flagger shall stop the first vehicle from the position shown, then cross traffic lane to stop other vehicles.
4. Individual channelizing devices may be omitted during working hours in areas where placement interferes with the work. Channelizing devices in taper required at all times.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing vehicle light



Channelizing device

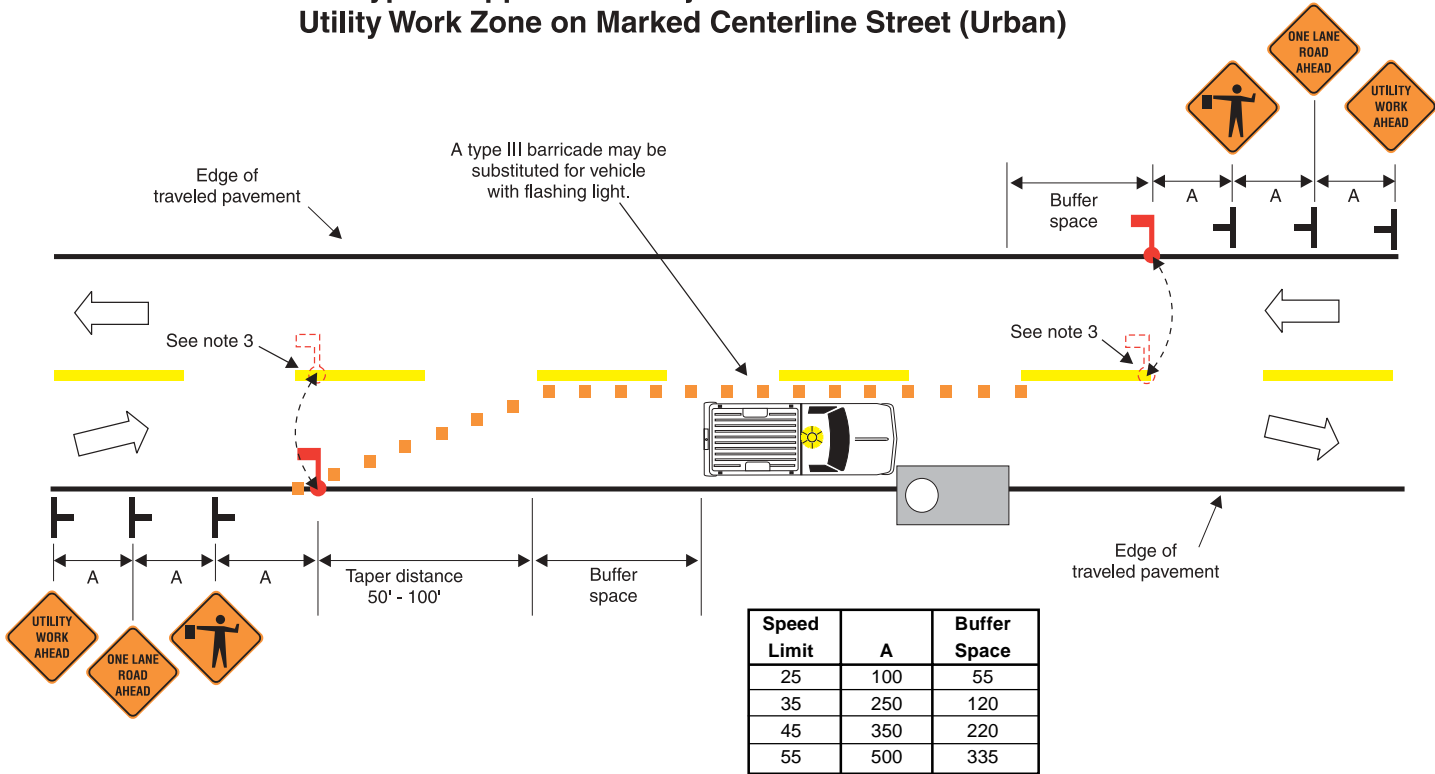


Flagger

### Symbols key

# UT-10

## Typical Application: Major Encroachment With Utility Work Zone on Marked Centerline Street (Urban)



## UT-11

### Typical Application: Residential Cul-de-sac

#### NOTES:

1. Cul-de-sac to be closed only if at least one lane cannot be maintained for traffic.
2. Signs required only if work or channelizing devices encroach into through street.
3. Use of this layout requires contact with road authority and emergency services.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light

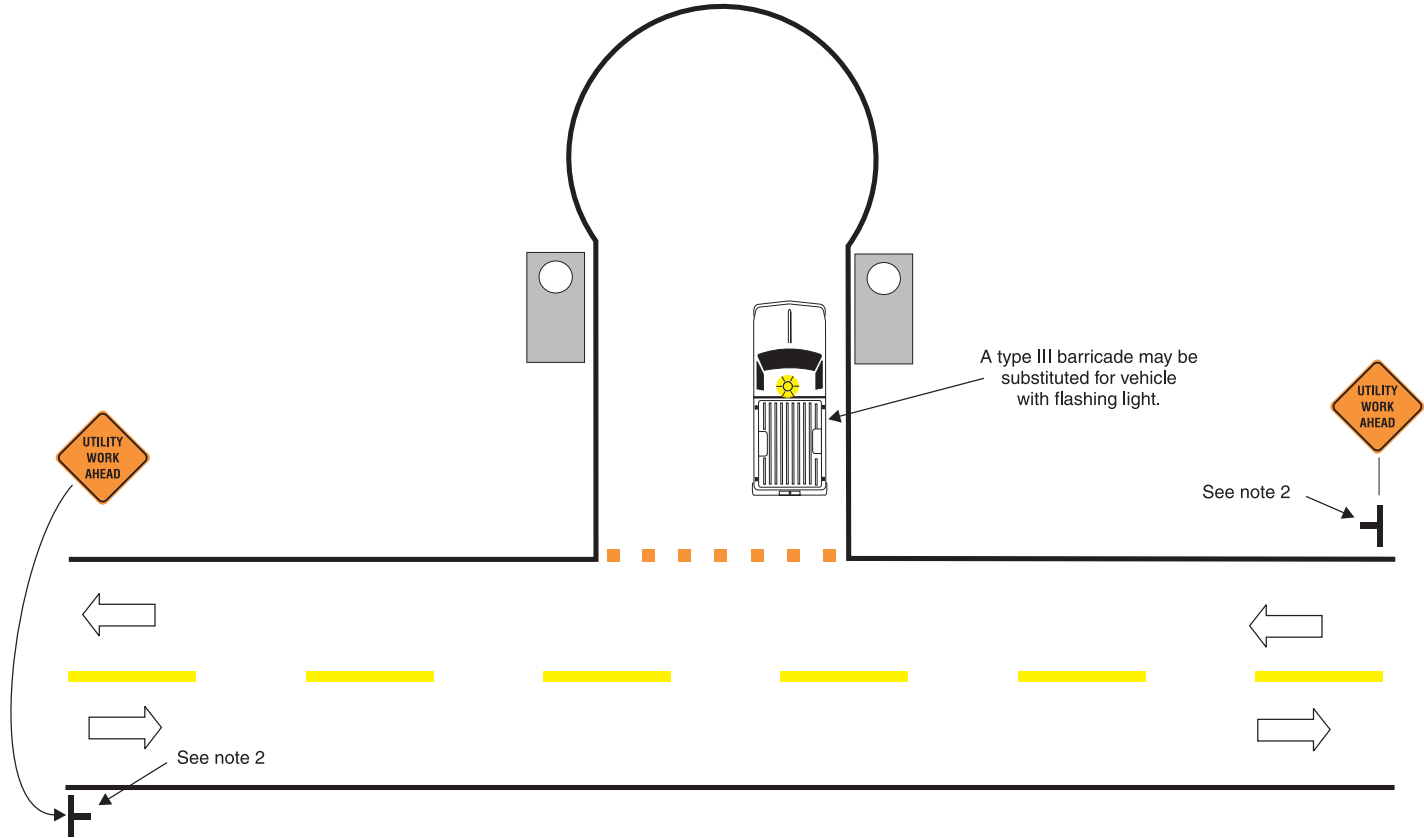


Channelizing  
device

#### **Symbols key**

# UT-11

## Typical Application: Residential Cul-de-sac



## UT-12

### Typical Application: Street Closing at Intersection of Four-lane and Two-lane Streets (Residential)

#### NOTES:

1. Conditions represented are for work that requires closing street during daylight hours only.
2. Use of this layout requires contact with road authority and emergency services.

**For work duration greater than 12 hours see MUTCD.**

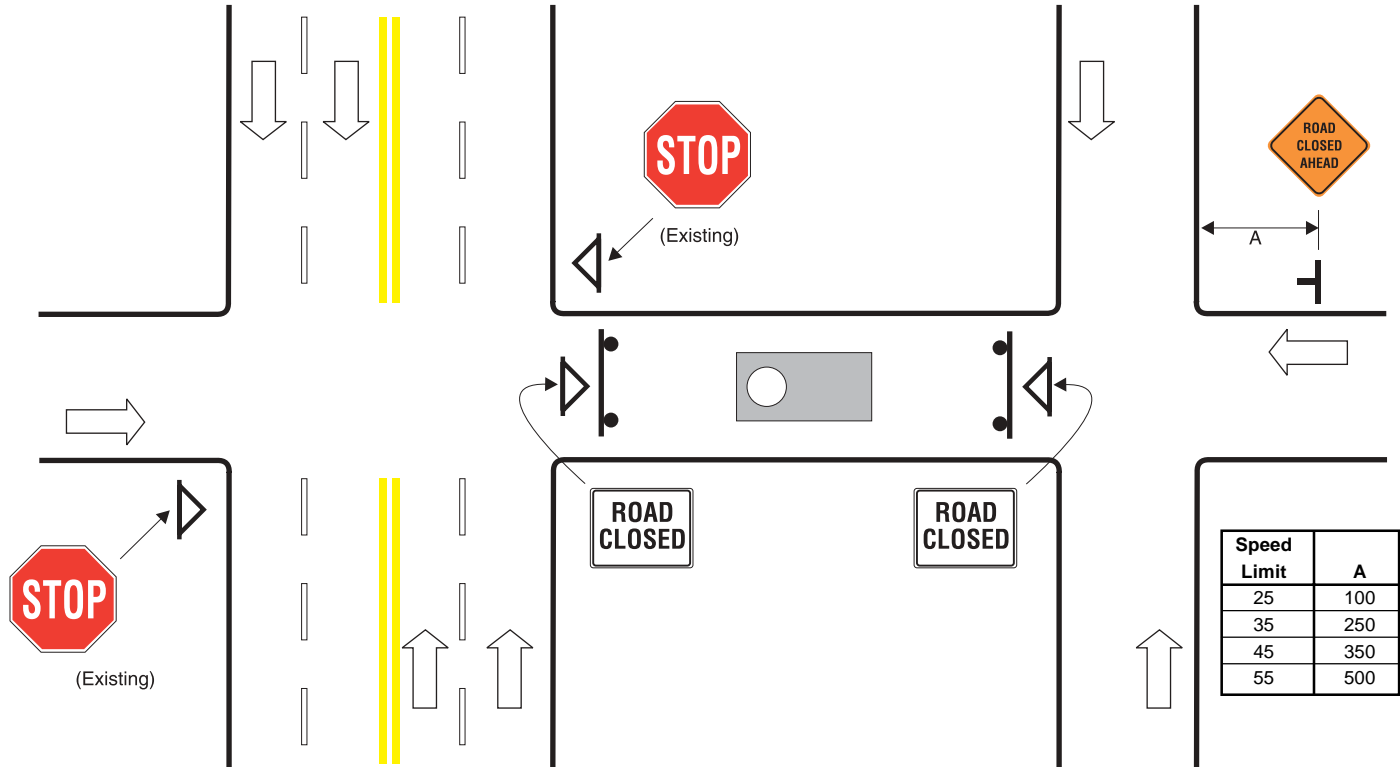


#### **Symbols key**



## UT-12

### Typical Application: Street Closing at Intersection of Four-lane and Two-lane Streets (Residential)



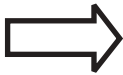
## UT-13

### Typical Application: Right Lane Closure on Four-lane Undivided Highway

#### NOTES:

1. This layout is intended for short-term use.
2. Cones may be used as channelizing devices in the tapers and along the lane line during daylight hours only.
3. The maximum spacing between channelizing devices in a merging taper shall be equal in feet to the speed limit.
4. Downstream tapers shall contain a minimum of five channelizing devices.
5. "Speed Limit" refers to the legally established speed limit.
6. Channelizing devices shall not be intermixed on the lane line through the work area.
7. Type II barricades will be placed in the closed lane at a 1,000 foot-interval. Where coreouts, holes or uncured concrete exists within the work space, an additional Type II barricade shall be placed just ahead of each.
8. A flagger shall be used to alert motorists when equipment or workers encroach within two feet of an open lane. The flagger shall be posted adjacent to the open traffic lane and immediately upstream of each operation. Encroachment shall be held to a minimum.
9. The use of an arrow panel is optional for daytime closure when the posted speed limit is 45 mph or less. Use shall be determined by the engineer. When there is no shoulder area, the arrow panel shall be placed within the closed lane behind the channelizing devices and as close to the beginning of the taper as practical.
10. A Type III barricade may be substituted for the vehicle with an amber rotating or strobe light.
11. Channelizing devices may be placed up to two feet beyond the lane line only at specific locations where actual work activity is taking place. The devices shall be returned to the lane line when the work activity has passed.

**For work duration greater than 12 hours see MUTCD.**



Traffic flow



Work space



Warning sign



Flashing  
vehicle light



Channelizing  
device



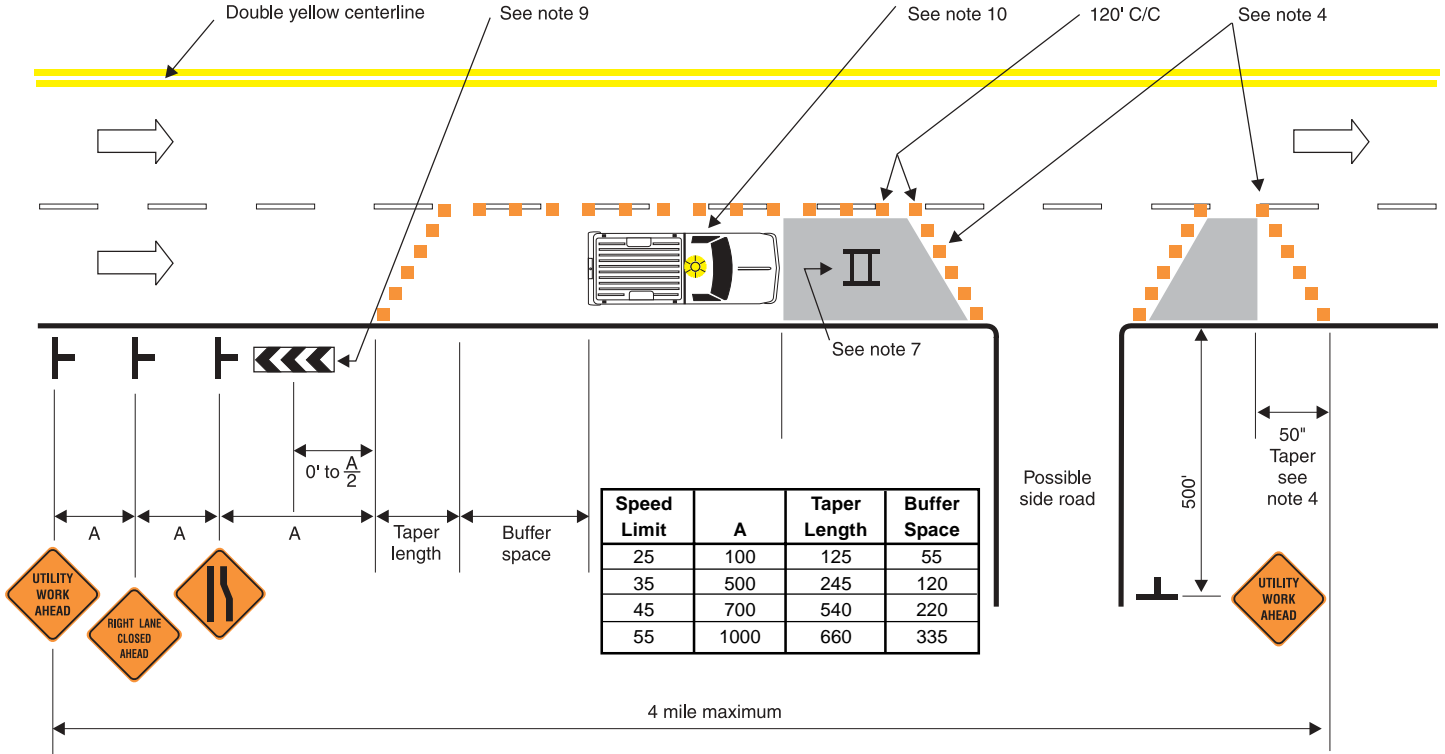
Arrow panel



Type II barricade

# UT-13

## Typical Application: Right Lane Closure on Four-lane Undivided Highway



## Minimum Recommended Documentation

- starting and ending time of work
- location of work
- type, condition and position of traffic control devices
- names of personnel
- type of equipment used
- any change in temporary or permanent regulatory devices
- additional information should be gathered in the event of an accident

## Supervisor's Checklist

1. Follow Part VI of the Manual on Uniform Traffic Control Devices (MUTCD). It is the national standard for work zone traffic control.
2. State and local manuals should be used to supplement the MUTCD.
3. Have a plan before going to the work site.
4. Devices are installed in the direction that traffic moves—that is “downstream.” The first device placed is the first advance warning sign.
5. Remove the devices in a timely manner.
6. When possible, traffic control zones should be removed by picking up the devices in a reverse sequence to that used for installation. This requires moving backwards or “upstream” through the zone.
7. Ask yourself, “What is the driver's view?”
8. Be sure all workers are properly trained and attired.

# Liability

## Steps to Minimize Liability

- have a traffic control plan
- follow the MUTCD (Manual on Uniform Traffic Control Devices)
- minimize traffic disruptions
- promptly remove devices not in use
- train all personnel
- inspect work zone sites periodically for conformance

## Elements of a Good Inspection Program

- routine schedule
- report form
- hazard identification
- adequate personnel and inventory
- repair verification
- formal documentation

## Taper Lengths For Lane Closure

| <b>Speed<br/>Limit<br/>MPH</b> | <b>Taper<br/>Length</b> | <b>Number<br/>of Devices<br/>for Taper</b> | <b>Spacing<br/>of Devices<br/>for Taper</b> |
|--------------------------------|-------------------------|--|---|
| 20                             | 80                      | 5  | 20  |
| 25                             | 125                     | 6  | 25  |
| 30                             | 180                     | 7  | 30  |
| 35                             | 245                     | 8  | 35  |
| 40                             | 320                     | 9  | 40  |
| 45                             | 540                     | 13   | 45  |
| 50                             | 600                     | 13   | 50  |
| 55                             | 660                     | 13   | 55  |
| 60                             | 720                     | 13   | 60  |
| 65                             | 780                     | 13   | 65  |
| 70                             | 840                     | 13   | 70  |

This table does not apply to one way (flagger) tapers.