

# TRAFFIC CONTROL HANDBOOK



FOR  
STREET MAINTENANCE  
AND  
CONSTRUCTION OPERATIONS

**OVERLAND PARK**  
K A N S A S

ABOVE AND BEYOND. BY DESIGN.

PUBLIC WORKS DEPARTMENT - TRAFFIC SERVICES  
JULY 2016 EDITION

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# CITY OF OVERLAND PARK TRAFFIC CONTROL HANDBOOK FOR STREET MAINTENANCE AND CONSTRUCTION OPERATIONS

## I. INTRODUCTION

The primary function of streets and highways is to provide for the movement of traffic. A common secondary use of the street area, or its right of way, is for the placement of public and private utilities. While the movement of traffic is paramount, streets need to be constructed or reconstructed and utility facilities need to be repaired, modified or expanded. Consequently, traffic movements and street or utility repair work must be coordinated to provide optimum safety and convenience to the general public.

## II. PURPOSE OF HANDBOOK

The purpose of this Handbook is to set forth basic principles, uniform procedures, and prescribed standards for all public and private organizations to follow in the design, application, installation, and maintenance of all types of traffic control devices required for street maintenance and construction operations. These principles and standards are directed to provide for the reasonably safe and effective movement of road users through or around temporary traffic control zones while reasonably protecting road users, workers, responders to traffic incidents, and equipment where necessary construction or repair work is being undertaken.

Traffic control devices and procedures specified in this Handbook shall conform to the Manual on Uniform Traffic Control Devices, (MUTCD) latest edition, as published by the Federal Highway Administration and adopted by State law.

## III. PURPOSE OF TRAFFIC CONTROL DEVICES

The purpose of the various traffic control devices used with construction and maintenance operations is to: (1) provide for the orderly flow of traffic; (2) reduce hazards for road users, pedestrians, and workers; (3) reduce overall job costs to both the contractor and the general public; (4) eliminate the necessity for formal legislation which could be unduly restrictive to both the contractor as well as the general public; and (5) to improve public relations. By using advance warning signs along with barricades and other types of traffic control devices, the best type of orderly traffic flow under existing conditions can be maintained. Orderly traffic flow makes it safer for the worker, the pedestrian, and the road user.

Adequate warning signs, delineation, and channelization may, and generally does, initially increase the construction cost, but the overall result will be less delay and less cost to road users, as well as less delay and cost to the contractor.

Adequate signs explaining why or where the work is being performed and guiding the traffic with good channelizing devices and barricading are great assets to the public. If the public understands why they are being delayed, there is likely to be fewer objections to the delay. However, it should be remembered that the improper use and location of signs, channelizing devices, and barricades can be worse than none at all.

#### IV. APPLICABILITY OF REGULATIONS

The provisions of this Handbook as set forth by the City of Overland Park shall apply to all municipal forces, contractors, utility companies, and any other person, firm, corporation, or agency performing construction, maintenance work, or any other activity that would require the blockage or the partial blockage of a traffic lane within the right of way of any public street, public way, or alley in the City of Overland Park.

#### V. PROCEDURE FOR OBTAINING PERMISSION TO WORK IN CITY STREETS

##### A. Permit Work

Except as otherwise provided, no right of way (ROW) user may excavate any ROW or conduct any repair, construction, or reconstruction of facilities located within the ROW without first having obtained the appropriate ROW permit.

No person owning or occupying any land abutting on a public ROW shall construct, maintain, or permit, in or on the portion of the public ROW to which such land is adjacent, any fixed structure, material or object without having obtained the appropriate ROW permit.

A ROW permit is required for emergency situations. If due to an emergency it may be unfeasible for the ROW user to first get the appropriate permit. The work may be performed, and the required permit shall be obtained as soon as possible during the next City working day.

##### B. Non Permit Work

Contractors working on the construction or reconstruction of public improvements and ROW users performing routine service operations which do not require excavation in the

right of way that do not disrupt traffic for more than four (4) hours are not required to obtain a permit.

Additional approval may also be necessary from the Kansas Department of Transportation (KDOT) for work on Federal and State Highways within the City.

## VI. GENERAL PROVISIONS APPLICABLE TO ALL STREET WORK

Except where otherwise specified, all persons or agencies doing work in or on streets and highways shall be responsible for accomplishing the items listed below.

### A. General

The Contractor shall be responsible for obtaining the required permits. Those securing permits will pay all fees and post any required bonds.

### B. Certification Requirements

All personnel involved in the preparation of construction traffic control plans and the installation of all traffic control devices shall be certified by the American Traffic Safety Services Association (ATSSA) as a "Traffic Control Supervisor", by the International Municipal Signal Association (IMSA) as a "Work Zone Safety Specialist", or other equivalent certification for the design and installation of construction traffic control devices. The certification must be current and readily available for verification at any time as requested by the City Engineer. Minimum requirements for the certification shall include, attending training sessions and successful completion of a written examination proctored by a nationally recognized and qualified agency.

### C. Emergency Services

The local fire department of the area involved, Med Act Emergency Medical Service, and the police department shall be notified of any excavation activity along fire lanes or thoroughfares. The Contractor or managing agency shall be responsible to make these contacts.

### D. Closures and Disruption to Traffic

No work shall be performed on collector or arterial (thoroughfare) streets which requires any lane closure, from 7 to 8:30 AM, 4 to 6 PM, on weekends, or holidays unless prior approval is received through the City Engineer or there are emergency repairs necessary by a utility company or their representative.

## E. Specifications

All construction shall be in accordance with the specifications, details, drawings, and City of Overland Park Manual of Infrastructure Standards approved by the City Engineer.

## F. Protective Clothing & High-Visibility Safety Apparel

All workers exposed to the risks of moving roadway traffic or construction equipment should wear high-visibility safety apparel meeting the requirements of the International Safety Equipment Association (ISEA) "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as the American National Standards Institute (ANSI) 107-2004 standard Performance Class 2 or 3 risk exposure. A competent person designated by the employer to be responsible for the worker safety plan within the activity area of the job site should make the selection of the appropriate class of garment.

For daytime and nighttime activity, flaggers shall wear high-visibility safety apparel that meets Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004. The apparel background (outer) material color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material shall be visible at a minimum distance of 1,000 feet. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

For nighttime activity, safety apparel that meets the requirements of the high-visibility ANSI/ISEA 107-2004 standard Performance Class 3 risk exposure should be used for flagger wear.

## G. Minimum Lane Width

Minimum lane width shall be 10 feet unless otherwise approved by the City Engineer. If at any time construction encroaches upon the traveled lane which doesn't allow a minimum lane width of 10 feet, the lane shall be closed.

## VII. Work Duration

Work duration is a major factor in determining the number and types of devices used in temporary traffic control zones. The duration of a temporary traffic control zone is defined relative to the length of time a work operation occupies a spot location.

The five categories of work duration and their time at a location shall be as follows:

## A. Long-Term Stationary

Long-term stationary is work that occupies a location for more than three (3) days.

At long-term stationary temporary traffic control zones, there is ample time to install and realize benefits from the full range of temporary traffic control procedures and devices that are available for use. Generally, larger channelizing devices, temporary roadways, and traffic barriers are used.

Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary temporary traffic control zones.

Inappropriate markings in long-term stationary temporary traffic control zones should be removed and replaced with temporary markings.

## B. Intermediate-Term Stationary

Intermediate-term stationary is work that occupies a location for more than one (1) daylight period up to three (3) days or nighttime work lasting more than one (1) hour.

In intermediate-term stationary temporary traffic control zones, it may not be feasible or practical to use procedures or devices that would be desirable for long-term stationary temporary traffic control zones, such as altered pavement markings, temporary traffic barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time.

However, since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary temporary traffic control zones.

## C. Short-Term Stationary

Short-term stationary is daytime work that occupies a location for more than one (1) hour within a single daylight period.

Most maintenance and utility operations are short-term stationary work.

Because the potential exists for the operations to extend into nighttime, retroreflective and/or illuminated devices shall be used in short-term stationary temporary traffic control zones.

#### D. Short-Duration

Short-duration is work that occupies a location for up to one (1) hour.

Safety in short-duration operations should not be compromised by using fewer devices simply because the operation will frequently change its location.

Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating or strobe lights, augmented with signs or arrow boards, may be used in place of signs and channelizing devices for short-duration operations.

#### E. Mobile

Mobile is work that moves intermittently or continuously. Mobile operations often involve frequent short stops for activities such as pothole patching or utility operations, where work activities, workers, and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.

Warning signs, high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle, flags, and/or channelizing devices should be used and moved periodically to keep them near the mobile work area.

When mobile operations are being performed, a shadow vehicle equipped with an arrow panel or a sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high. Warning signs should be placed along the roadway and moved periodically as work progresses.

Under high-volume conditions, consideration should be given to scheduling mobile operation work during off-peak hours.

If there are mobile operations on a high-speed travel lane of a multilane divided roadway, arrow panels should be

used, or appropriately colored and marked vehicles with signs, flags, high-intensity rotating, flashing, oscillating or strobe lights, truck-mounted attenuators, and arrow panels or portable changeable message signs may follow a train of moving work vehicles.

## VIII. PROCEDURE FOR PERFORMING WORK IN A CITY STREET ON AN EMERGENCY BASIS

Occasionally, an emergency situation may arise where immediate action to protect the safety of the general public requires work to be done in a City street which is not in full compliance with the provisions of this Handbook. Nothing in this Handbook shall be construed as requiring a person or agency to delay emergency repairs when to do so could endanger the public safety. However, if an emergency occurs during normal office hours (8 AM to 5 PM weekdays), the agency doing the work must phone the Department of Public Works directly after any actions needed to start the repair work process has occurred. At that point, the agency conducting the repairs will be given a maximum of two hours to comply with all applicable traffic control requirements set forth in this Handbook. The applicant then will obtain the written permit in person at the Department of Public Works on or before the next working day.

If the emergency occurs during other than normal office hours, the applicant is required to phone the Overland Park Police Department and give the location and nature of the emergency before starting the work. By this method, all other emergency agencies such as the Fire Department and Med Act Emergency Medical Service can be notified. The applicant is required to appear in person on or before the next working day and obtain a written permit.

## IX. COMPONENTS OF TEMPORARY TRAFFIC CONTROL ZONES

Most temporary traffic control zones are divided into four areas: the advance warning area, transition area, activity area, and termination area. **Figure 1** illustrates these four areas and are described below.

### A. Advance Warning Area

The advance warning area is the section of roadway where road users are informed about the upcoming work zone or incident area. The length is dependent upon the number of advance warning signs in the series. The recommended spacing between the signs is shown on **Table 1**.

The effective placement of the first warning sign should be the sum of the buffer space, transition area, and advance warning area.

TABLE 1				
Road Type	Speed Limit	Distance Between Signs (ft)		
		A	B	C
Residential and Collector	30 mph and under	100	100	100
Urban Arterials	35 mph and over	350	350	350
Rural Roads	40 mph and over	500	500	500
Expressway / Freeway	55 mph and over	1,000	1,500	2,640

## B. Transition Area

The transition area is that section of roadway where road users are redirected out of their normal path. In mobile operations, the transition area moves with the work space.

When redirection of the road users' normal path is required, they shall be directed from the normal path to a new path using an appropriate taper.

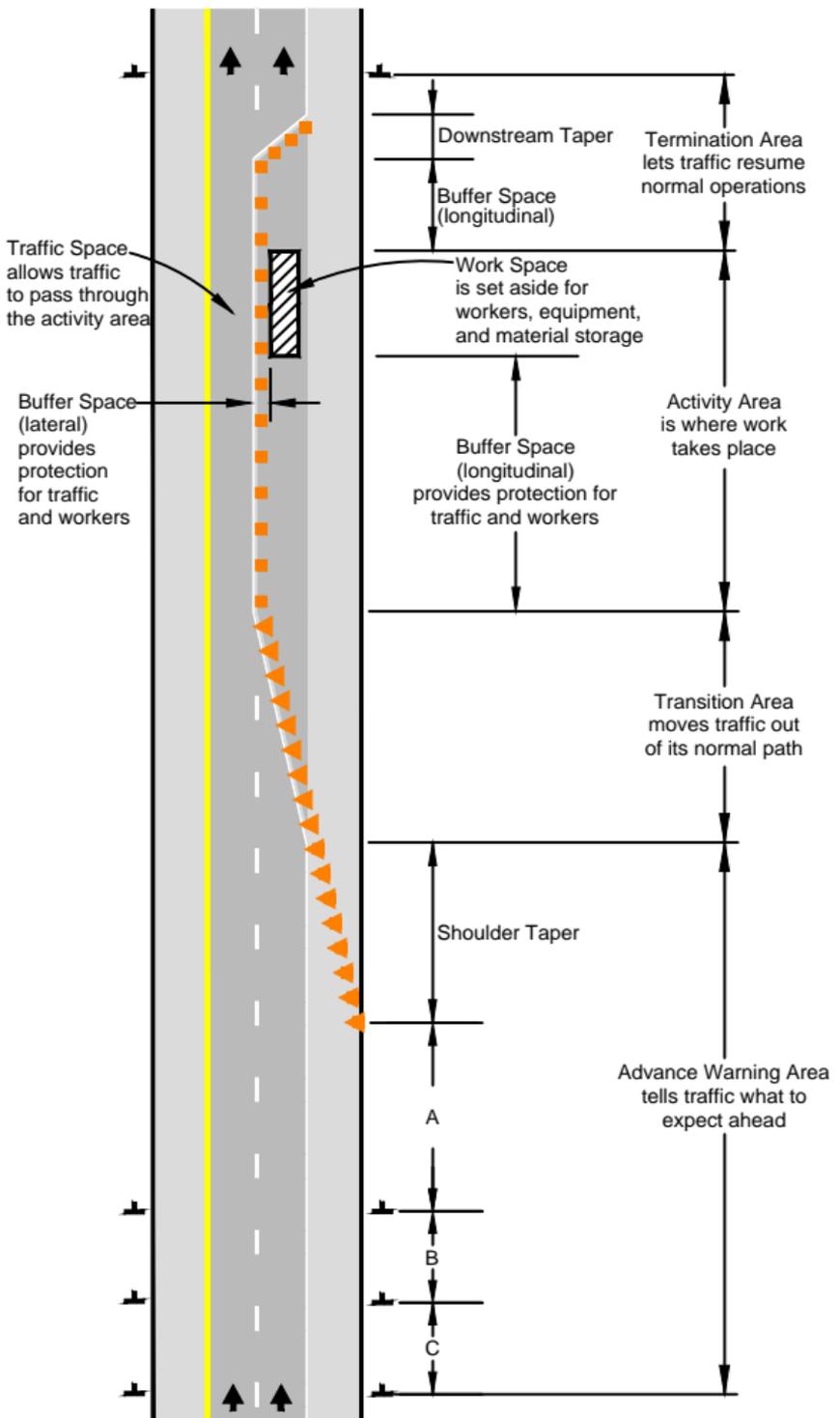
Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted. Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in **Figure 2**.

The criteria for determining the minimum taper length (L) is shown below in **Table 2**.

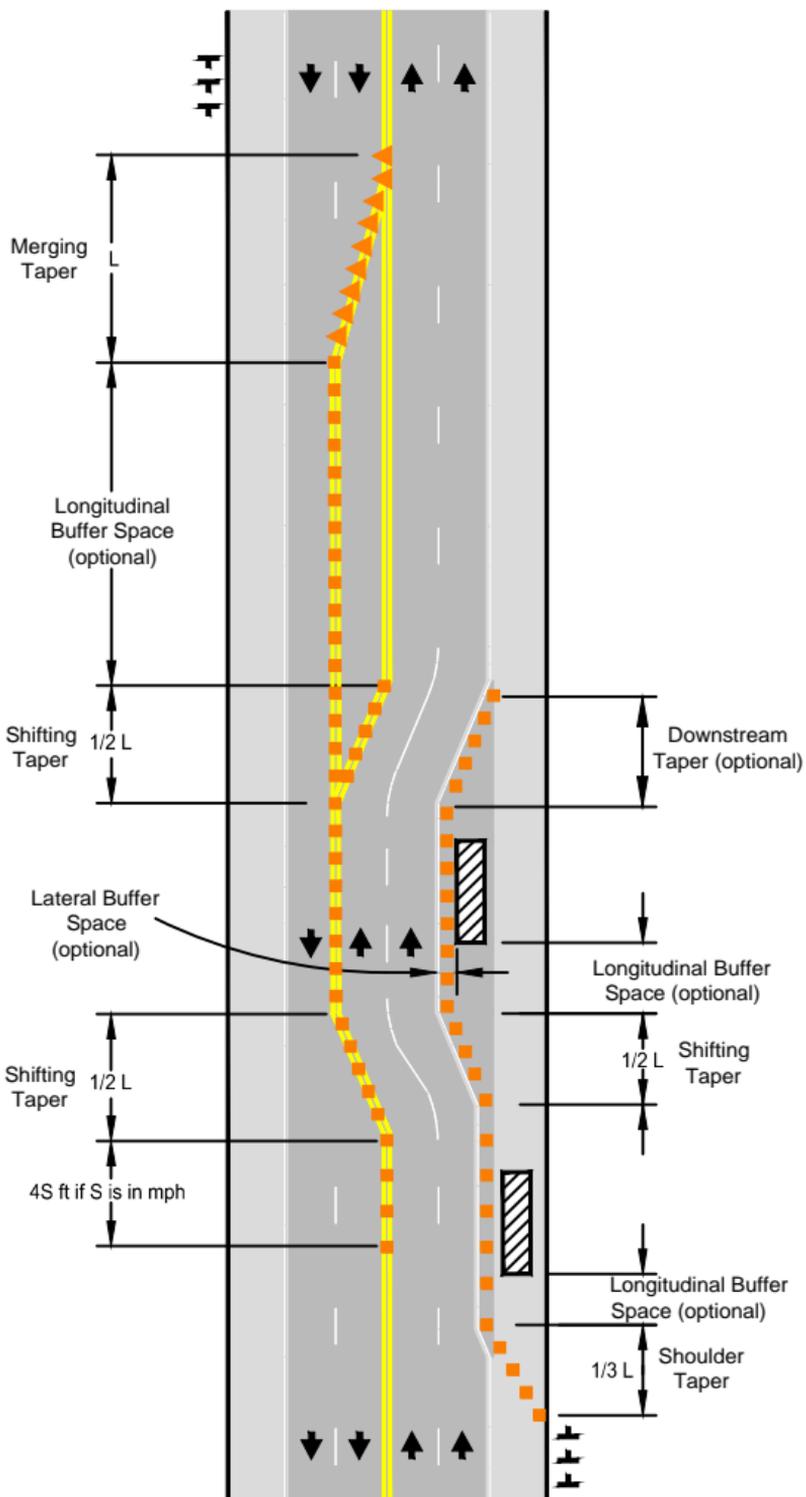
TABLE 2	
Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where:

- L = taper length (feet)
- W = width of offset (feet)
- S = posted speed limit,  
or off-peak 85th-percentile speed  
prior to work starting,  
or the anticipated operating speed  
(mph)



**FIGURE 1**  
**COMPONENTS OF A TEMPORARY TRAFFIC CONTROL ZONE**



**FIGURE 2**  
**TYPES OF TAPERS AND BUFFER SPACES**

The maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph.

There are three types of tapers that occur in the Transition Area of a Traffic Control Zone and are summarized below and in **Table 3**:

1. **Merging Taper** - A merging taper is used when the number of lanes is reduced on a multilane roadway. A merging taper requires the longest distance because drivers are required to merge into common road space. A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into an adjacent lane before the downstream end of the transition. (See **Table 2** for calculating merging taper lengths.)
2. **Shifting Taper** - A shifting taper is used when a lateral shift is needed but when the number of lanes is not being reduced. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal operating speeds. A shifting taper should have a length of approximately half of the merging taper ( $1/2L$ ).
3. **Shoulder Taper** - A shoulder taper is used when a shoulder is closed. A shoulder taper might be beneficial on a high speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used. If used, shoulder tapers should have a length of approximately one-third of the merging taper ( $1/3L$ ). If a shoulder is used as a travel lane, either through practice or during a temporary traffic control activity, a normal merging or shifting taper should be used.

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least $1/2L$
Shoulder Taper	at least $1/3L$
One Lane, Two-Way Traffic Taper	50 to 100 feet
Downstream Taper	100 feet per lane

## C. Activity Area

The activity area is the section of the roadway where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

### Work Space

The work space is that portion of the roadway closed to road users and set aside for workers, equipment, material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers. The work space may be stationary or may move as work progresses. Since there might be several work spaces within the project limits, each work space should be adequately signed to inform road users and reduce confusion.

### Traffic Space

The traffic space is the portion of the roadway in which road users are routed through the activity area. The buffer space is a lateral and/or longitudinal area that separates road user flow from the work spaces or an unsafe area, and might provide some recovery space for an errant vehicle. Neither work activity, storage of equipment, vehicles, or material should occur within a buffer space.

### Buffer Space

Buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow. The activity area may contain one or more lateral or longitudinal buffer spaces.

A longitudinal buffer space may be placed in advance of a work space. The longitudinal buffer space may also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in **Figure 2**.

Typically, the buffer space is formed as a traffic island and defined by channelizing devices. When a shadow vehicle, arrow board, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow board, or changeable message sign constitutes the buffer space.

The lateral buffer space may be used to separate the traffic space from the work space, in **Figure 1** and **Figure 2** or such areas as excavations or pavement edge drop-offs. A lateral buffer space may be used between two travel lanes, especially those carrying opposing flows.

## D. Termination Area

The termination area is the section of the roadway where road users are returned to their normal driving path. The termination area extends from the downstream end of the work area to the last temporary traffic control device such as END ROAD WORK signs, if posted. A downstream taper should be used in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed. When used the downstream taper should have a length of approximately 100 feet per lane (See **Table 3**) with devices placed at a spacing of approximately 20 feet.

## X. TRAFFIC CONTROL DEVICES AND THEIR USES

### A. General Requirements

All roadside appurtenances such as traffic barriers, barrier terminals, crash cushions, bridge railings, sign and light pole supports, and work zone hardware used shall meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" or the American Association of State Highway and Transportation Officials (AASHTO) Manual for Accessing Safety Hardware (MASH). The word "crashworthy" is a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the NCHRP Report 350 or MASH.

Contractors shall be responsible for providing and maintaining all traffic control devices and flaggers as necessary to protect the work area and safeguard and direct traffic around their work. Existing traffic signs and control devices must remain in place until construction or maintenance activities have started. The Contractor will be responsible for any damage or loss resulting from failure to maintain or protect such devices. It shall be the responsibility of the Contractor to notify the City Engineer when existing signs need to be removed for construction or maintenance work.

Traffic control devices shall be set up prior to the start of construction or maintenance operations and shall be properly maintained during the time that such conditions exist. They shall remain in place only as long as they are needed and shall be removed immediately thereafter.

Where operations are performed in stages, there shall be in place only those devices that apply to the conditions present during the stage in progress. Signs that do not apply to existing conditions shall be removed, covered, folded, or turned not to be readable by oncoming traffic. All barricades and sign supports shall be neatly constructed. They shall be repaired, cleaned, or resheeted as needed to maintain their appearance.

Weeds, shrubbery, construction materials or equipment, spoil, etc., shall not be allowed to obscure any traffic control device.

## B. Signs

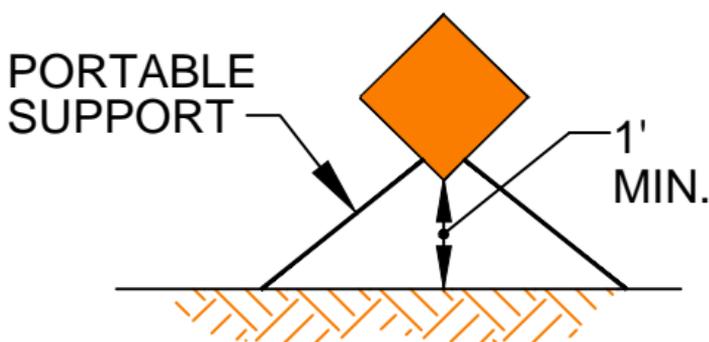
The color, size, shape, lettering, and retroreflectorization of any special sign must conform to the principles outlined in the MUTCD, latest edition. All orange construction signs shall be reflectorized with fluorescent orange micro-encapsulated prismatic retroreflective grade sheeting. All regulatory signs shall be reflectorized with micro-encapsulated prismatic retroreflective grade sheeting.

Signs shall be placed in positions where they will convey their messages most effectively and placement must, therefore, be accommodated to roadway design and alignment. Signs shall be so placed that the driver will have adequate time for response. The use of standard orange flags or yellow flashing warning lights in conjunction with signs is permitted, so long as they do not interfere with a clear view of the sign face.

As a general rule, signs shall be located on the right-hand side of the street or roadway. Where special emphasis is needed, such as a multi-lane divided arterial roadway, dual installations should be made which consist of duplicate signs opposite each other on the left and right sides of the roadway, respectively. However, within a construction or maintenance zone, it is often necessary and/or desirable to erect signs on portable supports placed within the roadway itself. It is also permissible to mount appropriate signs on or above barricades. Signs on fixed supports are usually mounted on a single post, although those wider than 36 inches or larger than 10 square feet in area should be mounted on two posts. Construction and maintenance signs shall not be mounted on existing traffic signs, posts, or other utility structures within the public right of way without permission from the City Engineer. Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities or areas designed for pedestrians or bicycles.

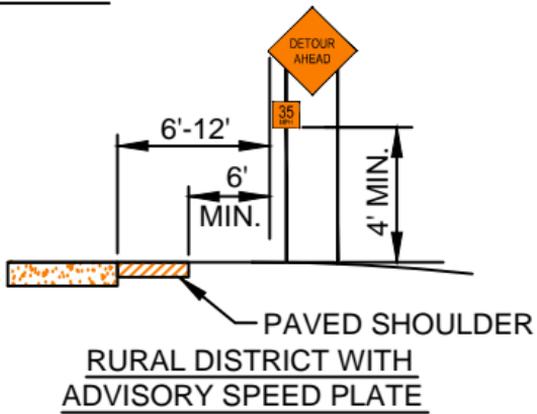
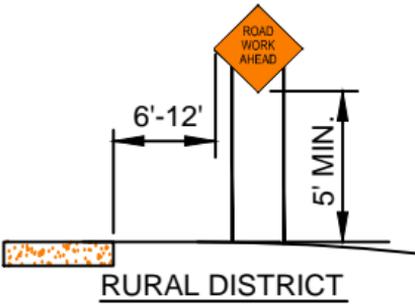
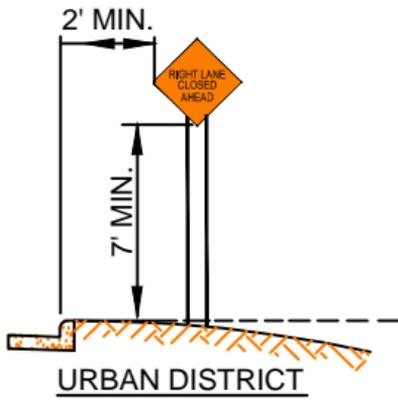
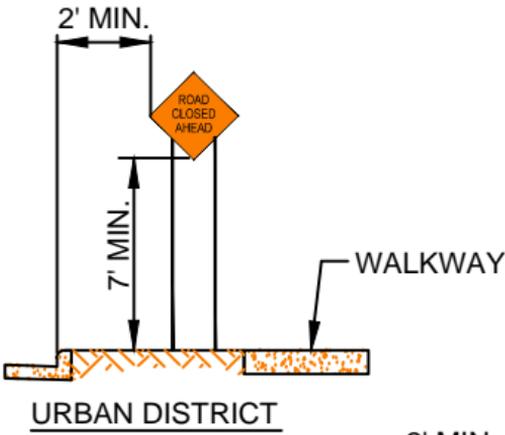
Construction or maintenance projects that require three (3) working days or less may mount signs on portable sign supports (see **Figure 3**); the bottom of the signs shall be a minimum of 1 foot above the adjacent pavement surface, with the exception of the Road Work Ahead sign (W20-1) which shall be a minimum of 7 feet from the bottom of the sign to above the adjacent pavement surface. Projects requiring more than 3 working days shall mount signs on posts as indicated in the rural and urban district detail as appropriate (see **Figure 4**).

Warning signs for construction and maintenance projects are used to notify drivers of specific hazards which may be encountered when those operations are underway. Advance warning signs shall be used in conjunction with barricading and channelization. The information presented by such signs assists the motorist following the required traffic arrangements. As an alternate to specific distance on advance warning signs, the word AHEAD may be used.



**FIGURE 3**  
**PORTABLE AND TEMPORARY**  
**MOUNTINGS FOR SIGNS**

Recommended sign spacing for construction and maintenance projects shall be as shown on **Table 1**. The sign spacing generally indicated on the typical traffic control plans in this handbook is the minimum spacing as indicated on **Table 1**. It should be noted that some urban conditions may require adjustment to the recommended



**FIGURE 4**  
**TYPICAL INSTALLATION HEIGHT AND LATERAL LOCATIONS OF SIGNS**

spacing due to the proximity of driveways, intersections, and physical barriers. In all cases, sign spacing shall not be less than indicated in **Table 1**.

Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic. If the bottom of a secondary sign that is mounted below another sign is mounted lower than 7 feet above a pedestrian sidewalk or pathway, the secondary sign should not project more than four (4) inches into the pedestrian facility.

### C. Barricades and Channelizing Devices

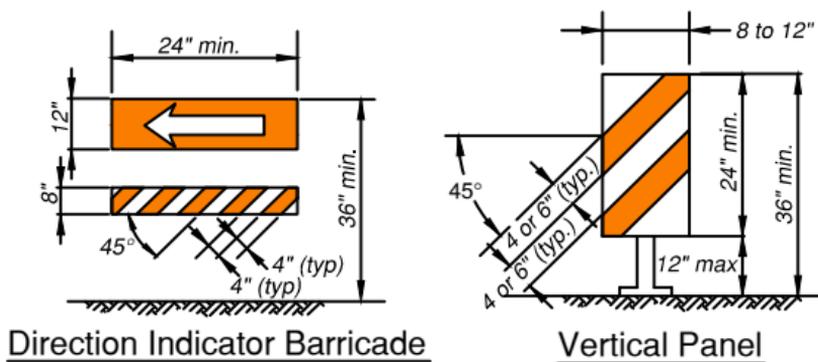
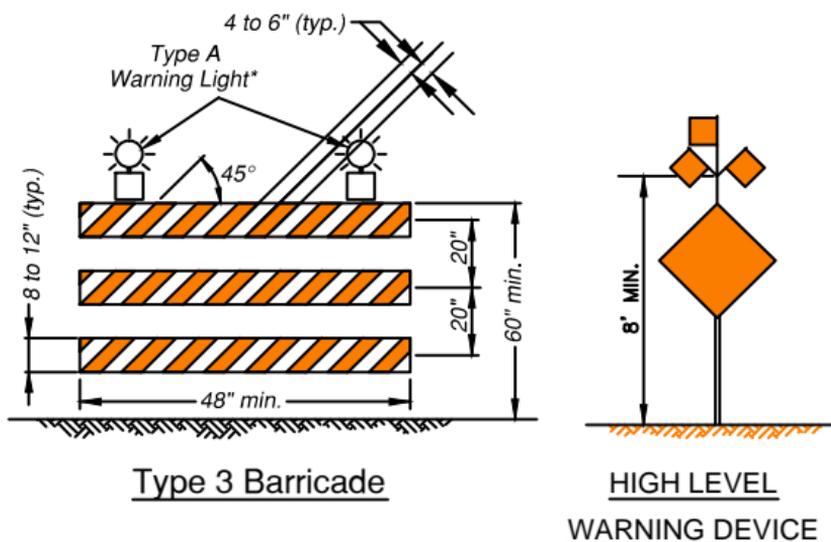
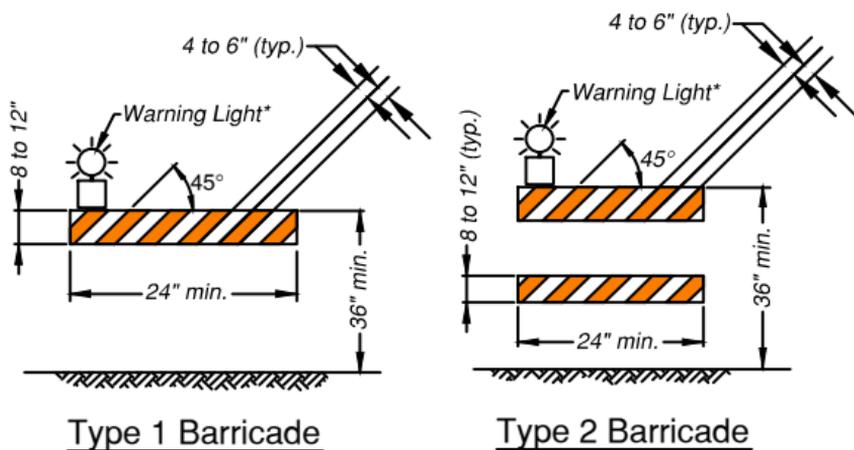
Channelizing devices are used to warn and alert road users of conditions created by work activities and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and barriers.

#### **Type 1, 2, & 3 Barricades**

Barricades are especially valuable for outlining the excavation or construction area in the street or for road and entrance closures. Portable, crashworthy barricades shall be used where the project is of short duration or for which the passage of equipment or of local traffic must be provided.

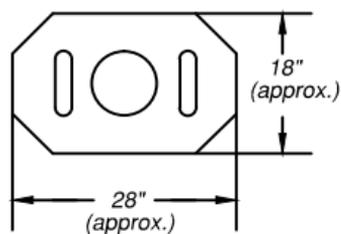
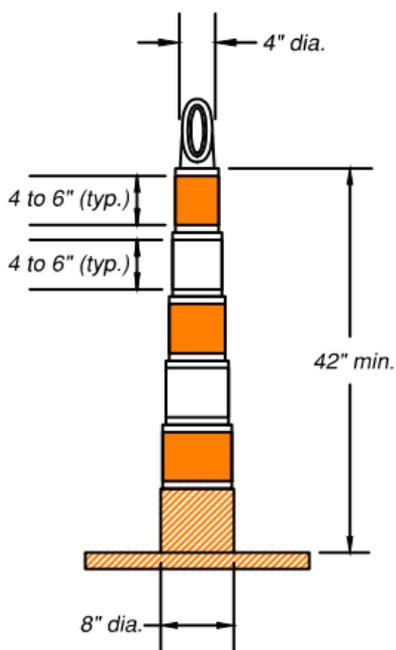
Barricades shall be one of three types: Type 1, Type 2, or Type 3. The characteristics of these types are shown in **Figure 5**. Markings for barricade rails shall be alternating orange and white stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes, except as otherwise noted, shall be 6 inches wide. When rail lengths are less than 36 inches, 4 inch wide stripes may be used. The minimum length for Type 1 and Type 2 Barricades shall be 24 inches, and the minimum length for Type 3 barricades shall be 48 inches. Each barricade rail shall be 8 to 12 inches wide. The entire area of orange and white shall be retroreflectorized with KDOT approved high intensity grade retroreflective sheeting.

On construction projects, when a road section is closed to traffic, Type 3 barricades shall be erected at the points of closure. They may extend completely across a roadway and its shoulders or from curb to curb. Where provisions must be made for access of equipment and authorized vehicles, the Type 3 barricades should be provided with gates or movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where access is provided through

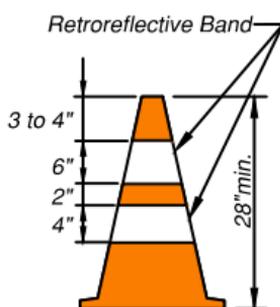


**FIGURE 5**  
**BARRICADES AND HIGH LEVEL**  
**WARNING DEVICES**

\*Optional during daylight hours

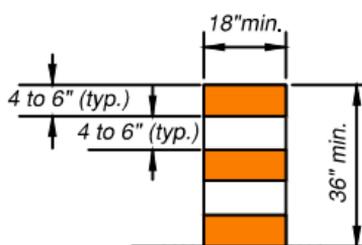


**Conical Delineator**

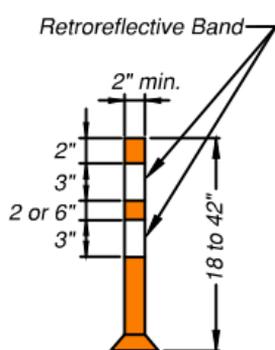


**28" Cone**

(NIGHT TIME USE AND HIGH SPEEDS)  
(NOT ALLOWED FOR LONG-TERM STATIONARY WORK)



**Drum**



**Tubular Marker**

(NIGHT TIME USE AND HIGH SPEEDS)  
(NOT ALLOWED FOR LONG-TERM STATIONARY WORK)

**FIGURE 6**  
**CHANNELIZING DEVICES AND HIGH LEVEL**  
**WARNING DEVICES**

*\*Optional during daylight hours*

the Type 3 barricades, responsibility should be assigned to a person to assure closure at the end of each working day

When a road or street is legally closed, but access must still be allowed for local road users, Type 3 barricades usually are not erected completely across a roadway. Instead, an arrangement should be devised that will permit local use but effectively discourage use by through traffic. A sign shall be installed with the appropriate legend concerning permissible use by local road users. Adequate visibility of the barricades from both directions shall be provided. Signs may be installed on barricades.

Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn. Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades. Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.

Type 1 or Type 2 Barricades are intended for use in situations where road user flow is maintained through the temporary traffic control zone. Barricades may be used alone or in groups to mark a specific condition.

On high speed expressways or in other situations where barricades may be susceptible to overturning in the wind, sandbags should be used for ballasting. Sandbags may be placed on lower parts of the frame or stays to provide the required ballast but shall not be placed on top of any striped rail.

Where maintenance activities are being performed, a street condition is seldom of a character that will require a complete closing of the facility. When such a condition does occur, it is almost always an emergency situation, as would result from a broken water main, for example. Repair work is generally initiated on an emergency basis and the street or road closing generally is of a kind wherein Type 1 or Type 2 barricades are utilized. A construction type sign shall be installed on or above the barricades such as "Large Arrow", "Road Closed", or "Detour" arrow signs.

All barricades when used at night shall be equipped with appropriate warning lights.

### **Direction Indicator Barricades**

Direction Indicator Barricades shall be used in lane merge tapers for all long-term stationary temporary traffic control installations. They may be used for intermediate-term stationary, short-term stationary and short duration installations, but are not required. Standard conical delineators may be used in place of directional indicator barricades as long as the traffic control setup is three days or less.

Direction Indicator Barricades shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally aligned, retroreflective rail. The One-Direction Large Arrow (W1-6) sign shall be black on an orange background and 24 inches x 12 inches. The stripes on the bottom rail shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 4 inches wide. The bottom rail shall have a length of 24 inches and a height of 8 inches (see **Figure 5**).

### **Cones**

Traffic cones shall be predominantly orange and shall be made of a material that will not damage vehicles if they are impacted. Retroreflectorization shall be provided by a six (6) inch wide white band located three (3) to four (4) inches from the top of the cone, and an additional four (4) inch wide white band located two (2) inches below the six (6) inch band made of KDOT approved high intensity retroreflective sheeting. Traffic cones shall be orange in color, kept clean, and checked frequently for location. The 28 inch retroreflectorized cone shall not be used for long-term stationary work (see **Figure 6**).

### **Drums**

Drums used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 36 inches in height and have at least an 18 inch width regardless of orientation. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflectorized stripes four (4) to six (6) inches wide. The white stripes shall be made of KDOT approved high intensity retroreflectorized sheeting. Orange stripes shall be fluorescent micro-encapsulated prismatic grade retroreflective sheeting (see **Figure 6**).

There shall be at least two (2) orange and two (2) white stripes on each drum with the top stripe being orange. Any non-retroreflectorized spaces between the horizontal

orange and white stripes shall not exceed three (3) inches in width. Drums should not be weighted with sand, water or any material to the extent that would make them hazardous to road users or workers when struck.

In addition, a flashing warning light should be added when drums are used singly. Ballast shall not be placed on top of a drum.

### **Vertical Panels**

Vertical panels shall have retroreflective striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of six (6) inches shall be used. Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of four (4) inches may be used. Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades.

### **Conical Delineators**

Conical delineators, also referred to as trimlines or grabber cones, are an acceptable alternative to drums. Therefore, they shall meet the MUTCD requirements for retroreflective sheeting. They shall be constructed of light weight, deformable, two (2) piece materials with breakaway design. They shall be a minimum of 42 inches in height, excluding the handle, with a minimum diameter at the base of eight (8) inches and a minimum diameter of four (4) inches immediately below the grabber handle. It shall be supported by a rubberized slipover base approximately 18 x 28 x 2 inches. The markers on the trimline/grabber cone shall be horizontal, circumferential alternating orange and white retroreflective stripes, four (4) to six (6) inches wide. The white stripes shall be made of KDOT approved high intensity retroreflective sheeting. The orange stripes shall be fluorescent micro-encapsulated prismatic retroreflective sheeting. Each device shall have a minimum of two (2) orange and two (2) white stripes, with the top stripe being orange. Any non-retroreflective spaces between the horizontal orange and white stripes shall not exceed three(3) inches in width (see **Figure 6**).

### **Delineators**

Delineators are retroreflective devices mounted on the roadway surface or at the side of the roadway in a series to indicate the alignment of the roadway. They may be used in temporary traffic control zones to indicate the alignment of the roadway and to outline the required vehicle path through the temporary traffic control zone. When used, delineators shall combine with or supplement other traffic control devices. They shall be mounted on crashworthy supports so that the reflecting unit is approximately four (4) feet above the near roadway edge. The standard color for delineators used along both sides of the two-way streets and roadways and the right side of one-way roadways shall be white. Delineators used along the left side of one-way roadways shall be yellow. Spacing along roadway curves should be as set forth per the MUTCD and should be such that several delineators are constantly visible to the driver.

### **Tubular Markers**

Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of more visible devices. They may be used effectively to divide opposing lanes of traffic, divide two lanes of traffic when two or more lanes are kept open in the same direction, and to delineate edge of pavement drop off where space limitations do not allow the use of larger devices.

Tubular markers for daytime use and speeds less than or equal to 40 mph, shall be predominantly orange, and shall not be less than 18 inches high and two (2) inches wide facing traffic with a single three (3) inch white KDOT approved high intensity retroreflective band. They shall be made of a material that can be struck without causing damage to the impacting vehicle.

Tubular markers for nighttime use and/or speeds greater than 40 mph shall have a height between 18 and 42 inches and shall be retroreflectorized. Retroreflection of tubular markers shall be provided by two (2) - three (3) inch wide white bands placed a maximum of two (2) inches from the top, with a maximum of six (6) inches between bands (see **Figure 6**). Retroreflectization of tubular markers that have a height of 42 inches shall be provided by four (4) - four (4) to six (6) inch wide alternating orange and white stripes with the top stripe being orange (see **Figure 6**). Tubular markers shall not be used for long-term stationary work, unless used to divide opposing lanes of traffic where space limitations exist.

## D. Lighting Devices

Hazard Identification Beacons are flashing yellow signal lights (minimum diameter 8 inches) used at points of special hazard as a means of calling drivers' attention to these locations. When used, the flashing beacons should operate 24 hours a day.

During normal daytime maintenance operations, the function of flashing warning beacons maybe provided by high intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle. Although vehicle hazard warning lights are permitted to be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights, vehicle hazard warning lights shall not be used instead of high-intensity rotating, flashing, oscillating, or strobe lights.

### **Warning Lights**

Warning Lights as used herein are portable, powered, yellow, lens directed, enclosed lights. They may be used in either a steady burn or flashing mode. Warning lights shall be in accordance with the current ITE "Purchase Specification for Flashing and Steady Burn Warning Lights" and 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. Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.

A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper. When used, the sequential flashing of the sequential warning lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55 or more than 75 times per minute.

**TYPE A** - Low Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area. They shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type A warning lights may be mounted on channelizing devices and barricades.

**TYPE B** - High Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area and shall be maintained as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet. They are designed to operate 24 hours per day and may be mounted on advance warning signs or independent supports.

**TYPE C & D** - Steady Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. They may be used during nighttime hours to delineate the edge of the traveled way. Flashing warning lights shall not be used for roadway delineation because a series of flashers fail to identify the desired path.

## E. Portable Changeable Message Signs

The primary purpose of portable changeable message signs in temporary traffic control zones is to advise the road user of unexpected situations. Portable changeable message signs shall display only traffic operational, regulatory, warning, and guidance information and shall not be used for advertising messages.

Portable changeable message signs are installed for temporary use with the flexibility to display a variety of messages. Messages should consist of no more than two phases. A phase shall consist of no more than three lines of text of eight characters per line. Each character module shall use at least a five wide and seven high pixel matrix.

The front face of the sign should be covered with a protective material. The color of the elements should be yellow or orange on a black background. Portable changeable message signs should be visible from 1/2 mile under both day and night conditions. The message panel should have adjustable display rates, so that the entire message can be read at least twice at the posted speed, the off-peak 85th percentile speed prior to work starting, or the anticipated operating speed. When a message is divided into two (2) phases, the display time for each phase should be at least two (2) seconds, and the sum of the display times for both phases should be a maximum of eight (8) seconds.

Portable changeable message signs shall automatically adjust their brightness under varying light conditions to maintain legibility.

The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable. Portable changeable message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.

The mounting of portable changeable message signs on a trailer, large truck, or service patrol truck shall be such that the bottom of the message sign panel shall be a minimum of seven (7) feet above the roadway in urban areas and five (5) feet above the roadway in rural areas when in the operating mode.

The text of the messages shall not scroll or travel horizontally or vertically across the face of the sign. Portable changeable message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings.

Portable changeable message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.

The message should be as brief as possible and should contain three thoughts (with each thought preferably shown on its own line) that convey:

1. The problem or situation that the road user will encounter ahead;
2. The location of or distance to the problem or situation;
3. The recommended driver action.

If using more than two (2) phases, additional portable changeable message signs should be used. When multiple portable changeable message signs are needed, they should be placed on the same side of the roadway and should be separated from each other by a distance of at least 1,000 feet on freeways and expressways, and by a distance of at least 500 feet on other types of roadways.

## F. Arrow Boards

Arrow boards shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a temporary traffic control zone. Arrow boards shall meet the minimum size, legibility distance, number of elements, and other specifications shown on **Figure 7**.

Type A, B, and C arrow boards shall have solid rectangular appearances. A Type D arrow board shall conform to the shape of the arrow. All arrow boards shall be finished in non-reflective black. The color presented by the elements shall be yellow. The arrow board shall be mounted on a vehicle, a trailer, or other suitable support.

Arrow board elements shall be capable of at least a 50% dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow boards. Full brilliance should be used for daytime operation of arrow boards.

The minimum element on-time shall be 50% for the flashing mode, with equal intervals of 25% for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.

Arrow boards shall have the following 3 mode selections:

1. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode;
2. A Flashing Double Arrow mode;
3. A Flashing Caution or Alternating Diamond mode.

An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

For shoulder work, blocking the shoulder, roadside work near the shoulder, or temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode.

An arrow board shall be used at all lane closures on multi-lane streets, or other locations specified by the City Engineer. An arrow board should be used in combination with appropriate signs, channelizing devices, or other temporary traffic control devices. For a stationary lane closure, the arrow board should be located on the shoulder at the beginning of the merging taper.

Where the shoulder is narrow, the arrow board should be located in the closed lane. When arrow boards are used to close multiple lanes, a separate arrow board shall be used for each closed lane.

For mobile operations where a lane is closed, the arrow board should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

A vehicle displaying an arrow board shall be equipped with rotating lights or strobe lights. When an arrow board is not being used, it should be removed, shielded, or delineated with retroreflective temporary traffic control devices.

The minimum mounting height, measured vertically from the bottom of the board to the roadway below it or to the elevation of the near edge of the roadway, should be seven (7) feet, except on vehicle-mounted arrow boards, which should be as high as practical.

<b>ADVANCE WARNING ARROW BOARD</b>			
<b>Arrow Board Type</b>	<b>Minimum Size</b>	<b>Minimum Legibility Distance</b>	<b>Minimum Number of Elements</b>
A	48 X 24 in.	1/2 mile	12
B	60 X 30 in.	3/4 mile	13
C	96 X 48 in.	1 mile	15
D	None*	1/2 mile	12

\*Length of arrow equals 48 inches, width of arrowhead equals 24 inches.

**TYPE A-D USAGES**

Type A: Low speed streets 25-30 mph

Type B: Intermediate speed 35-45 mph

Type C: High speed streets 50-55 mph

Type D: Vehicle mounted for short-term durations up to one (1) hour

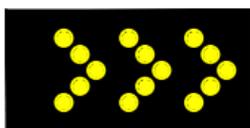
Use of a Type C board at an A or B location or use of a Type B board at an A location is allowable. A Type B board may be used for moving maintenance operations.

Arrow boards shall be set in the (left or right) sequential chevron or flashing arrow mode for lane closures.

**CAUTION MODE USAGE**

On shoulder or in turn bays

Arrow boards shall be set in the flashing caution mode for shoulder work, roadside work near the shoulder, or temporary closing of one lane on a two-lane, two-way roadway.



**FIGURE 7**  
**PORTABLE AND TEMPORARY SIGNS**  
**AND ARROW BOARD**

## G. High Level Warning Devices (Flag Trees)

High level warning devices are most commonly used in high density road user situations to warn road users of short-term operations and supplement other traffic control devices in temporary traffic control zones.

A high level warning device 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 eight (8) feet. The flag 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 (see **Figure 5**).

## H. Hand-Signaling Devices

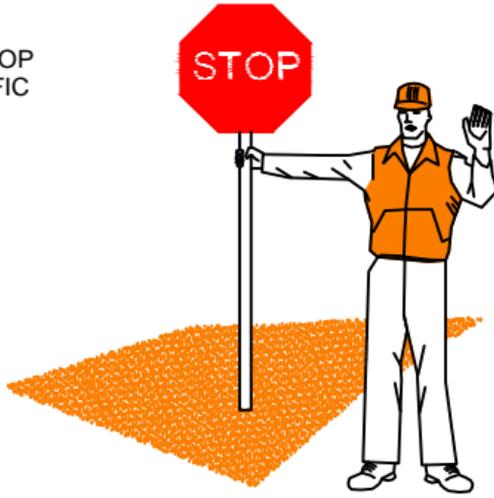
The STOP/SLOW paddle should be the primary and preferred hand-signaling device because it gives road users more positive guidance than red flags. Flag use should be limited to emergency situations.

STOP/SLOW paddles shall have an octagonal shape on a rigid handle and shall be at least 18 inches wide with letters at least six (6) inches high and should be fabricated from light semi-rigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

Flaggers are provided at work sites to stop traffic intermittently as necessitated by work progress or to maintain continuous traffic past a work site at reduced speeds to help protect the work crew. The flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.

The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. At a spot constriction, the flagger may have to stand on the shoulder or curb opposite the closed section to operate effectively. Under no circumstances should they stand in the lane being used by moving traffic. They should be clearly visible to approaching traffic at all times. For this reason they should

TO STOP  
TRAFFIC



TO LET  
TRAFFIC  
PROCEED



TO ALERT  
AND SLOW  
TRAFFIC



FIGURE 8  
USE OF HAND SIGNALING  
DEVICE BY FLAGGER

stand alone, never permitting a group of workers to congregate around them. They should be stationed sufficiently in advance of the work force to warn them of approaching danger, such as out of control vehicles.

Flagger stations should be adequately protected and preceded by proper advance warning signs. At night, flagger stations should be adequately illuminated. Flagging procedures have been illustrated in **Figure 8**.

## I. Pavement Markings

### **Interim Pavement Markings**

Interim markings are those pavement markings or devices that are placed within the temporary traffic control zones to provide road users with a clearly defined path of travel through the temporary traffic control zone when the permanent markings are either removed or obliterated during the work activities. Interim markings are typically needed during the reconstruction of a road while it is open to traffic, such as overlays or surface treatments or where lanes are temporarily shifted on pavement that is to remain in place.

The contractor shall make every possible effort to remove the interim pavement markings and install permanent pavement markings within 48 hours.

Interim pavement markings should not remain in place for more than 14 days after the application of the pavement surface treatment or the construction of the final pavement surface on new roadways or over existing pavement.

All interim broken line pavement markings shall use the same cycle length as permanent markings and shall have line segments that are at least two (2) feet long. This equates to a two (2) foot long line with a 22 foot long gap.

Half-cycle lengths with a minimum of two (2) foot stripes and 10 foot gaps may be used on roadways with severe curvature for broken line center lines in passing zones and for lane lines.

For temporary situations of three (3) calendar days or less, for a two or three-lane road, no-passing zones may be identified by using DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (W14-3) signs rather than pavement markings.

### **Temporary Pavement Markings**

These provisions for work zone pavement markings apply only for long-term stationary traffic control zones as described in Section VII of this document. They are not considered applicable for intermediate term, short term stationary, short duration, mobile, or incident management temporary traffic control zones.

Temporary pavement markings shall be maintained along streets and roadways in accordance with Chapters 3A and 3B in the MUTCD and shall match existing markings in place at each end of the temporary traffic control zone. Temporary pavement markings shall be placed along the entire length of any paved detour or temporary roadway prior to the detour or roadway being opened to road users. Appropriate warning signs, channelizing devices, and delineation shall accompany the temporary pavement markings to provide a clear path for the roadway users where it is not possible to provide a clear path by pavement markings alone.

For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical. Pavement marking obliteration shall leave minimal pavement scars and shall remove old marking material. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.

## **J. Sidewalks**

When a sidewalk or section of a sidewalk is removed, the contractor shall provide a temporary surface with the appropriate warning or close the sidewalk and install the proper traffic control devices as deemed necessary by the City. The Contractor shall conform to Chapter 6D in the MUTCD regarding pedestrian and worker safety including persons with disabilities in accordance with the Americans with Disabilities Act (most current revision). (Also see Section XII - Pedestrian & Accessibility Considerations.)

## **XI. SPECIAL OPERATIONS**

### **A. Moving Street Striping**

Moving street striping operations shall be considered mobile work and require only the use of vehicle mounted

warning lights for traffic control. Cones and/or flaggers may be used to supplement the warning lights for traffic control.

## B. Moving Maintenance

Moving maintenance operations with stops of a short duration (usually less than one (1) hour) will be considered short duration work. On multi-lane roads that require the blockage or partial blockage of a traffic lane, they shall trail a flashing arrow panel and utilize vehicle mounted warning lights for traffic control. An advance warning sign such as "ROAD WORK AHEAD" should also be mounted on portable sign supports on the right hand side of the roadway and relocated as the maintenance operation progresses. Moving maintenance on collector streets should utilize a flagger and vehicle mounted warning lights for traffic control. Moving maintenance on residential or low volume streets should utilize vehicle mounted warning lights for traffic control unless limited sight distance or other conditions warrant the use of a flagger.

## C. Crosswalk Pavement Markings

Crosswalk pavement marking installations should utilize the following traffic control:

Residential	-	Vehicle mounted warning lights and channelizers
Collector and Two Lane Arterial	-	Vehicle mounted warning lights, channelizers, and "Road Work Ahead" signs
Multi Lane Collector and Arterial	-	Vehicle mounted warning and lights, channelizers, "Road Work Ahead" signs, and advance warning arrow displays

## D. Spot Maintenance

Spot Maintenance will be considered mobile operations (usually less than 15 minutes) for traffic signal maintenance (e.g. light bulb change out, signal head adjustment, etc.); streetlight maintenance (e.g. random lamp replacement); and traffic sign installation or repair on thoroughfares and shall require the use of vehicle mounted warning lights and may require an advance warning arrow

panel when deemed necessary by the City for traffic control. Spot maintenance on collector streets shall require the use of vehicle mounted warning lights for traffic control. Cones and/or flaggers should be used to supplement the warning lights for traffic control when deemed necessary by the City.

Vehicle mounted warning lights shall be defined as a rotating beacon, warning arrow, arrow display, strobe light, or light bar. Standard 4-way emergency flashers alone will not meet these requirements.

## XII. PEDESTRIAN & ACCESSIBILITY CONSIDERATIONS

It is essential that the needs of all road users, including pedestrians with disabilities, are considered in temporary traffic control zones. Adequate provisions to the temporary traffic control should be made for pedestrians with disabilities.

A wide range of pedestrians might be affected by temporary traffic control zones, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path.

When existing pedestrian facilities are disrupted, closed, or relocated in a temporary traffic control zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.

Advance notification of sidewalk closures shall be provided. Because printed signs and surface delineation are not useable by pedestrians with visual disabilities, blocked routes, alternate crossings, sign and signal information should be communicated to pedestrians traveling with the aid of a long cane or who have low vision.

If the temporary traffic control zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the temporary traffic control zone affects an accessible and detectable pedestrian facility,

the accessibility and delectability shall be maintained along the alternate pedestrian route.

The following should be considered when planning for pedestrians in temporary traffic control zones:

1. Pedestrians should not be led into conflicts with vehicles, equipment, and operations.
2. Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.
3. Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).
4. Pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

Consideration should be made to separate pedestrian movements from both worksite activity and vehicular traffic. Unless an acceptable route that does not involve crossing the roadway can be provided, pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway.

To accommodate the needs of pedestrians, including those with disabilities, the following considerations should be addressed when temporary pedestrian pathways in temporary traffic control zones are designed or modified:

1. Provisions for continuity of accessible paths for pedestrians should be incorporated into the temporary traffic control plan.
2. Access to transit stops should be maintained.
3. A smooth, continuous hard surface should be provided throughout the entire length of the pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the *"Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities."*
4. The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the

useable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60 inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.

5. Blocked routes, alternate crossings, sign, and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision.
6. When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it (see **Figure 9**).
7. Signs and other devices mounted lower than seven (7) feet above the temporary pedestrian pathway should not project more than four (4) inches into accessible pedestrian facilities.

Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities. If a pushbutton is used to provide equivalent temporary traffic control information to pedestrians with visual disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with visual disabilities that a special accommodation is available, and to help them locate the pushbutton.

Closing off the worksite from pedestrian intrusion may be preferable to channelizing pedestrian traffic along the site with temporary traffic control devices. A canopied walkway may be used to protect pedestrians from falling debris, and to provide a covered passage for pedestrians.

Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision.

Where channelizing devices are used to channelize pedestrians, there shall be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the bottom surface shall be no higher than

two (2) inches above the ground. The top of the top surface shall be no lower than 32 inches above the ground (see **Figure 9**).

Short intermittent segments of temporary traffic barrier should not be used because they nullify the containment and redirective capabilities of the temporary traffic barrier, increase the potential for serious injury both to vehicle occupants and pedestrians, and encourage the presence of blunt, leading ends. All upstream leading ends that are present shall be appropriately flared or protected with properly installed and maintained crashworthy cushions. Adjacent temporary traffic barrier segments shall be properly connected in order to provide the overall strength required for the temporary traffic barrier to perform properly.

Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are needed.

#### **Detectable Edging for Pedestrians**

Longitudinal channelizing devices shall be interlocked. Interlocking devices shall not have any gaps. Individual channelizing devices, tape, rope, or plastic chain strung between devices or other discontinuous barriers and devices are not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities and do not comply with the design standard of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities" and should not be used as a control for pedestrian movements. Individual channelizing devices, other discontinuous barriers and devices, and pavement markings are also not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

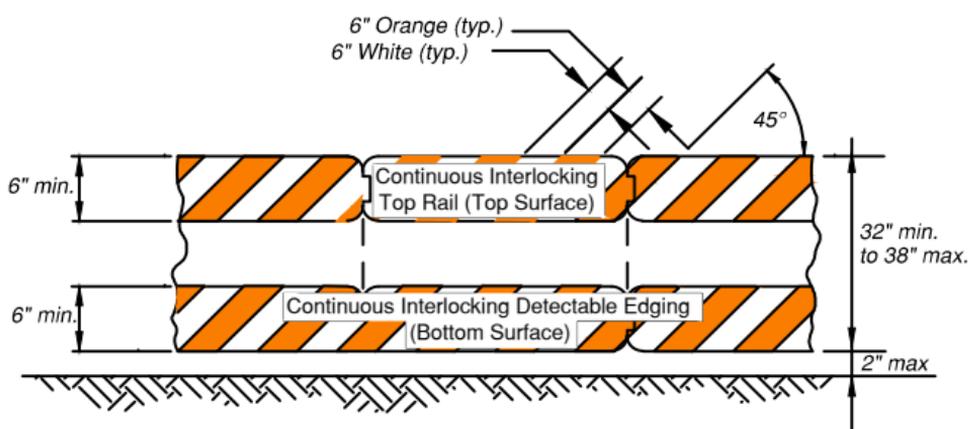
When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least six (6) inches above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of two (2) inches above the surface (see **Figure 9**).

Edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed in-place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly attached to the ground or to other devices. Adjacent sections of this edging should be such that it does not constitute a hazard to pedestrians, workers, or other road users.

Examples of detectable edging for pedestrians include:

1. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
2. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected, fixed in place, and placed on ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.
3. Sections of lumber interconnected and fixed in place to form a continuous edge.
4. Formed-in-place asphalt or concrete curb.
5. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.
6. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway that provides a pedestrian edging at ground level.
7. Chain link or other fencing equipped with a continuous bottom rail.

Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present (see **Figure 9**). A continuously detectable edging that can be followed by pedestrians using long canes should be provided throughout the length of the facility.



**Notes:**

1. Adjacent sections shall have the same base color (orange, white, or yellow).
2. Adjacent sections shall be interlocked together.
3. Stripes are Optional.

**FIGURE 9**  
**Detectable Pedestrian Barricade/Channelizer**

## COMMON TRAFFIC CONTROL SIGNS

Note: Consult MUTCD for appropriate sign sizes based on existing roadway geometry and speeds.



G20-2



M4-9



M4-8a



M4-10



M4-9A



M4-9B



R1-1



R1-2



R2-1



R3-1



R3-2



R3-7



R4-7A



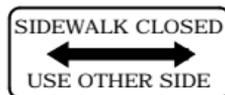
R4-7



R5-1



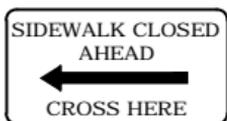
R9-9



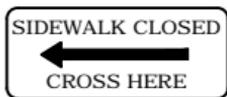
R9-10

## COMMON TRAFFIC CONTROL SIGNS

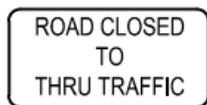
Note: Consult MUTCD for appropriate sign sizes based on existing roadway geometry and speeds.



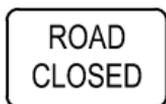
R9-11



R9-11a



R11-4



R11-2



W1-4



W1-6



W1-7



W3-4



W3-5



W4-2



W9-3



W5-1

## COMMON TRAFFIC CONTROL SIGNS

Note: Consult MUTCD for appropriate sign sizes based on existing roadway geometry and speeds.



W6-3



W8-17

SHOULDER  
DROP-OFF

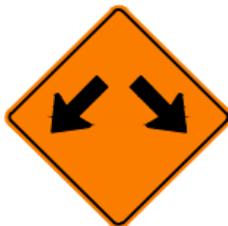
W8-17P



W8-11



W9-2



W12-1



W13-1p



W11-2



W20-1



W20-2



W16-7P



W20-3



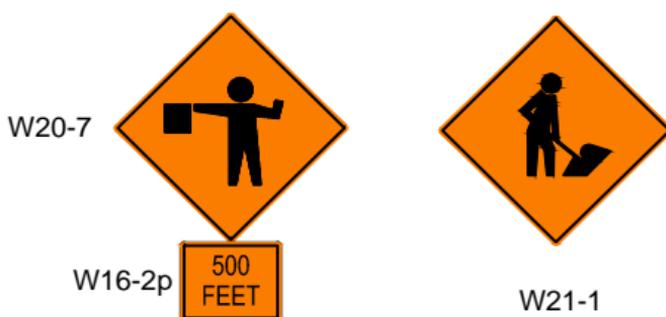
W20-4



W20-5

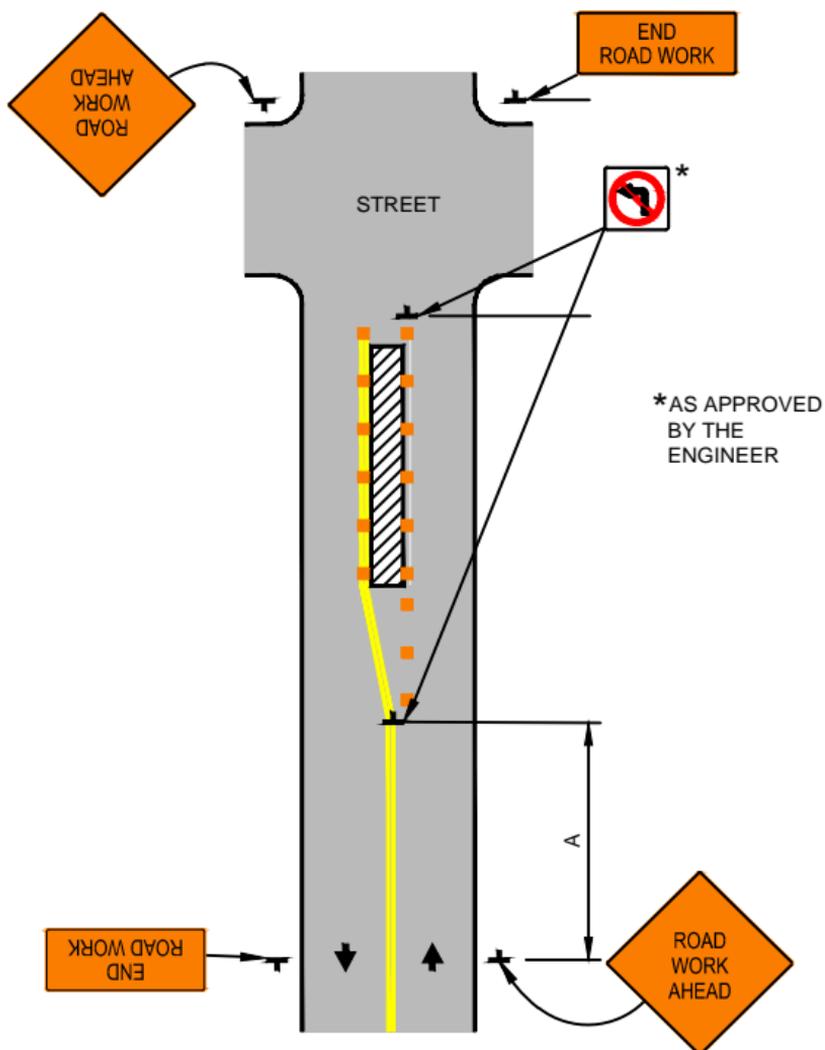
## COMMON TRAFFIC CONTROL SIGNS

Note: Consult MUTCD for appropriate sign sizes based on existing roadway geometry and speeds.



## MEANING OF SYMBOLS ON TYPICAL APPLICATION DIAGRAMS

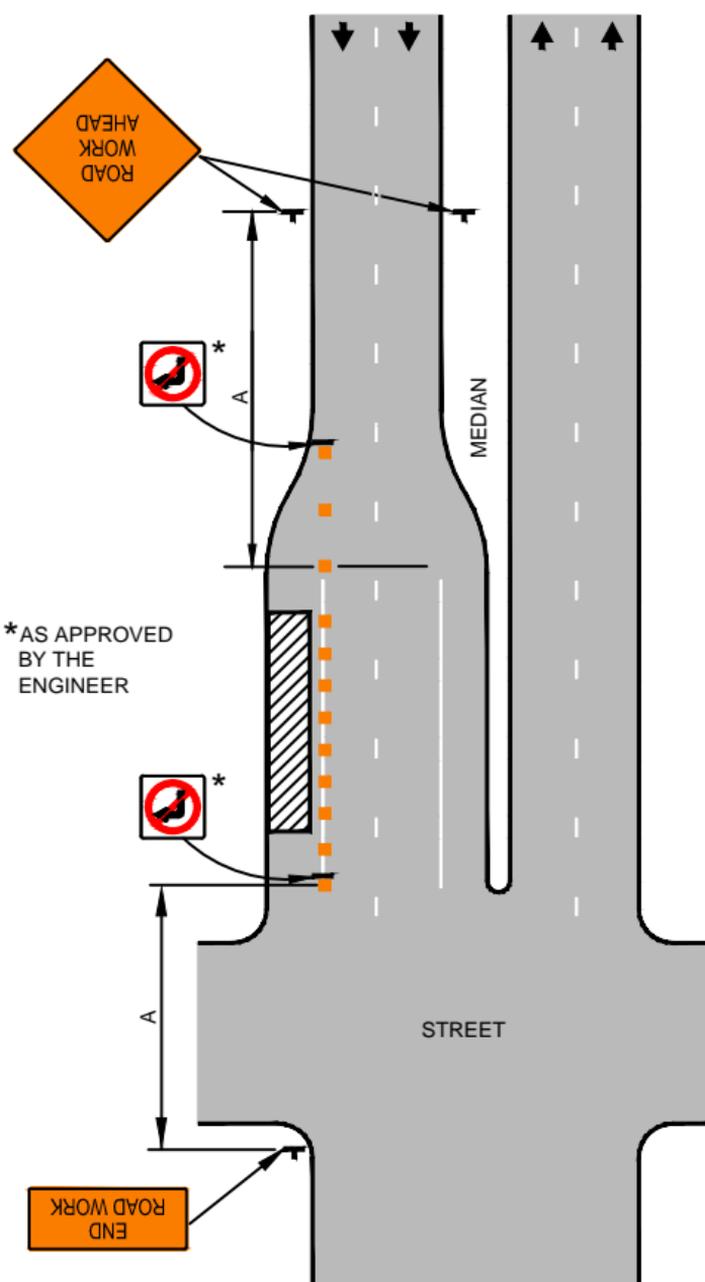
	CHANGEABLE MESSAGE SIGN
	ARROW BOARD
	TYPE 3 BARRICADE
	DETECTABLE PEDESTRIAN BARRICADE/CHANNELIZER
	TRAFFIC OR PEDESTRIAN SIGNAL
	WORK AREA
	SIGN (SHOWN FACING LEFT)
	CHANNELIZING DEVICE
	FLAGGER
	ARROW PANEL SUPPORT OR TRAILER (SHOWN FACING DOWN)
	DIRECTION OF TRAFFIC
	DIRECTION INDICATOR BARRICADE
	TUBULAR MARKER
	HIGH LEVEL WARNING DEVICE (FLAG TREE)



NOTES:

1. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MILES PER HOUR.
2. IF CONSTRUCTION OR MAINTENANCE REQUIRES A COMPLETE LEFT TURN LANE CLOSURE, CONTACT THE CITY TRAFFIC ENGINEER FOR VERIFICATION OF "NO LEFT TURN" SIGN REQUIREMENTS.
3. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

TYPICAL LEFT TURN LANE CLOSURE

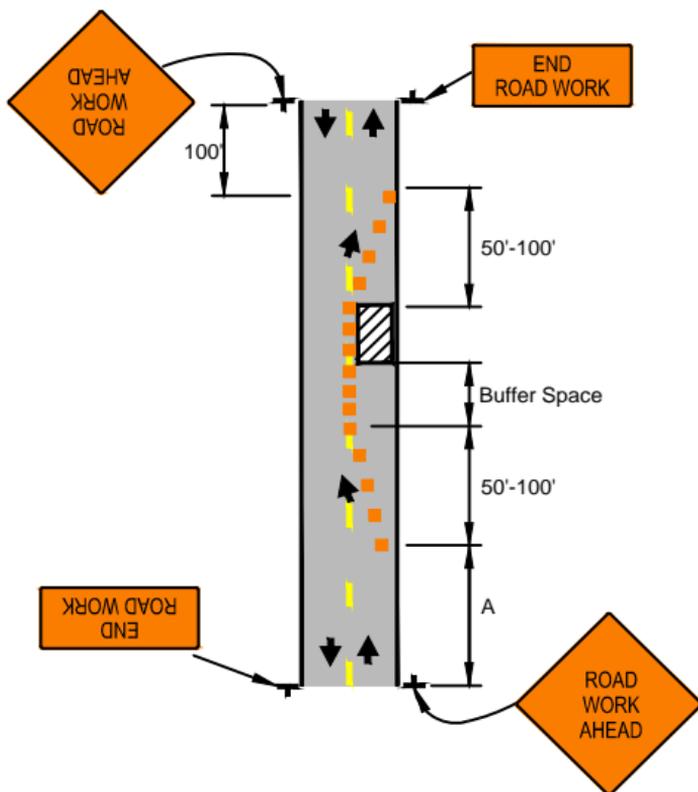


\*AS APPROVED BY THE ENGINEER

NOTES:

1. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MILES PER HOUR.
2. IF CONSTRUCTION OR MAINTENANCE REQUIRES A COMPLETE RIGHT TURN LANE CLOSURE, CONTACT THE CITY TRAFFIC ENGINEER FOR VERIFICATION OF "NO RIGHT TURN" SIGN REQUIREMENTS.
3. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

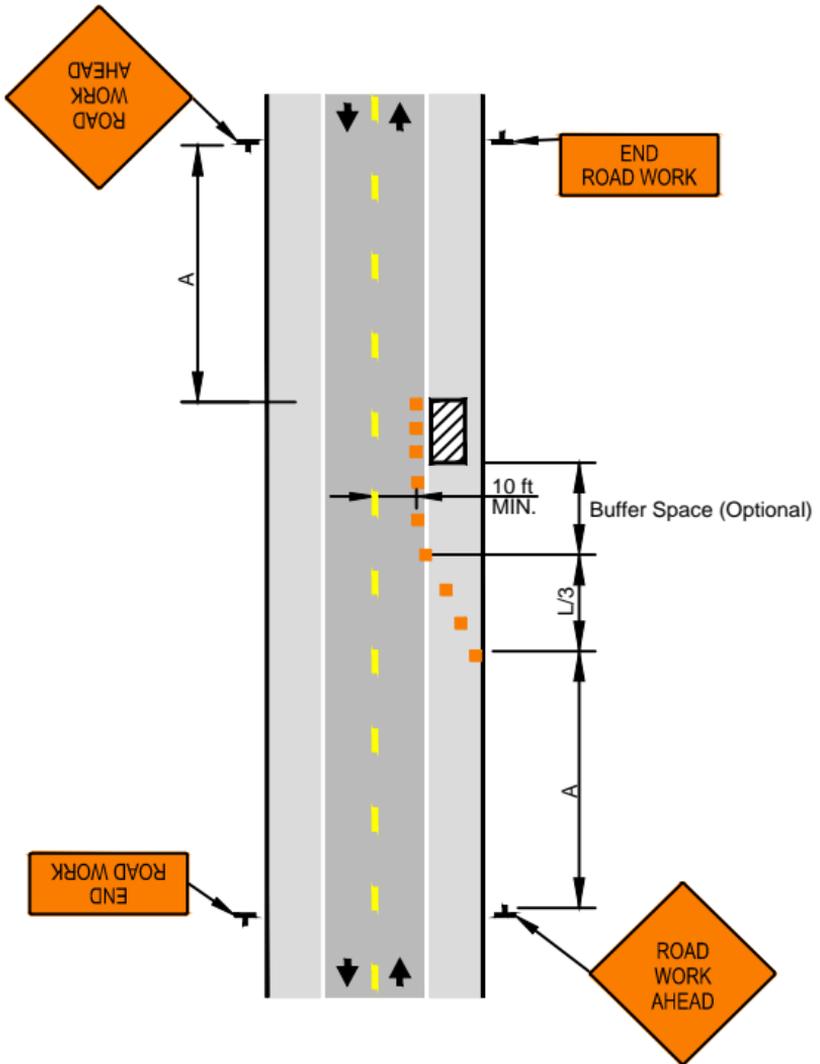
TYPICAL RIGHT TURN LANE CLOSURE



NOTES:

1. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE 10'-20' APART.
2. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA BETWEEN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MILES PER HOUR.
3. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A DOWNSTREAM TAPER SHOULD BE APPROXIMATELY 20'.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
5. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
6. THIS TYPICAL APPLICATION APPLIES WHEN BI-DIRECTIONAL TRAFFIC CAN MOVE FREELY AT REDUCED SPEEDS THROUGH THE WORK AREA.

**TYPICAL LANE CLOSURE**  
**TWO-LANE RESIDENTIAL STREET**  
 (LOW TRAFFIC VOLUME)



**NOTES:**

**1. TAPER FORMULAS:**

$L = WS$  FOR SPEEDS OF 45 OR MORE

$L = WS^2/60$  FOR SPEEDS OF 40 OR LESS

WHERE :  $L$  = MINIMUM LENGTH OF TAPER

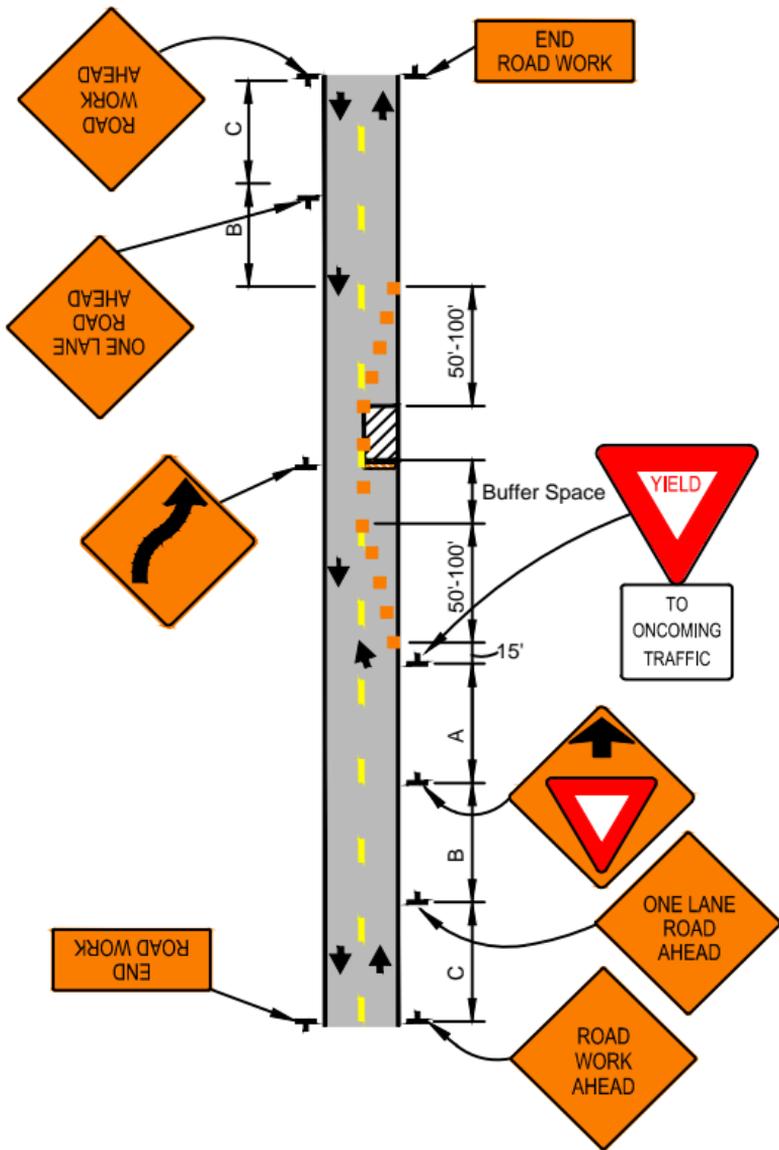
$S$  = NUMERICAL VALUE OF POSTED SPEED LIMIT

PRIOR TO WORK OR 85TH PERCENTILE SPEED

$W$  = WIDTH OF OFFSET

2. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
3. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

**MINOR ENCROACHMENT ON ROADWAY**  
**TWO-LANE ARTERIAL OR COLLECTOR STREET**



**NOTES:**

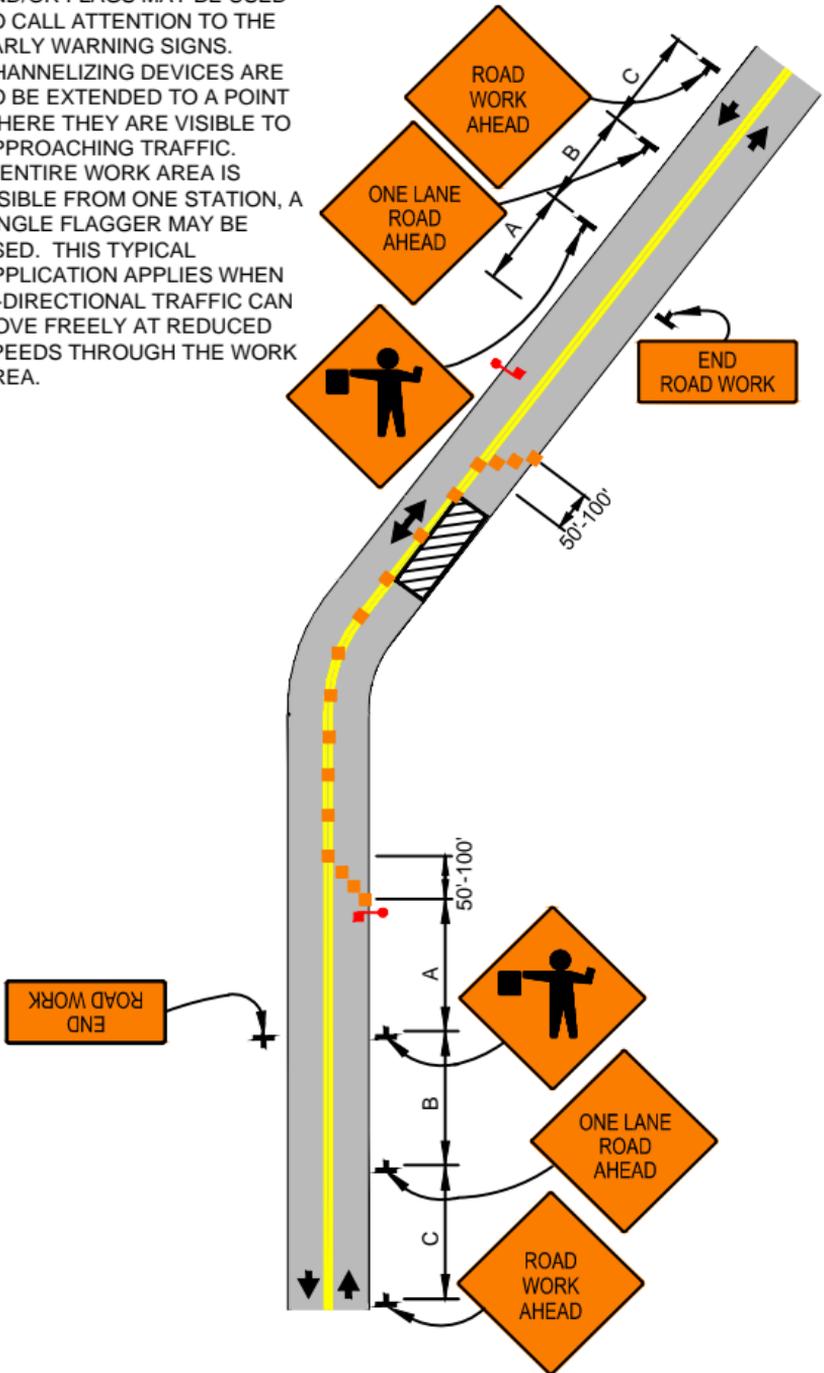
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2. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT.
3. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A DOWNSTREAM TAPER SHOULD BE APPROXIMATELY 20'.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
5. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
6. ROAD USERS FROM BOTH DIRECTIONS SHOULD BE ABLE TO SEE APPROACHING VEHICLE TRAFFIC THROUGH AND BEYOND THE WORKSITE AND HAVE SUFFICIENT VISIBILITY OF APPROACHING VEHICLES.
7. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.

**TYPICAL LANE CLOSURE**  
**TWO-LANE ARTERIAL OR COLLECTOR STREET**

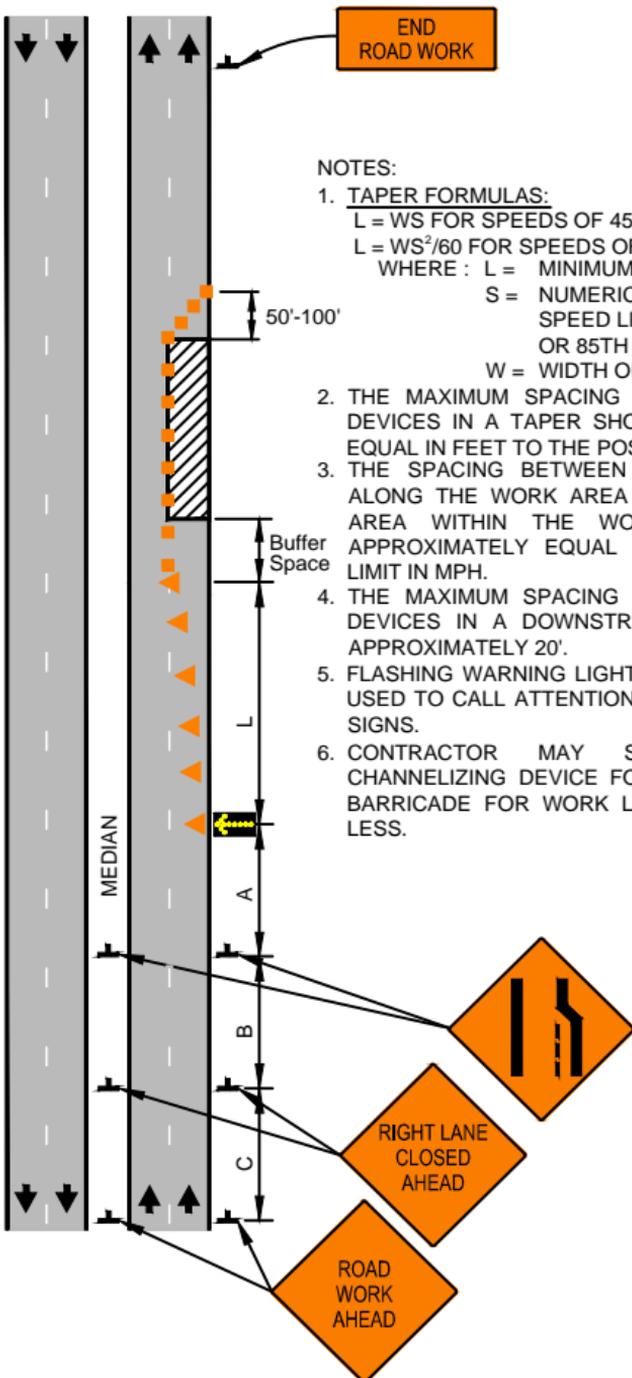
(LOW TRAFFIC VOLUME AND ADEQUATE SIGHT DISTANCE)

NOTES:

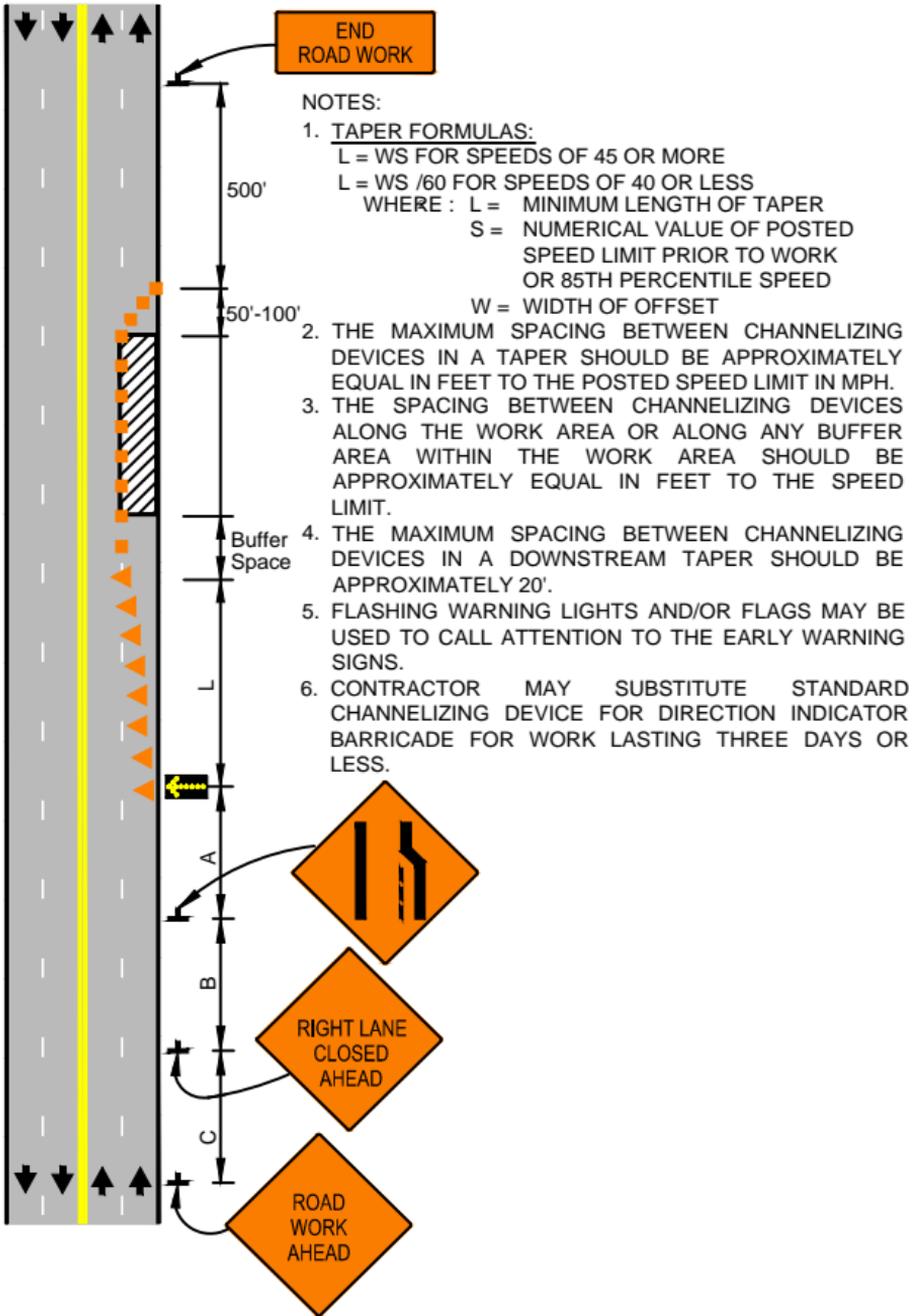
1. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE 10'-20' APART.
2. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT.
3. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A DOWNSTREAM TAPER SHOULD BE APPROXIMATELY 20'.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
5. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
6. IF ENTIRE WORK AREA IS VISIBLE FROM ONE STATION, A SINGLE FLAGGER MAY BE USED. THIS TYPICAL APPLICATION APPLIES WHEN BI-DIRECTIONAL TRAFFIC CAN MOVE FREELY AT REDUCED SPEEDS THROUGH THE WORK AREA.



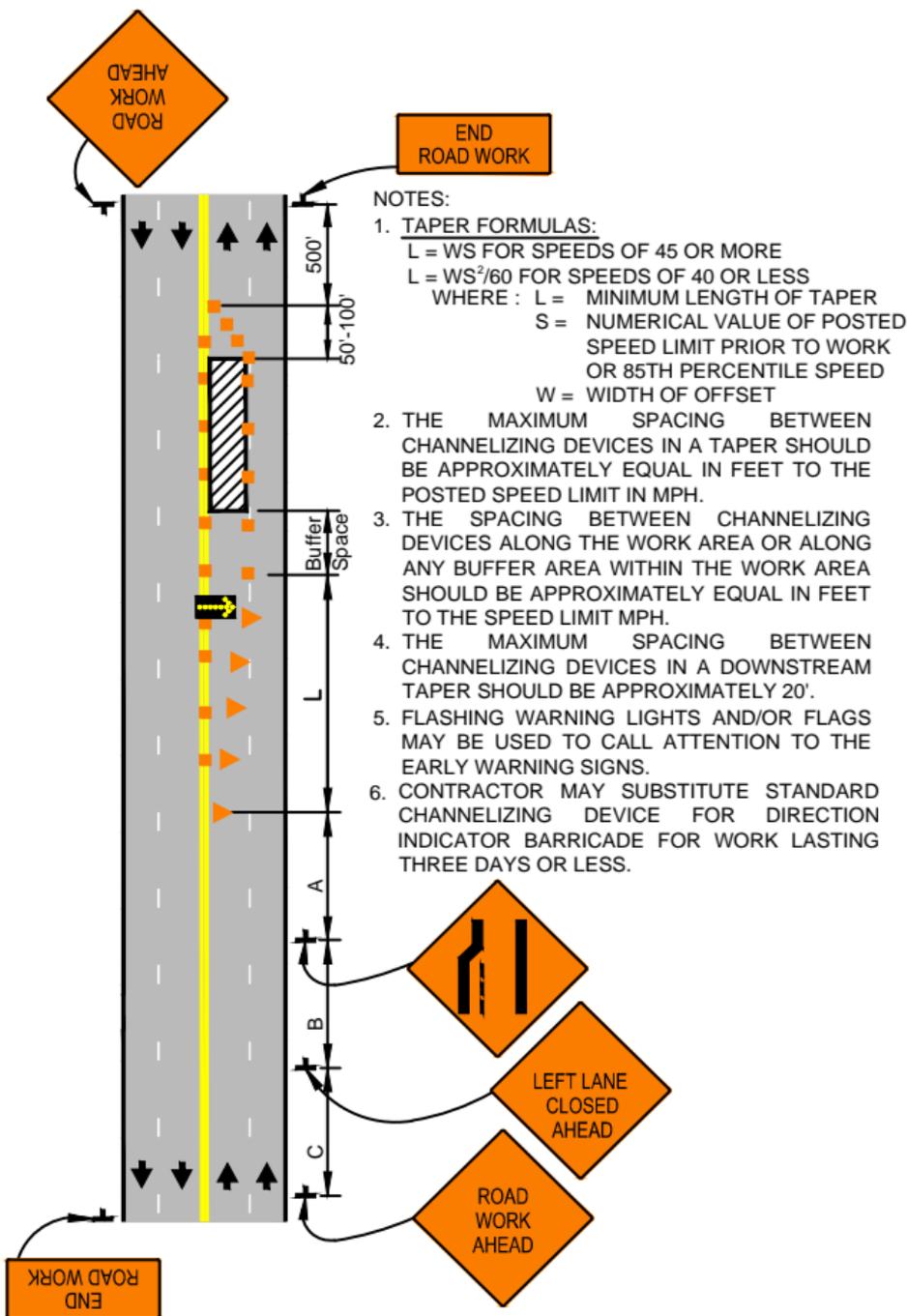
TYPICAL LANE CLOSURE ON  
TWO-LANE ROAD USING FLAGGERS



TYPICAL RIGHT LANE CLOSURE  
FOUR-LANE DIVIDED THOROUGHFARE

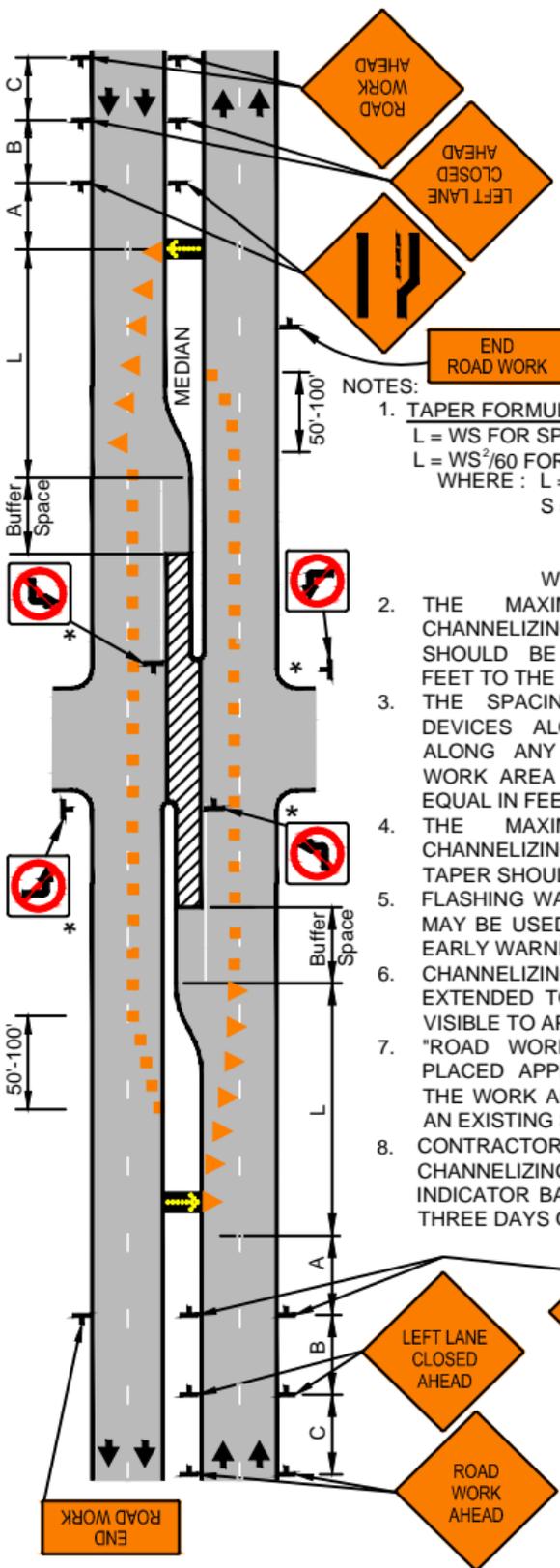


TYPICAL RIGHT LANE CLOSURE  
FOUR-LANE UNDIVIDED THOROUGHFARE



TYPICAL LEFT LANE CLOSURE  
FOUR-LANE UNDIVIDED THOROUGHFARE



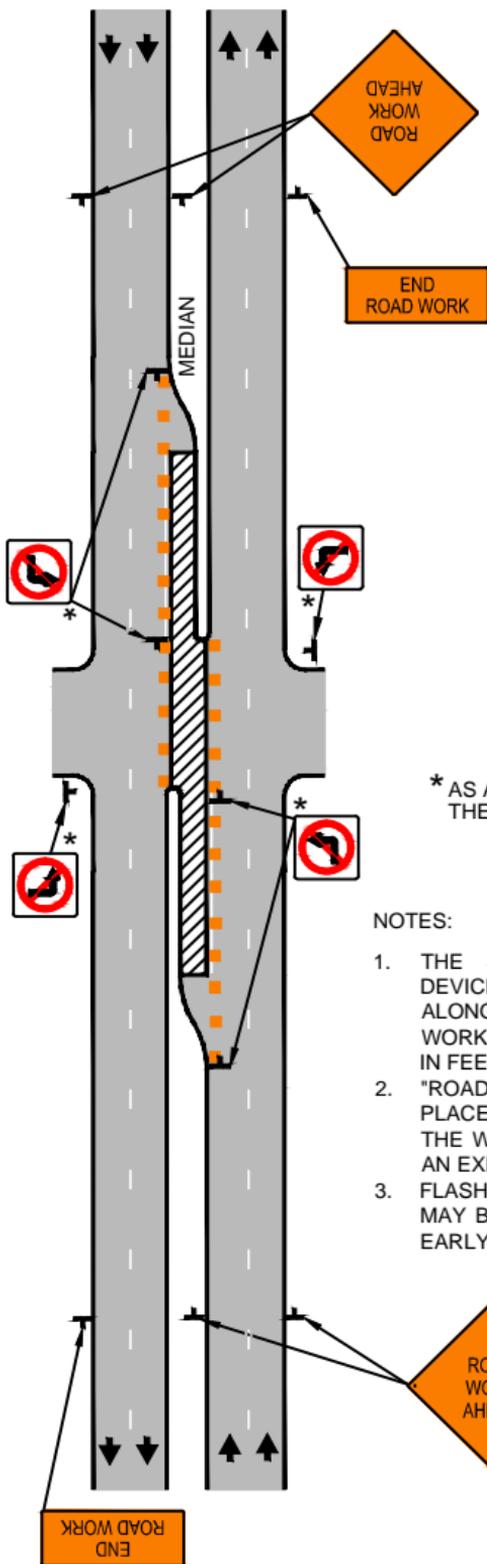


\* AS APPROVED BY THE ENGINEER

NOTES:

1. TAPER FORMULAS:  
 $L = WS$  FOR SPEEDS OF 45 OR MORE  
 $L = WS^2/60$  FOR SPEEDS OF 40 OR LESS  
 WHERE : L = MINIMUM LENGTH OF TAPER  
 S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK OR 85TH PERCENTILE SPEED  
 W = WIDTH OF OFFSET
2. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
3. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
4. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A DOWNSTREAM TAPER SHOULD BE APPROXIMATELY 20'.
5. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
6. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
7. "ROAD WORK AHEAD" SIGNS SHALL BE PLACED APPROXIMATELY 250 FEET FROM THE WORK AREA ON THE APPROACHES OF AN EXISTING SIDE STREET
8. CONTRACTOR MAY SUBSTITUTE STANDARD CHANNELIZING DEVICE FOR DIRECTION INDICATOR BARRICADE FOR WORK LASTING THREE DAYS OR LESS.

**MEDIAN CUT MULTI-LANE DIVIDED ROADWAY  
 TYPICAL APPLICATION  
 DURING CONSTRUCTION PERIODS**



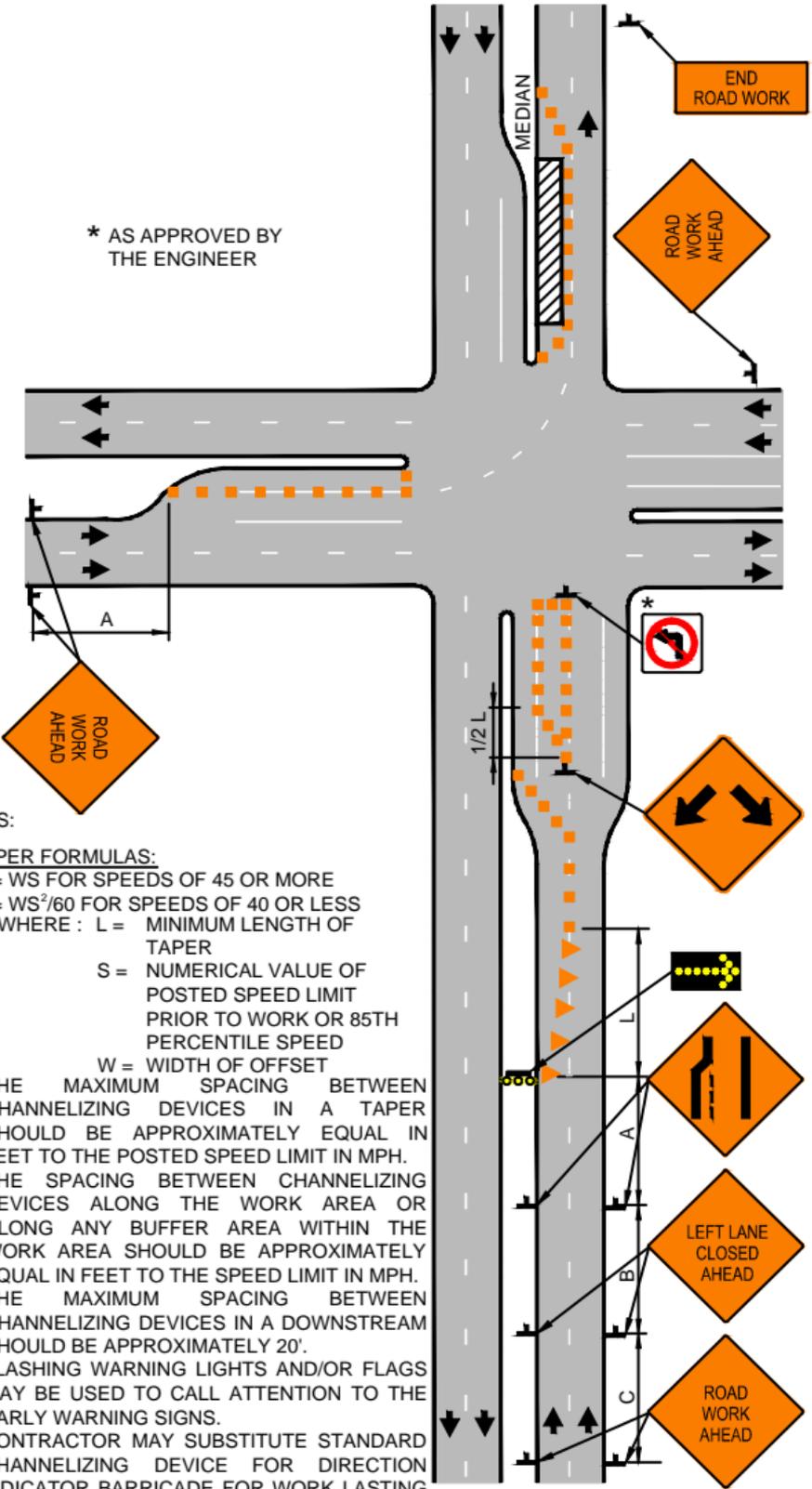
\* AS APPROVED BY THE ENGINEER

NOTES:

1. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
2. "ROAD WORK AHEAD" SIGNS SHALL BE PLACED APPROXIMATELY 250 FEET FROM THE WORK AREA ON THE APPROACHES OF AN EXISTING SIDE STREET.
3. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

MEDIAN CUT MULTI-LANE DIVIDED ROADWAY  
TYPICAL APPLICATION  
NON-CONSTRUCTION PERIODS

\* AS APPROVED BY THE ENGINEER

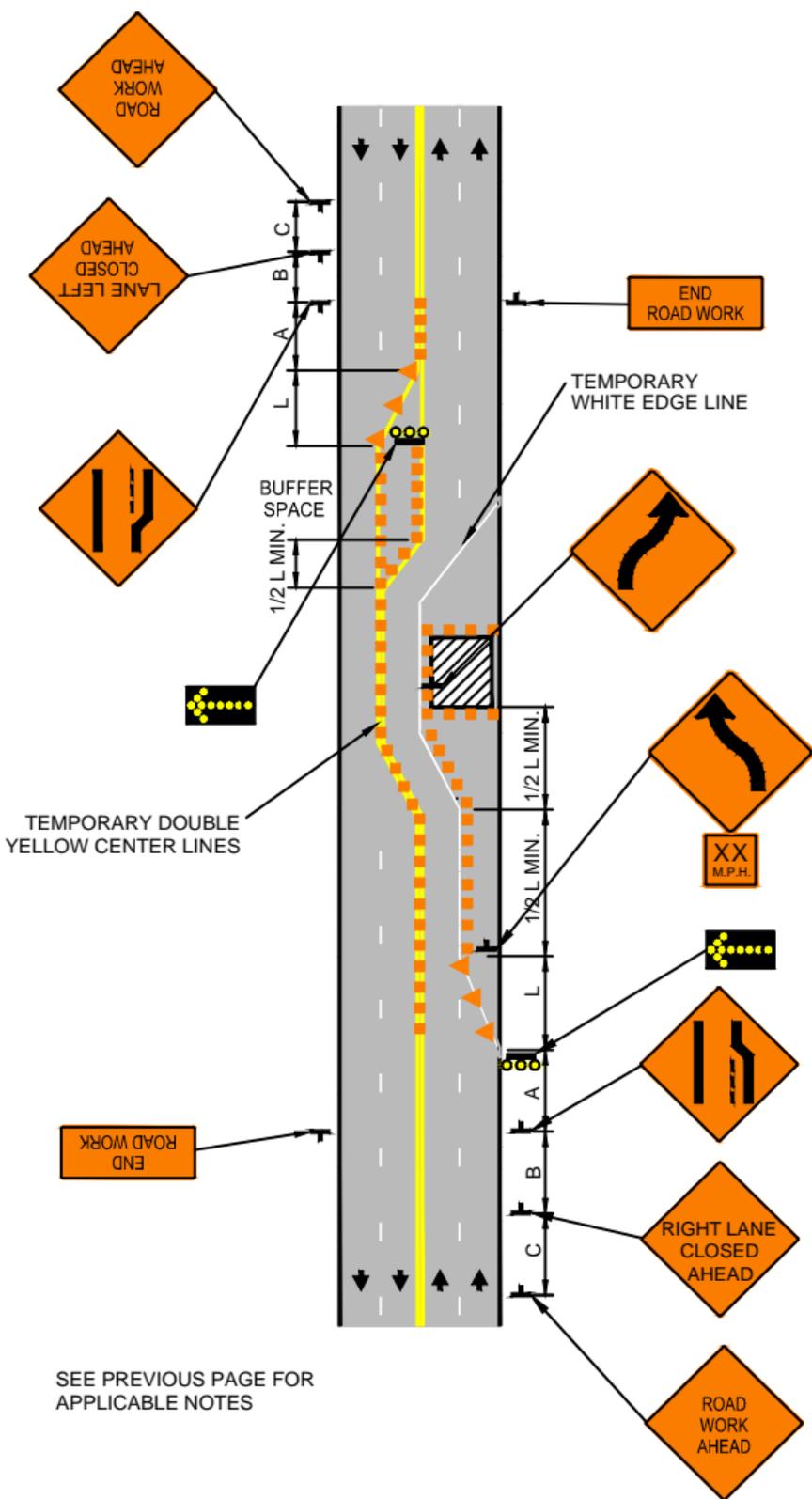


NOTES:

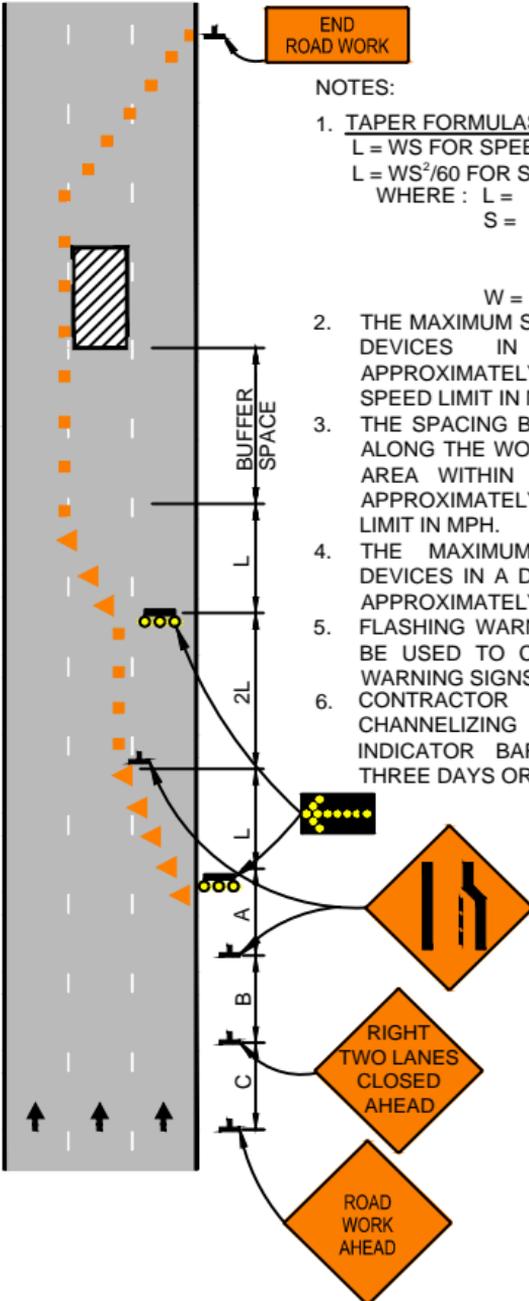
- TAPER FORMULAS:**  
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 $L = WS^2/60$  FOR SPEEDS OF 40 OR LESS  
 WHERE :  $L$  = MINIMUM LENGTH OF TAPER  
 $S$  = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK OR 85TH PERCENTILE SPEED  
 $W$  = WIDTH OF OFFSET
- THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
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- THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A DOWNSTREAM SHOULD BE APPROXIMATELY 20'.
- FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
- CONTRACTOR MAY SUBSTITUTE STANDARD CHANNELIZING DEVICE FOR DIRECTION INDICATOR BARRICADE FOR WORK LASTING THREE DAYS OR LESS.

TYPICAL LEFT LANE CLOSURE  
PROVIDING ACCESS TO LEFT TURN LANE





FOUR-LANE UNDIVIDED THOROUGHFARE  
ONE-HALF ROADWAY CLOSURE



END ROAD WORK

NOTES:

1. TAPER FORMULAS:

$L = WS$  FOR SPEEDS OF 45 OR MORE

$L = WS^2/60$  FOR SPEEDS OF 40 OR LESS

WHERE : L = MINIMUM LENGTH OF TAPER

S = NUMERICAL VALUE OF POSTED

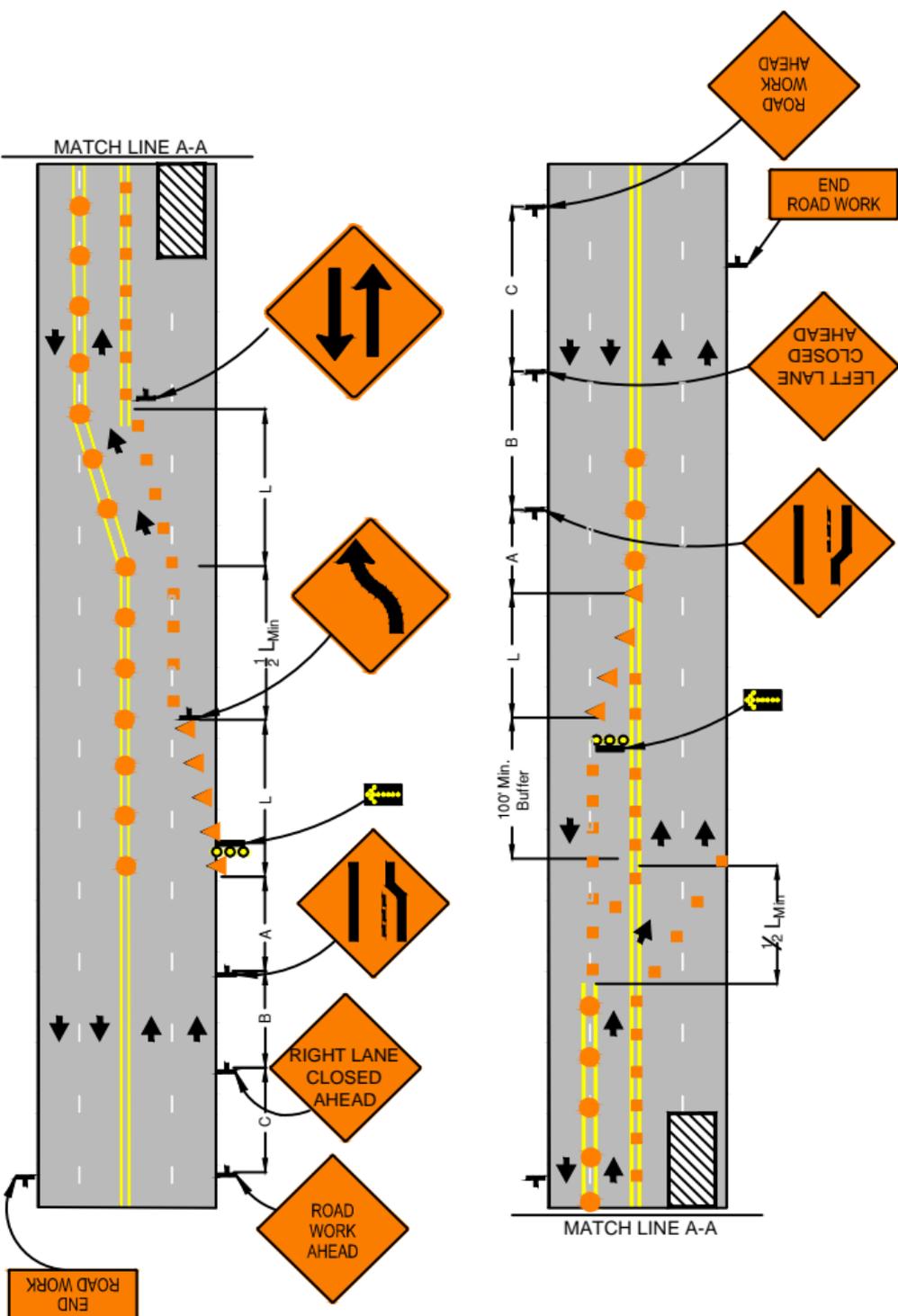
SPEED LIMIT PRIOR TO WORK OR

85TH PERCENTILE SPEED

W = WIDTH OF OFFSET

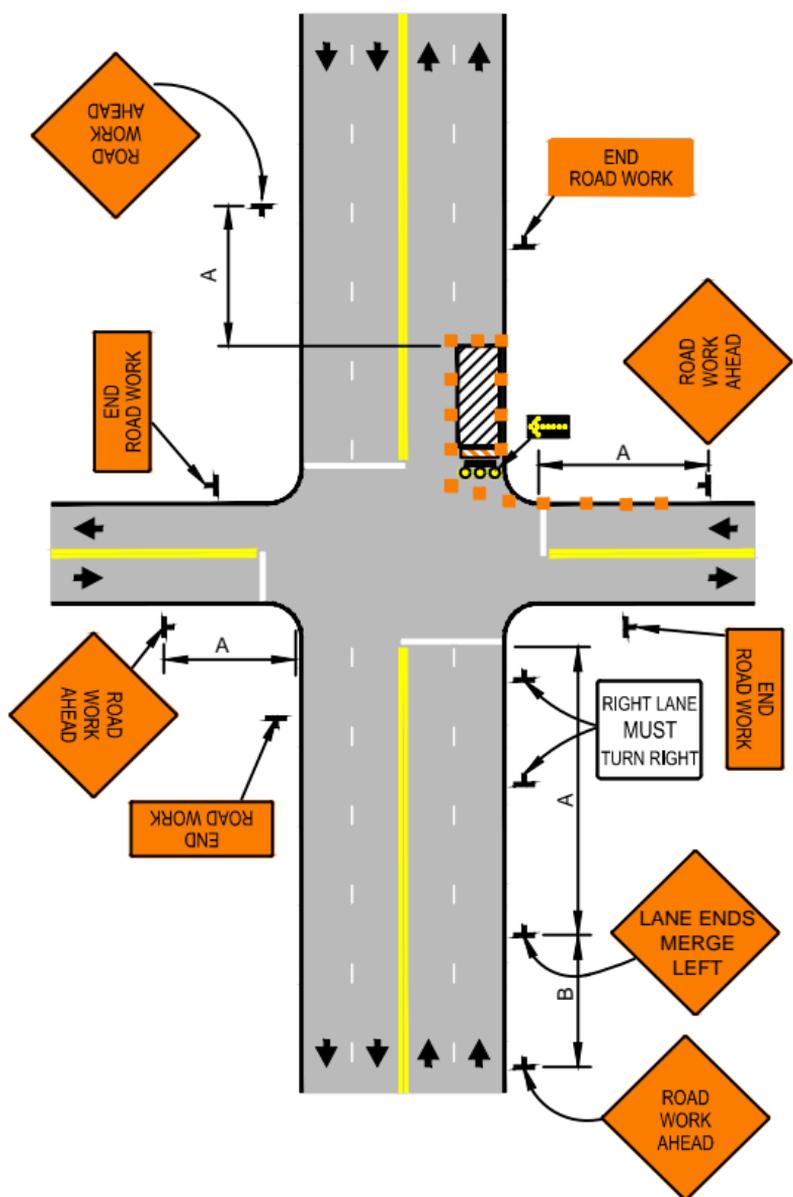
2. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
3. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
4. THE MAXIMUM SPACING OF CHANNELIZING DEVICES IN A DOWNSTREAM TAPER SHOULD BE APPROXIMATELY 20'.
5. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
6. CONTRACTOR MAY SUBSTITUTE STANDARD CHANNELIZING DEVICE FOR DIRECTION INDICATOR BARRICADE FOR WORK LASTING THREE DAYS OR LESS.

THOROUGHFARE DOUBLE LANE CLOSURE



SEE PREVIOUS PAGE FOR APPLICABLE NOTES

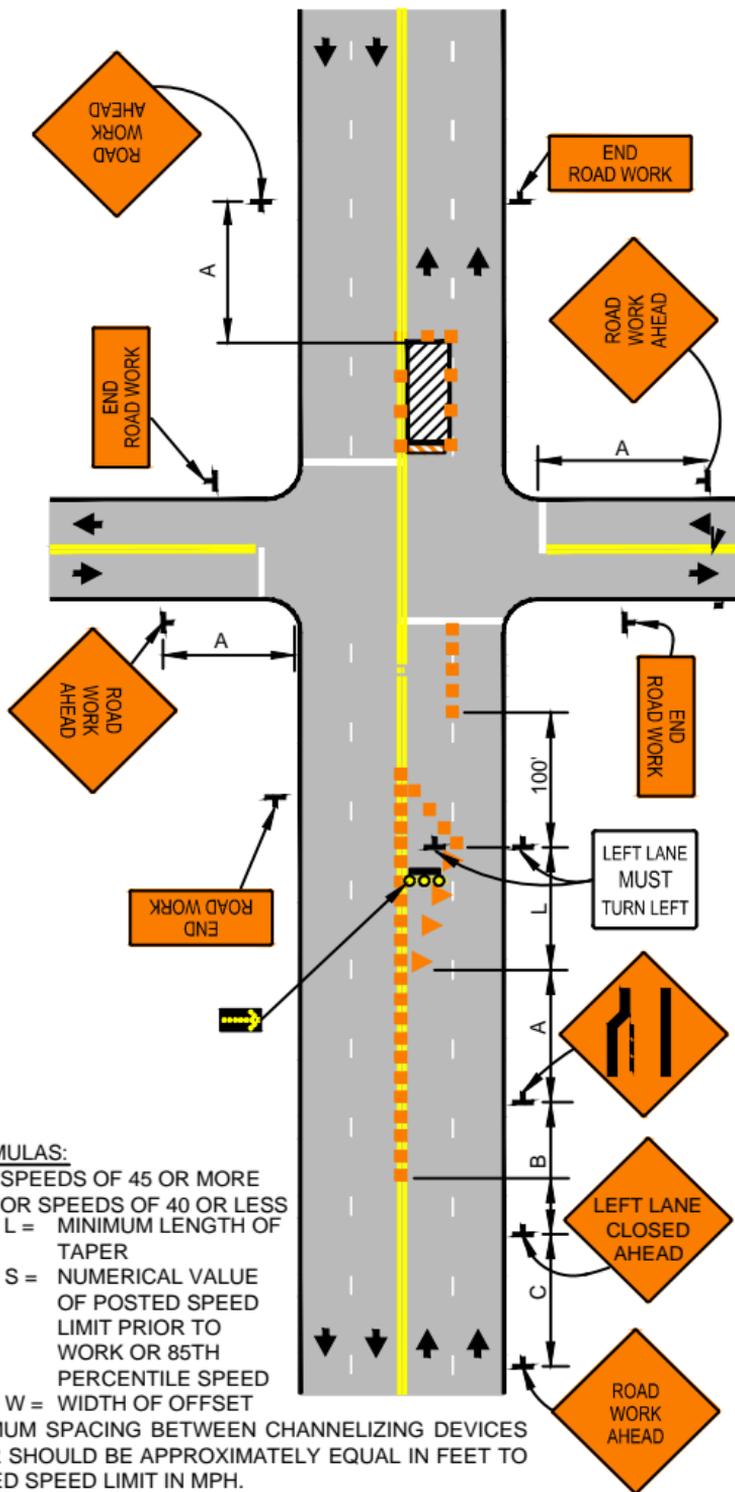
TYPICAL DOUBLE LANE CLOSURE ON FOUR-LANE UNDIVIDED THOROUGHFARE



NOTES:

1. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
2. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

RIGHT LANE CLOSURE  
ON FAR SIDE OF INTERSECTION



**NOTES:**

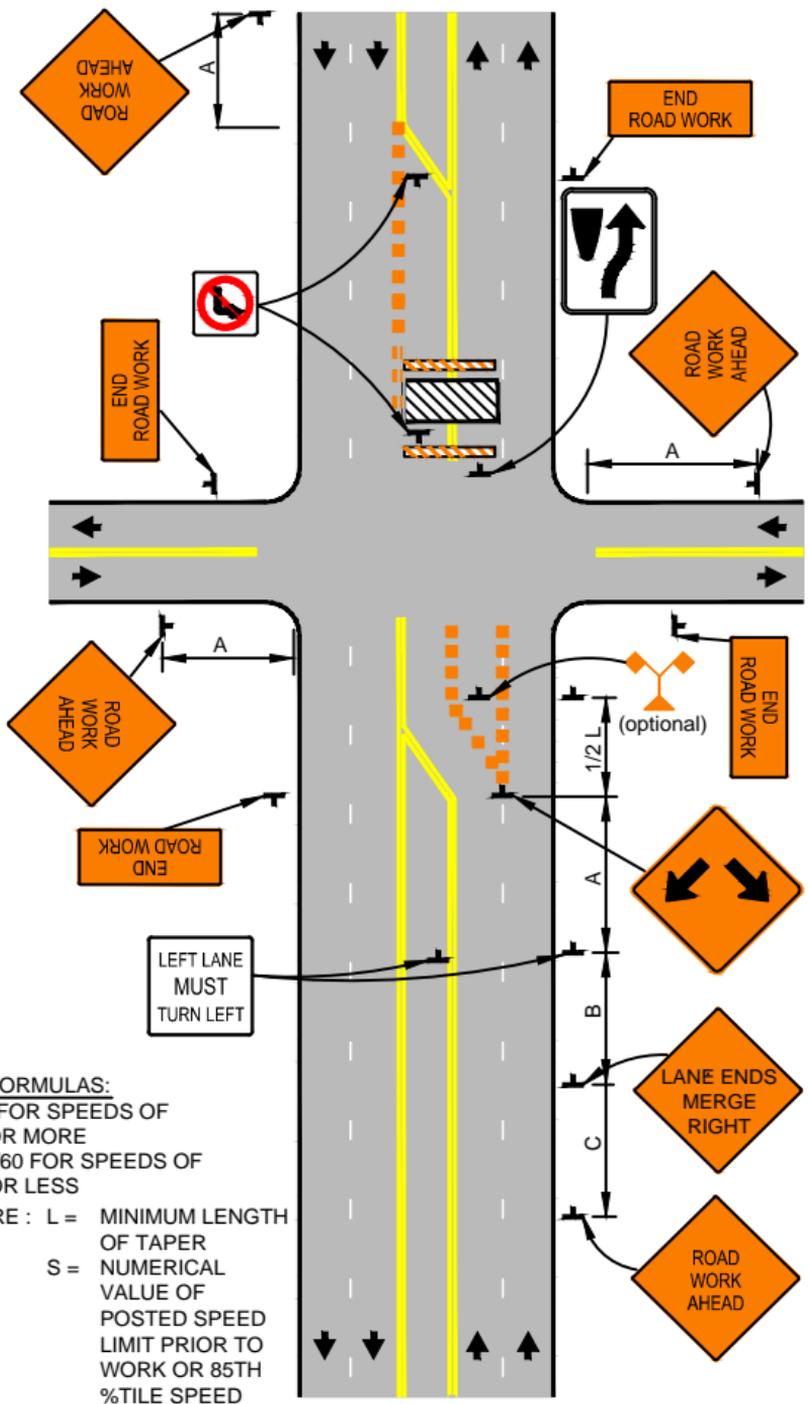
**1. TAPER FORMULAS:**

$L = WS$  FOR SPEEDS OF 45 OR MORE  
 $L = WS^2/60$  FOR SPEEDS OF 40 OR LESS  
 WHERE : L = MINIMUM LENGTH OF TAPER

S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK OR 85TH PERCENTILE SPEED  
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2. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
3. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
5. CONTRACTOR MAY SUBSTITUTE STANDARD CHANNELIZING DEVICE FOR DIRECTION INDICATOR BARRICADE FOR WORK LASTING THREE DAYS OR LESS.

**LEFT LANE CLOSURE**  
**ON FAR SIDE OF INTERSECTION**



**NOTES:**

**1. TAPER FORMULAS:**

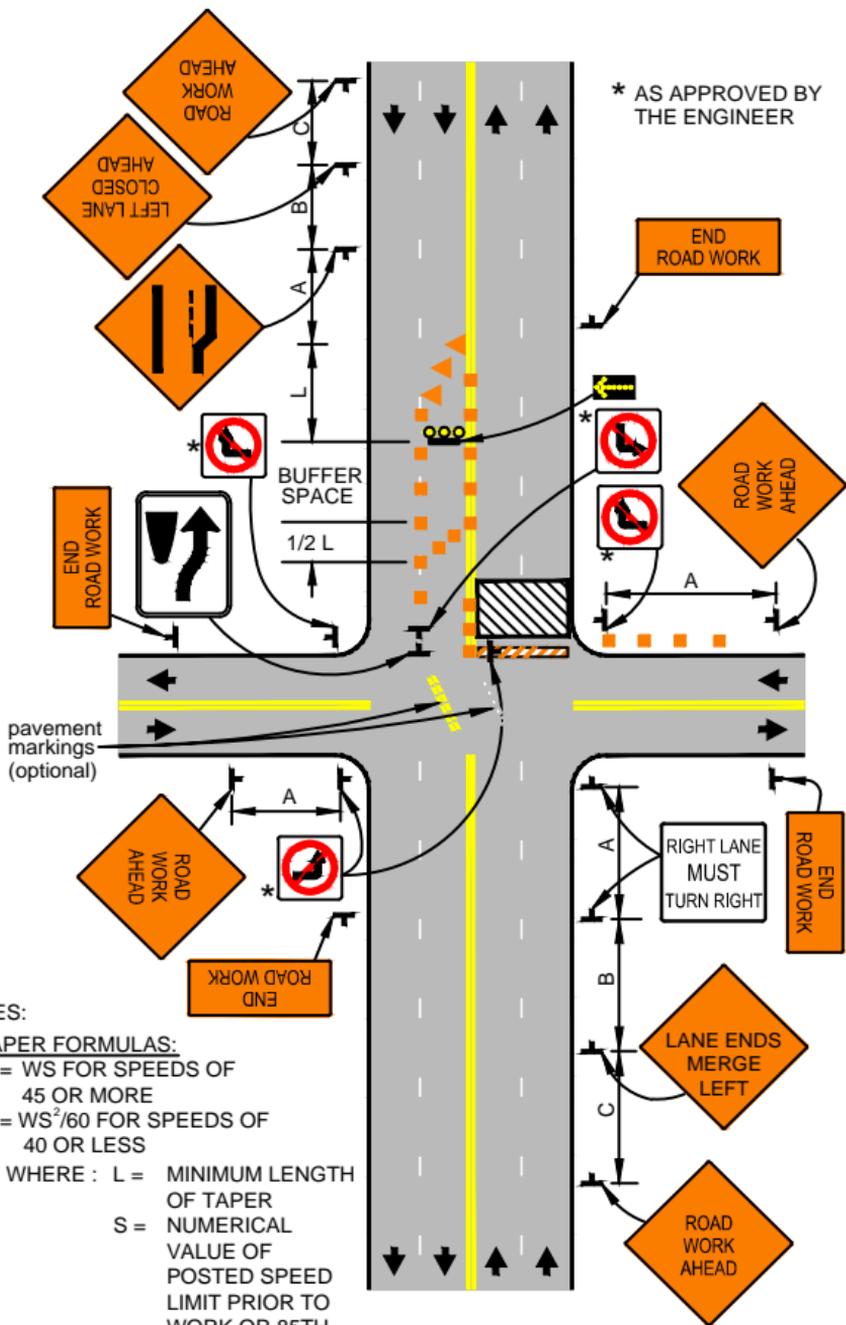
$L = WS$  FOR SPEEDS OF 45 OR MORE

$L = WS^2/60$  FOR SPEEDS OF 40 OR LESS

WHERE : L = MINIMUM LENGTH OF TAPER  
 S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK OR 85TH %TILE SPEED  
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3. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

**MULTIPLE LANE CLOSURE AT INTERSECTION**



**NOTES:**

**1. TAPER FORMULAS:**

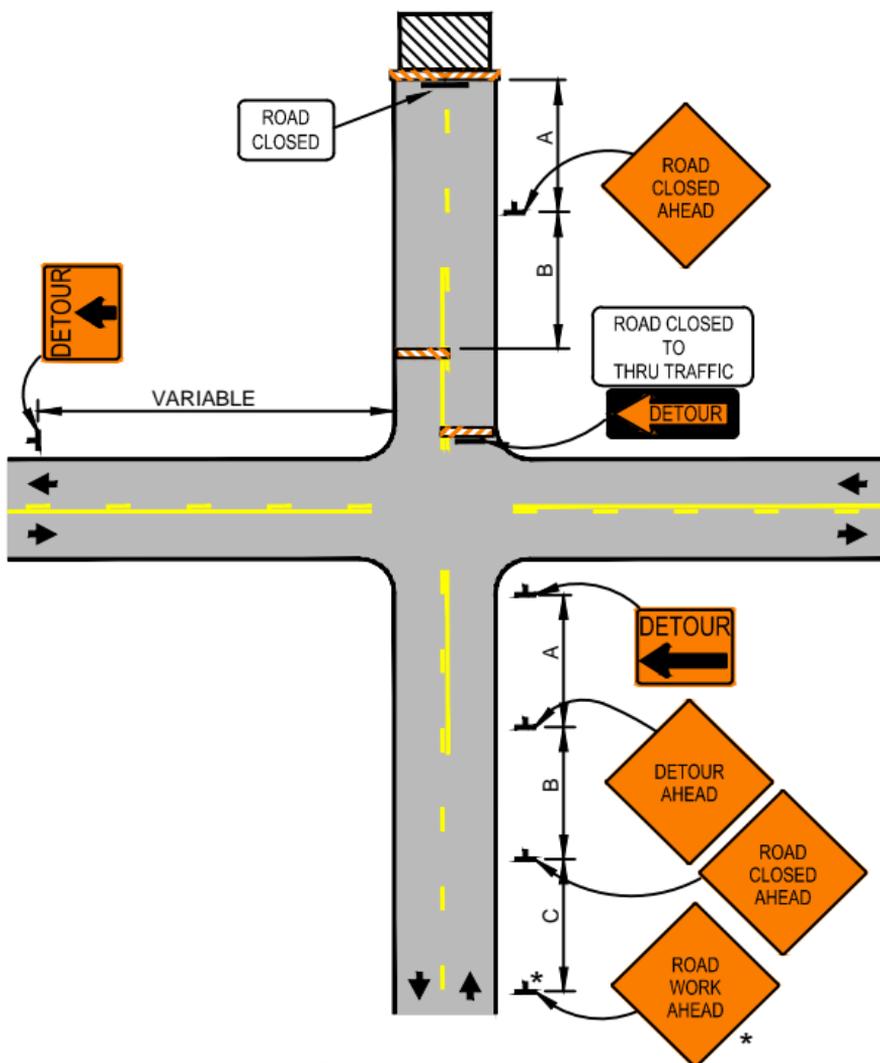
$L = WS$  FOR SPEEDS OF 45 OR MORE

$L = WS^2/60$  FOR SPEEDS OF 40 OR LESS

WHERE : L = MINIMUM LENGTH OF TAPER  
 S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK OR 85TH %TILE SPEED  
 W = WIDTH OF OFFSET

2. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
3. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
4. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
5. CONTRACTOR MAY SUBSTITUTE STANDARD CHANNELIZING DEVICE FOR DIRECTION INDICATOR BARRICADE FOR WORK LASTING THREE DAYS OR LESS.

**HALF ROAD CLOSURE ON FAR SIDE OF INTERSECTION**

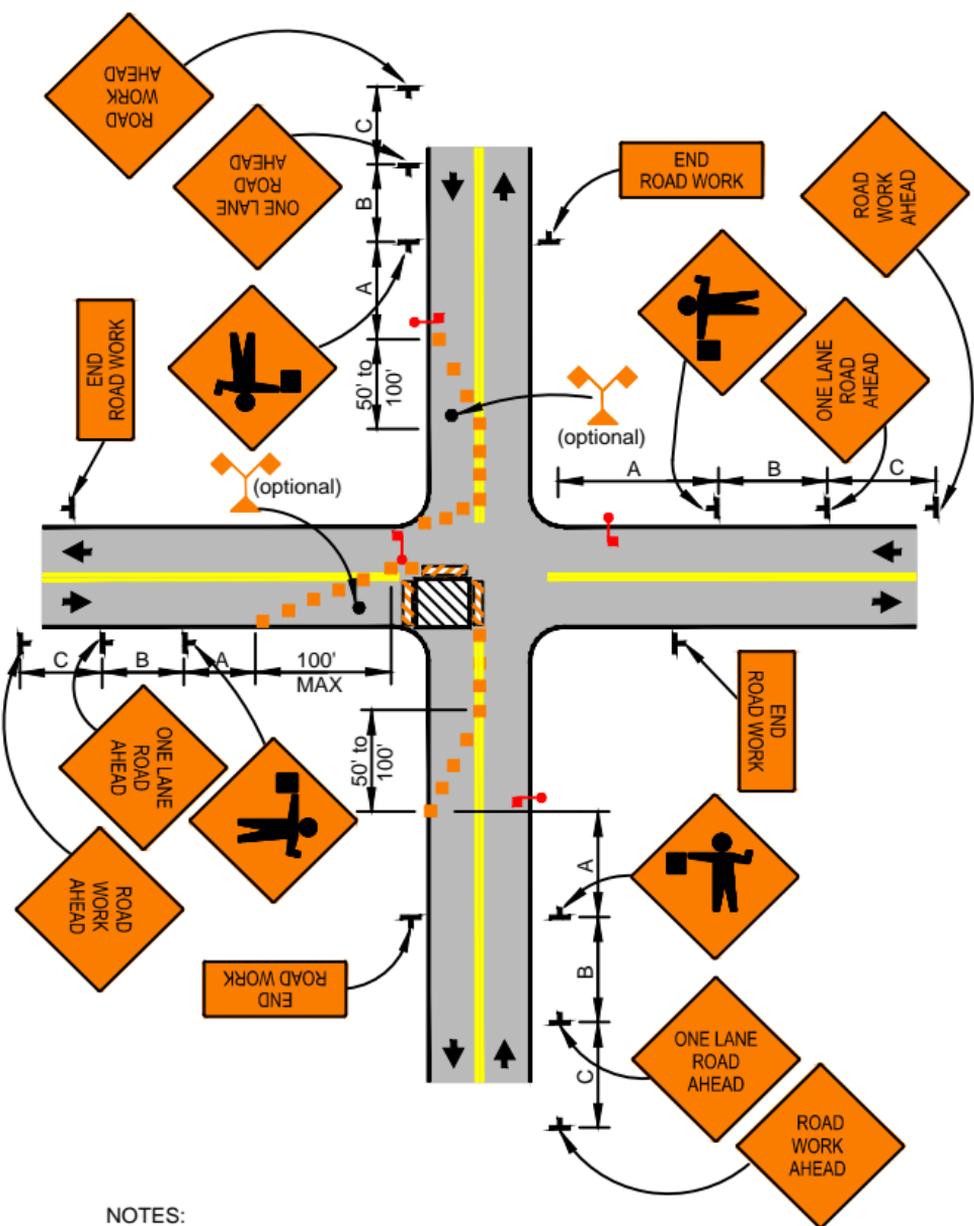


\* As approved by the Engineer.

NOTES:

1. THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT A FULL TRAFFIC DETOUR SIGNING PLAN TO THE CITY ENGINEER FOR APPROVAL.
2. THE CONTRACTOR SHALL BE REQUIRED TO CONTACT ALL EMERGENCY PROVIDERS TO NOTIFY THEM OF THE STREET CLOSURE.
3. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
4. ADVANCE LANE CLOSINGS OR TURN LANE CLOSURES WILL BE NECESSARY FOR STREETS WITH MULTI-LANE APPROACHES. CONSULT OTHER TYPICAL APPROPRIATE TRAFFIC CONTROL ARRANGEMENTS WITHIN THIS HANDBOOK.

STREET CLOSURE WITH OFF-SITE DETOUR

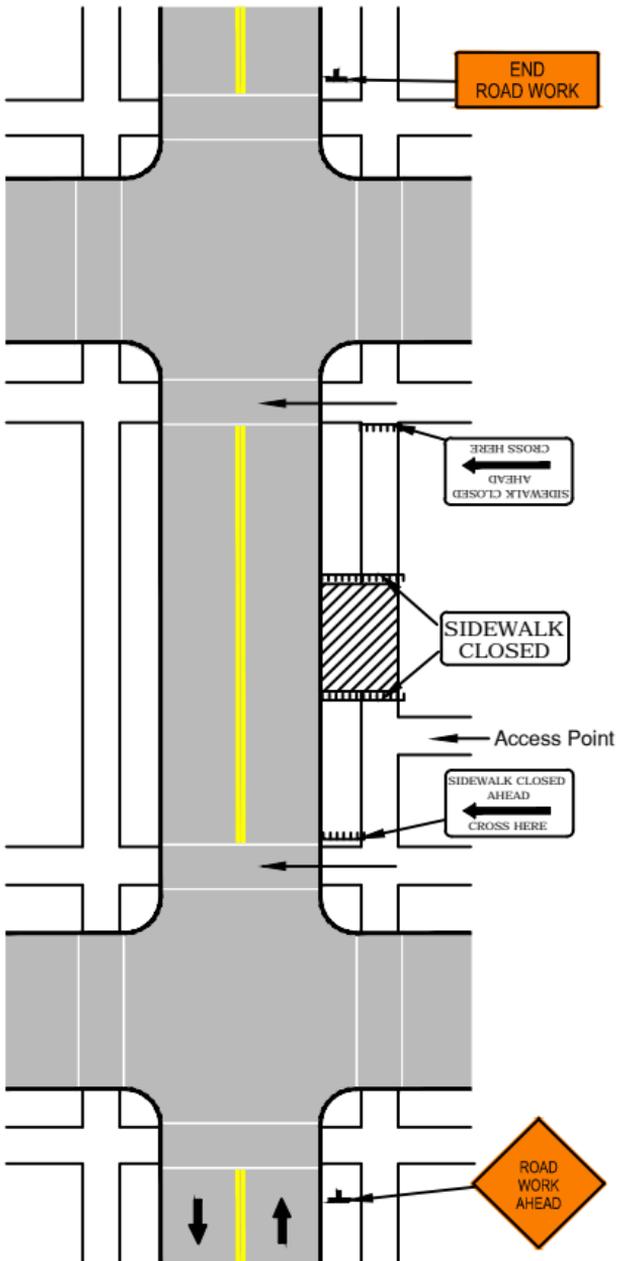


**NOTES:**

1. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE 10'-20' APART.
2. THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
3. FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.
4. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.

**CLOSURE AT SIDE OF INTERSECTION  
FOR RESIDENTIAL OR COLLECTOR STREETS**

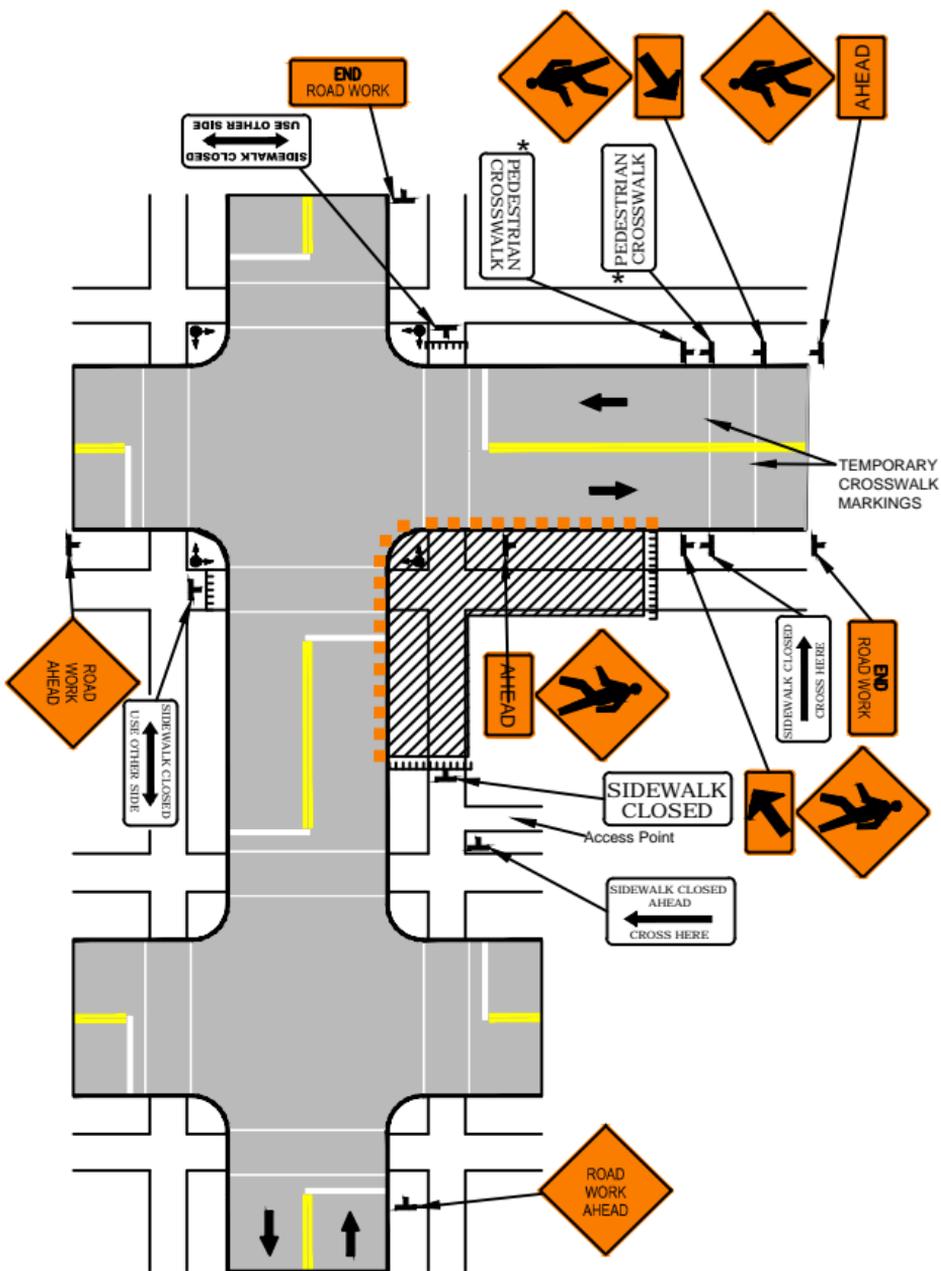




NOTES:

1. ONLY THE TRAFFIC CONTROL DEVICES FOR PEDESTRIANS ARE SHOWN. OTHER DEVICES MAY BE REQUIRED TO CONTROL VEHICULAR TRAFFIC.
2. ONLY THE TRAFFIC CONTROL DEVICES FOR PEDESTRIANS ARE SHOWN. OTHER DEVICES MAY BE REQUIRED TO CONTROL VEHICULAR TRAFFIC.

SIDEWALK CLOSURE

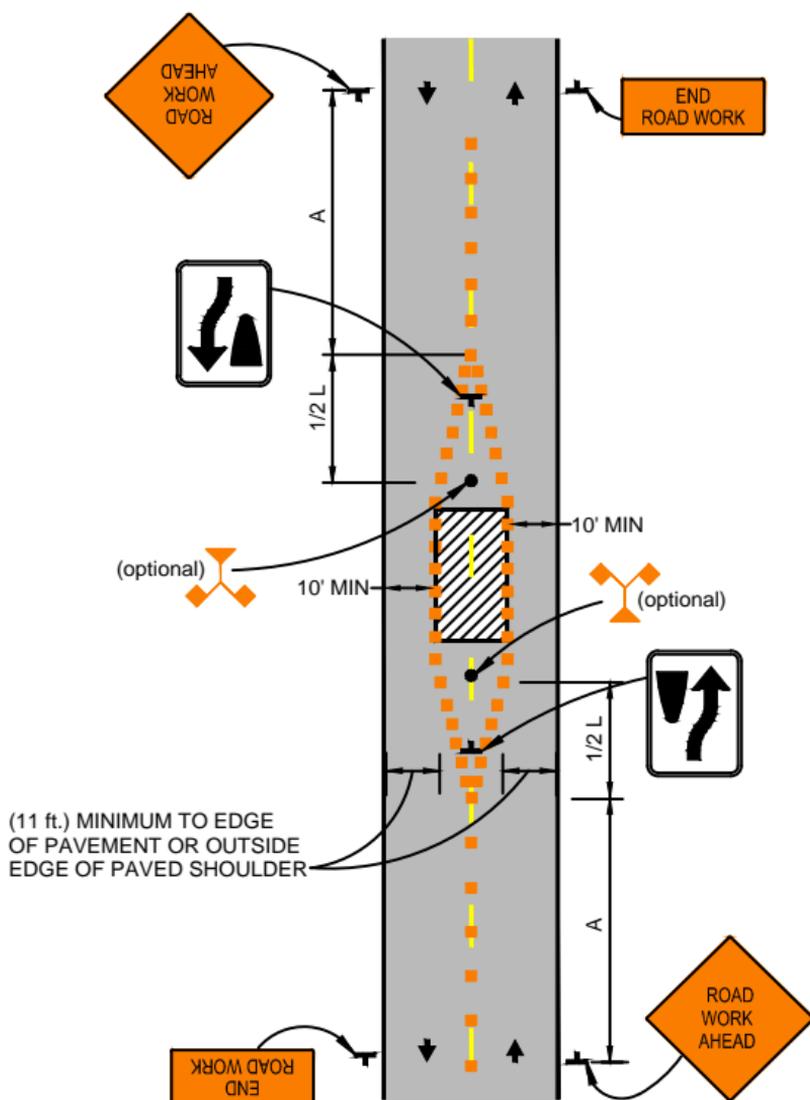


\* OPTIONAL

NOTES:

1. FOR LONG-TERM STATIONARY WORK, THE DOUBLE YELLOW CENTERLINE AND/OR LANE LINES SHOULD BE REMOVED BETWEEN THE CROSSWALK LINES.
2. ONLY THE TRAFFIC CONTROL DEVICES FOR PEDESTRIANS ARE SHOWN. OTHER DEVICES MAY BE REQUIRED TO CONTROL VEHICULAR TRAFFIC.

SIDEWALK CLOSURE WITH  
TEMPORARY PEDESTRIAN CROSSING



NOTES:

- TAPER FORMULAS:**  
 $L = WS$  FOR SPEEDS OF 45 OR MORE  
 $L = WS^2/60$  FOR SPEEDS OF 40 OR LESS  
 WHERE : L = MINIMUM LENGTH OF TAPER  
 S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK OR 85TH PERCENTILE SPEED  
 W = WIDTH OF OFFSET
- THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT IN MPH.
- THE SPACING BETWEEN CHANNELIZING DEVICES ALONG THE WORK AREA OR ALONG ANY BUFFER AREA WITHIN THE WORK AREA SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- FLASHING WARNING LIGHTS AND/OR FLAGS MAY BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

WORK IN CENTER OF RESIDENTIAL OR COLLECTOR WITH LOW TRAFFIC VOLUMES

Length and Device Spacing for Lane Closure  
& Channelizing Tapers

Speed Limit	Minimum Taper Length (L) in Feet			Min. No. of Devices for Taper	Maximum Device Spacing
MPH	Lane Width (W) in Feet			(12 ft lane)	In Feet
	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

$$L = WS \quad S \geq 45 \text{ MPH}$$

$$L = WS^2/60 \quad S \leq 40 \text{ MPH}$$

L = Minimum Taper Length (Feet)

W = Width of Offset (Feet)

S = Posted Speed Limits Prior to Construction (MPH)

**NOTE:** LENGTH OF DOWNSTREAM TAPER TO BE BETWEEN 50' AND 100' WITH DEVICE SPACING OF 20'.