

## PREFACE

Any interpretation or clarification regarding the *City of Dallas Traffic Barricade Manual* **shall** be made by the City's Traffic Engineer.

The City Traffic Engineer will periodically review this *Manual* and make changes or updates that reflect the most current revisions to the *Texas Manual on Uniform Traffic Control Devices (TMUTCD)*.

The illustrations in this *Manual* are not intended to recommend the use of specific traffic control devices or traffic control techniques. The drawings and figures included in this *Manual* illustrate examples of suggested traffic control devices and traffic control techniques. Engineering judgment must be used to meet the requirements of this *Manual*.

In this *Manual*, the words "shall", "should", and "may" are used to describe specific conditions. To clarify the use of these terms, the following definitions apply:

- **SHALL**- A mandatory condition where certain requirements described in this *Manual* must be met. Violations of the "**shall**" stipulation could result in a fine.
- **SHOULD**- An advisory condition where certain actions are recommended, but not mandatory. Violations of "**should**" provisions could result in a notice of violation being issued.
- **MAY**- A permissive condition where no requirement for design, application, or standards is intended.

Any section of this *Manual* which **does not** specify a "shall," "should," or "may" condition could still result in a penalty or fine.

## ACKNOWLEDGEMENTS

The 2011 edition of the City of Dallas, *Traffic Barricade Manual* was developed based on the field experience of the City's most experienced traffic control inspectors, professional traffic engineers and other City staff members.

At the direction of the City Traffic Engineer, a committee was formed to address the overall needs of the City. This Traffic Barricade Committee focused on three goals. The first goal was to update the City's *Traffic Barricade Manual*. The Committee's second goal was to evaluate each City department's traffic control equipment and implement standardization throughout the City. Finally, the Committee realized the need to increase training and awareness for City staff working within the City's right-of-way.

The City is appreciative for the time and effort shown by the Traffic Barricade Committee.

The City Traffic Engineer would like to thank the following City Departments for their support and assistance in creating this Manual:

- Public Works and Transportation
- Street Operations
- Parks Department
- Dallas Water Utilities
- Office of Special Events
- City Attorney's Office

The City of Dallas would also like to thank the following companies for their guidance and input:

- Altus Traffic Management
- Buyers Barricades
- Dallas Lite and Barricades
- Utility Companies serving Dallas

## INTRODUCTION

This *City of Dallas Traffic Barricade Manual* (henceforth referred to as the “*Manual*”) was prepared for persons working in and near public right-of-ways in the City of Dallas.

The primary function of this *Manual* is to promote the safe and efficient movement of people and goods by providing traffic safety guidelines for persons working in or near the public right-of-way. The City Traffic Engineer, shall be the authorized person within the City of Dallas to coordinate all activities in the public right-of-way. It is necessary to have this person acting as a liaison between City departments and external entities. Chapter 28 of the *City of Dallas Code* requires the Traffic Engineer to maintain safe and efficient movement of traffic in the City and to prescribe a traffic barricade manual. The successful movement of people and goods will require good communication, coordination, and cooperation with other City departments and external entities.

This *Manual* will provide guidelines and requirements that must meet or exceed those issued by the Federal and *Texas Manuals on Uniform Traffic Control Devices* (henceforth referred to as the “*TMUTCD*”). This *Manual* was written as a guide which focuses on the needs of persons working on city streets or in an urban setting. This is in full agreement with the *TMUTCD* which specifies in Section 1A.09 (Engineering Study and Engineering Judgment), that the *TMUTCD* should not be considered “a substitute for engineering judgment.” This concept is important since no single document can address the diverse conditions a practitioner faces in controlling traffic on city streets.

The conditions on freeways and high speed rural roads are different than those on slower speed urban streets. The urban engineer is confronted with other factors when developing traffic control plans. These factors include:

- Pedestrians (including those with disabilities) and bicyclists
- Buses, light rail, and other forms of public transit
- Egress and ingress demands every 50 feet
- Short city blocks with intersections every 150 feet
- Economic impact to abutting commercial properties

This *Manual* provides guidance for implementing the most effective temporary traffic control for urban streets. This was achieved with input from City staff and interested contractors who contributed data and ideas for this *Manual*.

For addition copies of this *Manual* please go to following link:  
[www.dallascityhall.org/pwt/manuals\\_construction\\_standards.html](http://www.dallascityhall.org/pwt/manuals_construction_standards.html)

## LEGAL AUTHORITY

The *Texas Manual on Uniform Traffic Control Devices* is incorporated by the **State Transportation Code § 544.001** and shall be recognized as the **Texas** standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel.

### **Section 1A.07 *TMUTCD* Responsibility for Traffic Control Devices**

“The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction.”

The legal authority for this *Manual* is derived from Chapter 28 Motor Vehicles and Traffic of the *City of Dallas Code*:

### **Section 28-24.1 Traffic Barricade Manual**

“The Traffic Engineer is authorized to prescribe a traffic barricade manual, conforming to the manual and specifications adopted by the Texas Transportation Commission, for providing barricades, warning signs, and other traffic control devices that alert the public to hazards caused by construction, repair, pavement excavation or cuts, or other uses requiring closure of any portion of a public street or public right-of-way.”

### **Applicability**

This *Manual*, with subsequent revisions, will be effective at the time of publication and supersede all previous versions and **shall** apply to all pedestrian and vehicular traffic control devices erected or used on public streets and right-of-ways in the City of Dallas.

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## DEFINITIONS

## **Section 1.0 General Requirements**

### **1.1 Permission for Street and Right-of-Way Closures**

Permission of the Traffic Engineer **shall** be required to completely or partially close streets or right-of-way within the City of Dallas. This requirement is in addition to any other permits issued by the City. Requests for closures **shall** be directed to the Transportation Operations Division staff at **(214) 670-6904 or City Hall, 1500 Marilla Street, Room L1BS, Dallas, TX 75201.**

Requests for any lane closure which involves rerouting of traffic over other streets (detours) **shall** be received by the Traffic Engineer's office a minimum of 5 working days in advance of the street closure in order that adequate preparation and notification can be issued to affected persons. All street closures lasting 3 days or longer **shall** include a Temporary Traffic Control (TTC) plan to be submitted to the Traffic Engineer's office.

Requests for any lane closure which will affect traffic within a signalized intersection or on a major or collector street **shall** be submitted to the Traffic Engineer's office at least 72 hours in advance of such closure.

Requests for any lane closure which will affect traffic on a residential street **shall** be received by the Traffic Engineer's office at least 48 hours in advance of such closure.

### **1.2 Permission to Install Temporary Traffic Control Devices**

All temporary traffic control devices placed or installed in accordance with this *Manual* **shall** be an official traffic control device of the City of Dallas. Any person who disobeys or disregards the instructions or requirements of any such traffic control device **shall** be guilty of a misdemeanor and upon conviction shall be subject to a fine as specified in **Chapter 28-24.1. (d) of the City of Dallas Code.**

### **1.3 Accommodating Traffic**

Repair work on any street within the Central Business District (CBD) and on any major or collector street outside the CBD **shall** not be permitted to interfere with peak traffic flow during the hours of **7 am to 9 am or 4 pm to 6 pm Mondays thru Fridays**, except with the approval of the Traffic Engineer.

When repair work in the CBD and on any major or collector street is stopped for the day, all lanes **shall** be opened to traffic, unless otherwise specifically authorized by the Traffic Engineer.

In the CBD, the Traffic Engineer **may** restrict activities in the public right-of-way to nights or weekends, due to intolerable congestion or other potential safety hazards to pedestrians, vehicles or adjacent property owners.

#### **1.4 Access to Property**

Access **shall** be maintained to all properties on all streets at all possible times. When access cannot be maintained, it **shall** be the responsibility of the contractor, utility, or other agency performing the work, to notify the affected property owner, resident, or tenant a minimum of 48 hours in advance. The reasons for the closures **shall** be fully explained to the affected parties. Alternative access or accommodations **should** also be explained. Full, unimpeded access **shall** be restored as soon as possible.

#### **1.5 Special Access to Public Facilities**

Access to fire stations, police stations, hospitals, transit facilities, bus stops, and schools **shall** be maintained at all times. When restrictions are necessary, the contractor, utility, or other agency **shall** coordinate such access restrictions with the Traffic Engineer's office and the responsible person-in-charge of the affected facility.

#### **1.6 Holiday Season (November 15 through January 1)**

To limit the economic impact to the City and local merchants, the Traffic Engineer's office **shall** require any construction and/or maintenance activities to be minimized on all streets which serve as a primary access to large retail shopping centers. Due to the large number of special events within the CBD during the holiday season, construction, and maintenance activities **shall** not be permitted, unless authorized by the Traffic Engineer. Contractors are encouraged to plan around this predictable, and congested time period.

#### **1.7 Fair Park Events (State Fair and Cotton Bowl)**

To minimize disruption and economic impact to the State Fair and events at the Cotton Bowl, contractors will not be allowed to close any lanes or streets within the Fair Park boundaries one week prior to these events. The boundaries are: Main Street/Canton Street/Carroll Avenue/Interstate 30 to the north, Interstate 45 to the west, Hatcher Street to the south, and Dolphin Road to the east. The Traffic Engineer will consider closures on a case-by-case basis. If any emergency work needs to be performed and the work **may** cause traffic congestion, the contractor is encouraged to minimize lane closures.

Fair Park personnel and their authorized agents **shall** notify the Traffic Engineer when closing City streets in and/or adjacent to Fair Park.

#### **1.8 Special Event Coordination**

Extraordinary coordination efforts are required for major special events. The Traffic Engineer's office and the Office of Special Events shall work together to insure there are no conflicts with construction and maintenance activities, and planned events.

A TTC plan **shall** be submitted to the Traffic Engineer for all special events involving street and/or lane closures.

### **1.9 Protection of Traffic Signals**

Contractors working near a traffic signal **shall** be required to notify the Traffic Operations Division, Signal Construction staff, at **(214) 670-3983** a minimum of 48 hours prior to the start of any excavation or construction in the vicinity of a signalized intersection.

Contractors performing excavation or construction work **shall** exercise caution to prevent damage to all existing traffic signal equipment. Should damage occur, the contractor **shall** immediately notify the Traffic Signal Construction Section so that necessary repairs can be made and the traffic signals can return to normal operations.

### **1.10 Protection of Traffic Signs**

Traffic control and street name signs existing prior to the beginning of construction or repair work **shall** not be torn down, covered up, or otherwise removed from the clear view of a driver or pedestrian without prior approval of the Traffic Engineer. Regulatory and street name signs which will interfere with construction **shall** either be relocated or placed on a portable stand at the direction of the Traffic Engineer.

Contractors **shall** be responsible for all costs related to the modification, adjustment, repair, removal, and restoration of existing traffic control devices or street name signs as approved by the Traffic Engineer.

### **1.11 Protection of Parking Meters**

All metered parking spaces **shall** remain open for parking at all times, unless other actions are approved by the Traffic Engineer. Contractors performing excavation or construction work in the street **shall** notify the Parking Management Contractor at **(214) 671-1324** a minimum of 48 hours in advance when meters need to be hooded or removed. Any parking meter removals, installations, or relocations **shall** be performed by the Parking Management Contractor. Contractors who fail to hood or remove meters will be suspended from work and/or cited.

### **1.12 Storage of Temporary Traffic Control Devices and Materials**

Roadways and sidewalks belong to the public. As such, they **shall** not be used by contractors to store materials and equipment, unless specifically authorized by the Traffic Engineer. Contractors who leave barricades or signs where they impose a safety hazard **shall** remove them when not in use. Failure to remove these items can impede the accessibility of pedestrians and vehicles. Improper storage of these unused items can also create a tort liability risk for both the City and the contractor.

Storage of materials and equipment on City-administered projects for extended periods of time **should** be limited. Careful consideration **should** be given to the location where material and equipment is to be stored. The contractor **shall** concentrate material and equipment in one location at the end of the work day. The contractor **shall** strategically place materials and equipment so as to not interfere with vehicle or pedestrian movements. All contractors **shall** conform to **Article VIII, Chapter 43, Section 43-139. (c)(17) of the City of Dallas Code.**

The Traffic Engineer **shall** have the right to approve the storage of materials and equipment on the public right-of-way. The Traffic Engineer **shall** also have the authority to require the removal of materials and equipment if the contractor does not comply with the above requirements.

### **1.13 Project Boards and Ownership of Traffic Control Devices**

Contractors **shall** consider the accessibility of pedestrians and vehicles when placing project information boards on City right-of-way. The contractor **shall** not place a project information board where it will cause a hazard to pedestrians or vehicles.

Contractors placing barricades or other temporary traffic control devices **shall** have the name of the company, address, and phone number of the responsible party clearly posted on the device **(see Article VIII, Chapter 43, Section 43-139.(d)(3) of the City of Dallas Code)**.

### **1.14 Emergency Activities**

Emergency activities are defined as work which should be done immediately. By their nature, they cannot be pre-planned. However, TTC devices are required whenever practical. Any work that is left over for another day is **not** considered emergency work. The contractor **shall** notify the City of Dallas 311 Call Center if any emergency work in the CBD or on major streets expands into rush hours **(7am to 9am or 4pm to 6pm Monday thru Friday)**.

**Note:** A TTC plan is required if the work extends beyond three days.

### **1.15 Suspension of Work**

The Traffic Engineer has the authority to suspend work within the public right-of-way until compliance of this *Manual* has been achieved. Any work on private property that creates a safety hazard on public right-of-way can also be suspended until the safety hazard is corrected. Any work required by the City to achieve compliance with the *Manual* **shall** be paid by the contractor.

### **1.16 Corner Visibility Triangle and Sight Distances**

Contractors **shall not** store material, debris, project signs, or equipment within 45 feet of any street corner **(See Figure 1a)**. This includes both private property and public streets. Contractors **shall** also maintain sight distance requirements **(See Sight Distance Table)**. A contractor working within 45 feet of an intersection **should** inspect each intersection approach for visibility hazards and take appropriate precautions such as the use of flagmen or police officers.

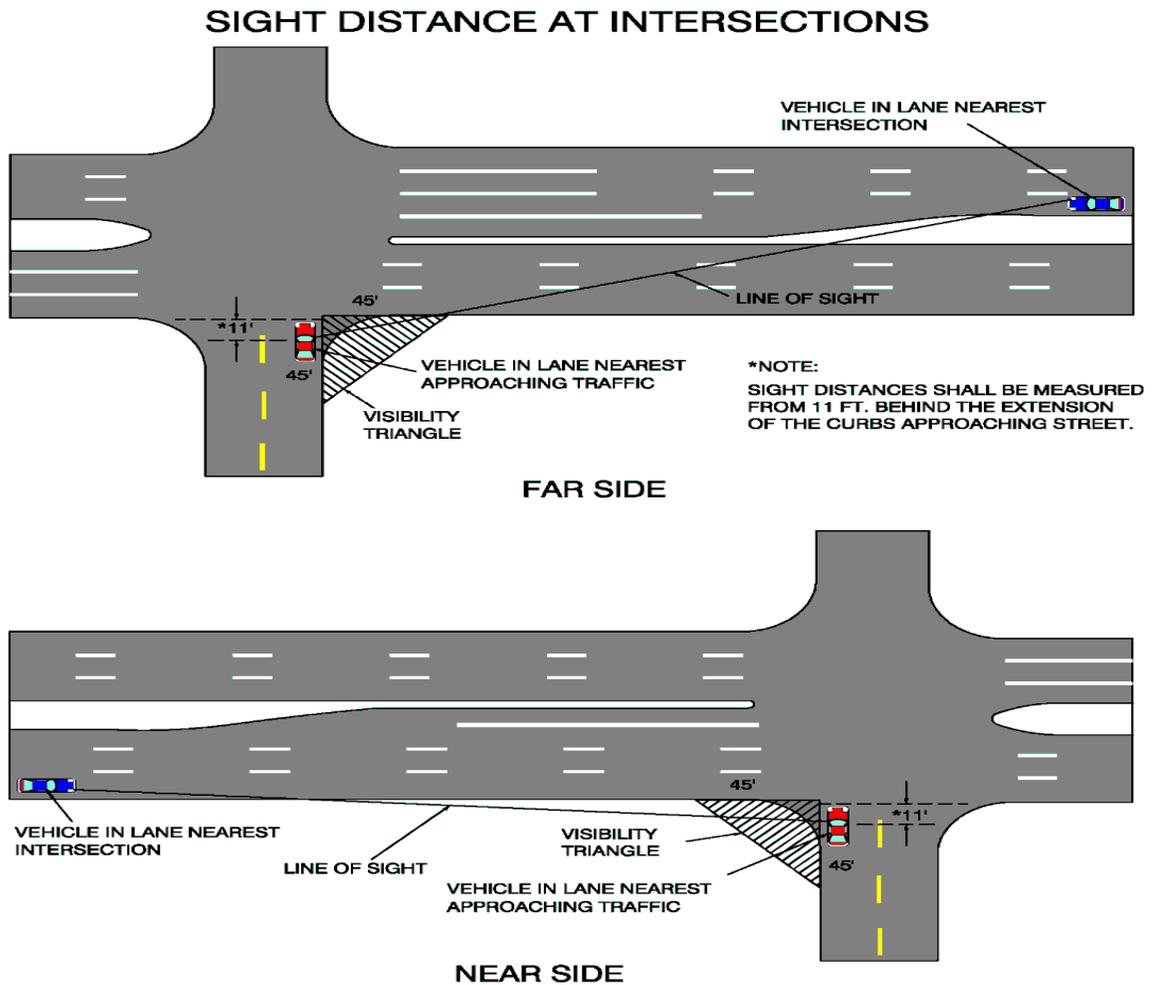
### **1.17 Temporary Truck Routes**

The Traffic Engineer has the right to approve temporary routing of construction vehicles over City streets. A truck route plan may be required from the contractor.

## SIGHT DISTANCE TABLE

Design Speed	Stopping Sight Distance (Feet)		Pavement Width	Intersection Sight Distance - (Feet)			
				Near Side		Far Side	
	Minimum	Desirable		Minimum	Desirable	Minimum	Desirable
25	150	200	26'	150	220	150	260
30	200	200	26'	200	260	200	300
			36'	200	275	220	310
35	240	250	40'	240	325	270	370
			44'	240	330	275	375
			2-22'	240	330	305	410
40	275	300	33'	275	350	280	400
			44'	275	350	305	425
			2-33'	280	400	400	520
45	315	375	2-33'	320	450	450	580

**Figure 1a**



## **Section 2.0**

### **Training and Certification Requirements**

#### **2.1 Traffic Control Training for City Staff**

This *Manual* will be used to promote uniformity in implementing temporary traffic control zones and to guide City personnel who restrict movement on city streets to use the most effective and least disruptive methods. To accomplish this, all City personnel working in or near city streets **should** be trained in flagging procedures and work zone traffic control. A City employee who is trained in proper traffic control procedures is a safer employee and can recognize potential dangers to him and the traveling public. City employees **should** receive refresher training every three (3) years. It is also recommended that all crew-leaders, supervisors, and managers receive more advanced training in traffic control, including how to develop a traffic control plan.

#### **2.2 Traffic Control Training and Certification for Contractors**

The City is requiring a competent person be responsible for the installation and removal of all TTC devices on City right-of-way. This person **shall** develop a TTC plan which is subject to review before any permit can be issued. The TTC plan **shall** be available at the job site for review by any City inspector. The requirement to provide a TTC plan **shall not** be considered an approval by the City of Dallas. This requirement insures a competent person has given some foresight and thought into the proper method to close streets, protect their employees, and to allow the effective movement of pedestrian and vehicles. The competent person **shall** comply with all Federal, State, and City temporary traffic control manuals. The competent person **shall** have sufficient training in work zone traffic control, traffic control planning, and worker safety. Traffic control training and certification can be obtained through one of the following agencies:

**Texas Engineering Extension Service (TEEX)**  
(1-800-824-7303) or [www.teex.com/ett](http://www.teex.com/ett)

**The American Traffic Safety Services Association (ATSSA)**  
(1-877-642-4637) or [www.atssa.com](http://www.atssa.com)

#### **2.3 Reserved**

## **Section 3.0**

### **Penalties for Non-Performance**

#### **3.1 Notice of Violations to City Staff**

A Notice of Violation (NOV) can be issued to any City employee who does not comply with this *Manual*. Special attention will be given to employees not wearing the appropriate safety apparel. Also, serious failures to comply with the minimum standards set forth in this *Manual* in regards to placement of TTC devices will result in a NOV being issued to the crew-leader or person-in-charge. A copy of the NOV will be forwarded to the employee's manager.

#### **3.2 Notice of Violations to Contractors**

An NOV **may** be issued to any contractor or person who has a minor infraction for improper placement of TTC devices. Examples of minor infractions that could result in a NOV include improper placement of signage, improper taper length distances, or improper maintenance of TTC devices. A citation and/or suspension will be issued, if a pattern of unsafe work continues.

#### **3.3 Major Violations**

A major infraction could result in a citation and/or suspension. Examples of major infractions include not wearing appropriate safety apparel or failure to place appropriate traffic control devices. Also, contractors can be cited for failure to notify the Traffic Engineer's Office of lane or right-of-way closures.

#### **3.4 Fines**

A maximum fine of \$500.00 **may** be issued to any contractor or person who fails to comply with the provisions of this *Manual*. **See Chapter 28-24.1. (d) Of the City of Dallas Code for fine amounts.**

## **Section 4.0 Worker Safety**

### **4.1 Personal Protection Equipment**

All personnel working in City right-of-way who are exposed to moving traffic or construction equipment **shall** wear high-visibility safety apparel rated class 2 or greater and meeting the requirements of **ANSI/ISEA “American National Standard for High-Visibility Safety Apparel” ANSI 107-2004** or equivalent revisions. A competent person responsible for the worker safety plan within the activity area of the job site **shall** make the selection of the appropriate class of garment. All workers exposed to risks where construction equipment or materials exist **should** wear ANSI-labeled hard hats which meet standard performance risk exposure. All workers exposed to risk of falls from three point platforms, such as bucket trucks, **shall** wear appropriate safety harnesses.

### **4.2 Training**

All workers **should** be trained on how to work next to motor vehicle traffic in a way that minimizes their vulnerability. Workers having specific temporary traffic control responsibilities **should** be trained in TTC techniques, device usage, and placement.

### **4.3 Planning**

A competent person **should** conduct a basic hazard assessment for the work site and job classifications required in the activity area.

### **4.4 Shadow Vehicle**

In the case of mobile and constantly moving operations, such as pothole patching or striping operations, a shadow vehicle, equipped with appropriate lights and warning signs, **may** be used to protect the workers from impacts by errant vehicles. The shadow vehicle **may** be equipped with a rear-mounted impact attenuator.

## Section 5.0 Pedestrian and School Safety

### 5.1 Pedestrian Considerations

Contractors **shall** minimize any impact to pedestrian movements in or near a temporary work zone. A contractor **shall** conform to **Title II, Paragraph 35.130 of the Americans with Disabilities Act of 1990 (ADA)**. Provisions **should** be made for persons with disabilities as determined by an engineering study or engineering judgment. Unless prior approval is granted by the Traffic Engineer's office, all contractors **shall** maintain a minimum of 48-inches of unobstructed sidewalk width in the CBD and the Victory Development and 36-inches in width throughout the rest of the City.

- Traffic and pedestrian safety must be an integral and high-priority element in every project, from planning through design and construction.
- Pedestrians **should** not be led into conflicts with work site vehicles, equipment, and operations.
- Pedestrians **should** be provided with a reasonably safe, convenient, and accessible path that replicates the existing sidewalk as much as possible.
- Personnel must be adequately trained in the proper management of pedestrian and traffic control, so they are qualified to make work zone safety decisions in the selection, placement, and maintenance of traffic control devices.
- Pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance, or go to out-of-the-way destinations.

### 5.2 Business Considerations

Contractors **shall** take into consideration the economic impact to businesses that will be affected by the complete closure of pedestrian sidewalks.

### 5.3 Special Considerations

Gates and/or fencing shall not open out into the street or impede pedestrian movement. Contractors **shall** also maintain access to fire hydrants, traffic signal equipment, manholes, and utilities at all times.

### 5.4 School Zones

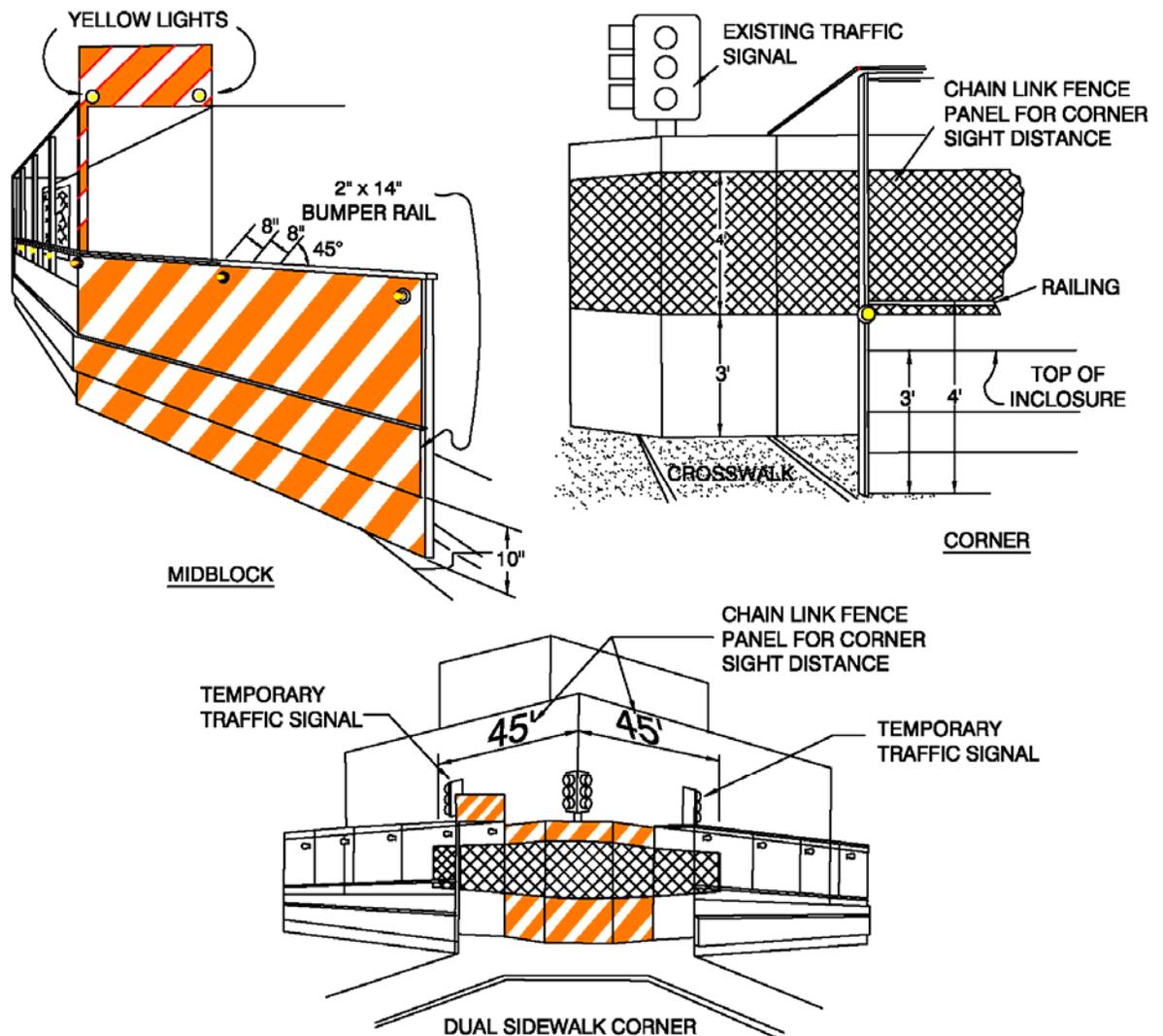
Contractors **shall** take all necessary precautions when working within **1000 feet of any school**. Sidewalks and streets near schools **shall** not be closed until school is in session unless approved by the Traffic Engineer. Contractors **shall** contact schools and coordinate with their principals. The contractor **shall** have all lanes and sidewalks open for use prior to dismissal at the end of the school day. If the scope of work requires a lengthy closure, the contractor should consider working on weekends or during school holidays.

### 5.5 Temporary Covered Walkways and Scaffolding (Figure 5a)

At the direction of the Traffic Engineer, contractors **shall** install temporary covered walkways or scaffolding for the safety of pedestrians. Contractors **shall** designate a competent person to design and inspect temporary covered walkways or scaffolding. Covered walkways and scaffolding **shall** conform to **Section 3306 of the International Building Code and Subpart L-Scaffolds of the OSHA Standards for the Construction Industry.**

Figure 5a

#### TYPICAL INSTALLATION: A COVERED PEDESTRIAN WALKWAY



## **Section 6.0 Flaggers and Traffic Control**

### **6.1 Required Personnel**

At the direction of the Traffic Engineer, a flagger or peace officer shall be required to direct traffic.

### **6.2 Qualifications for Flaggers**

Flaggers are responsible for public safety and make the greatest number of contacts with the public on construction projects. All flaggers **shall** be certified or have documentation showing they have been trained in safe traffic control practices and public contact techniques prior to **July 1, 2012**. Flaggers should be able to satisfactorily demonstrate the ability to receive and communicate specific instructions clearly, firmly, and courteously. A flagger **should** be able to apply safe traffic control practices, and be able to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury from errant vehicles. Flaggers **should** be stationed where they are visible to oncoming vehicular traffic and have an appropriate escape route in order to avoid danger from errant vehicles.

### **6.3 Flagger Training**

Contractors are also responsible for insuring that flaggers are properly trained. They are responsible for furnishing certified flagmen and all safety equipment needed for a safe flagging operation. A contractor can either send their flaggers to an approved certified flagger course or they can have one employee certified as a Train-the-Trainer Flagger from an approved course. Documentation **shall** be kept at the job site that proves that flaggers have had proper training. **Certification must be obtained through one of the following agencies:**

**Texas Engineering Extension Service (TEEX)**  
(1-800-824-7303) or [www.teex.com/ett](http://www.teex.com/ett)

**The American Traffic Safety Services Association (ATSSA)**  
(1-877-642-4637) or [www.atssa.com](http://www.atssa.com)

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

A flagger **shall** wear safety apparel meeting the requirements of **ANSI/ISEA “American National Standard for High-Visibility Apparel” and labeled as meeting the ANSI 107-2004** or current standard performance for Class 2 or greater risk exposure. The retroreflective safety apparel **shall** be visible at a minimum distance of 1000 ft. and be designed to clearly identify the wearer as a person.

**For nighttime activity, high-visibility safety apparel that meets the performance Class 3 requirements of ANSI/ISEA 107-2004 publication entitled “American National Standard for High-Visibility Apparel and Headwear” and labeled as meeting the ANSI 107-2004 standard performance for Class 3 risk exposure shall be worn when flagging.**

**When uniformed law enforcement officers are used, high-visibility-ANSI labeled class 2 or greater safety apparel as described in this section shall be worn by the law enforcement officer.**

### **6.5 Hand-Signaling Devices**

Hand-signaling devices, such as **STOP/SLOW paddles**, lights, and red flags, are used to control vehicles through TTC zones. The STOP/SLOW paddle **shall** be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. **The use of flags shall be limited to emergency situations.**

The STOP/SLOW paddle **shall** have an octagonal shape on a rigid handle. STOP/SLOW paddles **shall** be at least 18 inches wide with letters at least 6 inches high and **should** be fabricated from light semi-rigid material. Where speeds exceed 40 mph, contractors **shall** use 24-inch wide STOP/SLOW paddles. All paddles **should** be mounted on a rigid staff at a height of 7 feet from the bottom of the sign to the ground. 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** meet minimum retroreflectivity standards.

Flags, when used, **shall** be a minimum of 24-inches square, made of a good grade of **red material**, and securely fastened to a staff that is approximately 36-inches in length. The free edge of a flag **should** be weighted so the flag will hang vertically, even in heavy winds. When used at nighttime, flags **shall** be retroreflectorized red.

### **6.6 Flagger Procedures** (Figure 6a, page 15)

The following methods of signaling with paddles **shall** be used:

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

The following methods of signaling with a flag **shall** be used:

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

### 6.7 Flagger Stations

Flagger stations **shall** be located such that approaching motorists will have sufficient distance to stop prior to the intended stopping point (**see table at right**).

Speed* (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

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

At a spot lane closure, the flagger **may** have to take a position on the shoulder opposite the closed section in order to operate effectively. Where adequate sight distance is available for low-volume, low-speed roadways, the use of one flagger **may** be sufficient.

**Except in emergencies, temporary lighting shall be provided at all flagger stations during nighttime operations.**

### 6.8 Restrictions on Flaggers

Flaggers are limited by the *TMUTCD* to flagging operations that can be accomplished from the edge of the traveled way. Flagging operations are **prohibited** within an intersection. When multiple lanes need to be stopped or redirected, peace officers **should** be used instead of flaggers.

## 6.9 Exceptions for Flaggers

Flaggers can be used in the following situations, if traffic control equipment is inadequate:

- A. Where workers or equipment are intermittently blocking a traffic lane.
- B. Where equipment is backing or maneuvering on the roadway.
- C. Where traffic control equipment is being placed or removed from the roadway.

## 6.10 Peace Officer

The use of a peace officer for manual control of traffic is expensive, but necessary during some forms of temporary traffic control work. Peace officers carry with them the broad authority under State Law to control traffic and also possess special training. These characteristics make peace officers better suited to handle multiple lane closures or directing traffic within a signalized intersection.

When directed by the Traffic Engineer, a contractor **shall** hire an off-duty uniformed peace officer who is authorized to control traffic.

Uniformed peace officers who are authorized to enforce City of Dallas ordinances shall be used to direct traffic in the City. In addition, City of Dallas traffic and parking controllers can direct traffic. Due to Federal regulations, DART officers will be required to direct traffic near their light-rail tracks.

Peace officers that are alert, visible, and accommodating can be a valuable public relations asset for both the City and the hiring contractor. Conversely, they can create a poor image for the City if they are not contributing to the efficient and safe movement of traffic. Since officers wear an official uniform, their performance reflects upon the City of Dallas.

When an officer is hired to support construction, maintenance, or special event efforts, expectations are that officers will:

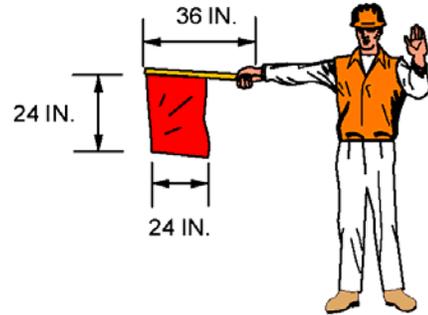
- Be properly equipped (i.e., high-visibility class 2 or greater safety vest, two-way radio) as required to perform this vital temporary traffic function.
- Perform in a manner that favorably reflects on the City of Dallas and the officer's department.
- Facilitate manual traffic control when needed to cope with unforeseen traffic pattern changes.
- Assist troubled flagging operations by providing a more authoritative presence to motorists.
- Station their vehicle in a manner that does not block sidewalks or block traffic.
- "Stand-their-post" at all times except during planned breaks. Like any other employer, contractors who hire off-duty officers **should** coordinate breaks and shift changes to keep officers safe, especially during extreme weather conditions.

Figure 6a

Flagger Procedures

PREFERRED METHOD  
STOP/SLOW PADDLE

EMERGENCY SITUATIONS ONLY  
RED FLAG



TO STOP TRAFFIC



TO LET  
TRAFFIC PROCEED



TO ALERT AND  
SLOW TRAFFIC

## Section 7.0 Temporary Traffic Control Elements

### 7.1 Temporary Traffic Control Plans

TTC plans play a vital role in providing continuity of reasonably safe and efficient traffic flow when a work zone, incident, or other event temporarily disrupts normal traffic flow. TTC plans range in scope from being very detailed to simply referencing typical drawings contained in the *TMUTCD*.

A TTC plan **shall** be prepared and submitted to the Traffic Engineer's office for all projects that involve lane or sidewalk closures 3 days or longer. However, a TTC plan may be required for projects of shorter duration, if requested by the Traffic Engineer's office. Contractors **shall** provide a TTC plan before any permit will be issued. City staff **should** create a TTC plan for any project lasting longer than two days, but does not have to submit plans to the Traffic Engineer's office. **(Article VIII, Chapter 43, Section 43-139. (c)(8) of the City of Dallas Code).**

### 7.2 Temporary Traffic Control Zone

A TTC zone is an area of the road where road user conditions are changed. A work zone is an area of the road with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles.

### 7.3 Components of TTC Zone (Figure 7a-1, page 18)

Most TTC zones are divided into four areas:

1. **Advance Warning Area** - When the work space is within the traveled way, except for short-duration and mobile operations, advance warning signs shall provide a general message that work is taking place.
2. **Transition Area** - The transition area is that section of the road where road users are redirected out of their normal path and into a new path. Transition areas usually involve strategic use of tapers.
3. **Activity Area** - The activity area is the section of the road where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space. The work space consists of the portion of the roadway set aside for workers, equipment, material, and a shadow vehicle if one is used upstream. The traffic space is the portion of the road in which road users are routed through the activity area. The optional buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area and might provide some recovery space for errant vehicles.
4. **Termination Area** - The termination area shall be used to return motorists to their normal path. The termination area shall extend from the downstream end of the work area to the last TTC device such as "END ROAD WORK" signs, if posted.

#### **7.4 Mobile Operations** (Figure 7b, page 20)

Contractors **shall** use high-intensity rotating, flashing, oscillating, strobe lights, or truck-mounted arrow boards for mobile operations. Examples of mobile operations are street sweepers, cable, or line work.

#### **7.5 Short Duration** (Figure 7b, page 20)

Short duration projects last one hour or less. During short duration work, it often takes longer to set up and remove the TTC zone than to perform the work. Workers face hazards in setting up and taking down the TTC zone. Since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed. A reduction in the number of devices **may** be offset by the use of other more dominant devices. Contractors **shall** use high-intensity, rotating, flashing, oscillating, strobe lights, or truck-mounted arrow boards in short duration work zones. Crews performing short duration work **should** also be equipped with the proper-sized cones and advance warning signs just in case the work expands beyond one hour.

#### **7.6 Short-Term Stationary**

A TTC zone for short-term stationary projects lasting longer than an hour, but within a single daylight period, **shall** have advance warning signs and proper channelizing devices. The type of barricade equipment needed in short-term stationary TTC zones will depend upon the location of the work to be performed. Low-volume, low-speed locations, such as residential streets, will differ from those on major or collector streets where multiple lanes **may** be closed. Contractors working on any public street within the City **shall**, at a minimum, use 18-inch orange cones and two advance warning signs. On low-volume, low-speed streets where the work zone is less than 18 feet wide, a flagger **shall** be used. Examples of short-term stationary projects include crews doing minor street repairs, or work that **may** require multiple lane closures.

#### **7.7 Intermediate and Long-Term Stationary** (Figure 7a-2, page 19)

A project lasting beyond daylight hours up to 3 days is considered an intermediate project. A project lasting longer than 3 days is considered a long-term stationary project. The amount of barricading equipment needed in a TTC zone will depend upon the work that is to be performed. Because of the longer timeframe for these types of projects, a more formal TTC plan **should** be prepared. Inappropriate pavement markings in long-term stationary TTC zones **should** be removed and replaced with temporary markings. Since intermediate and long-term stationary operations extend into nighttime hours, contractors **shall** use traffic control devices that meet minimum retroreflectivity standards.

Figure 7a-1

Components of TTC Zone

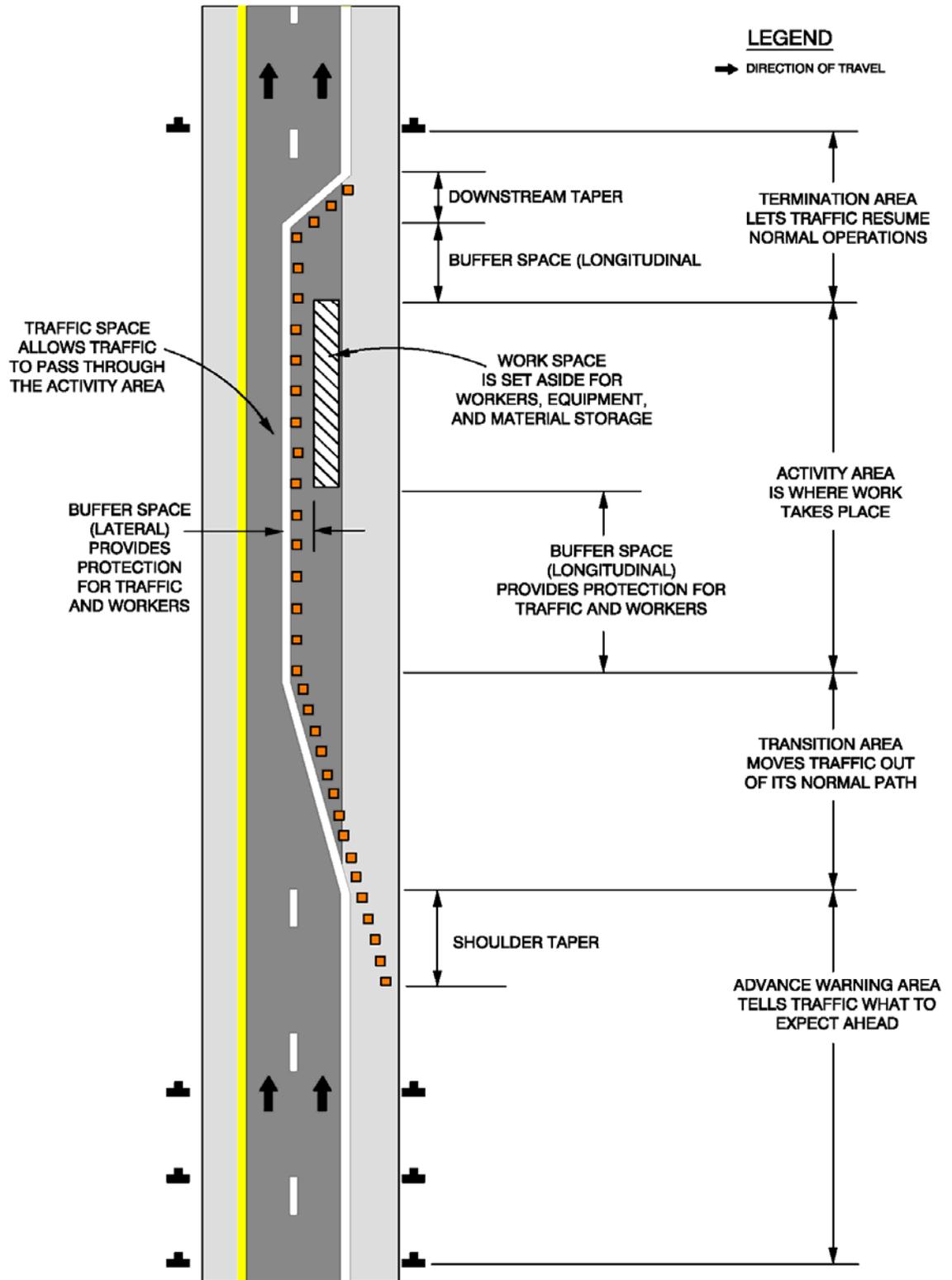


Figure 7a-2

Taper and Buffer Zone

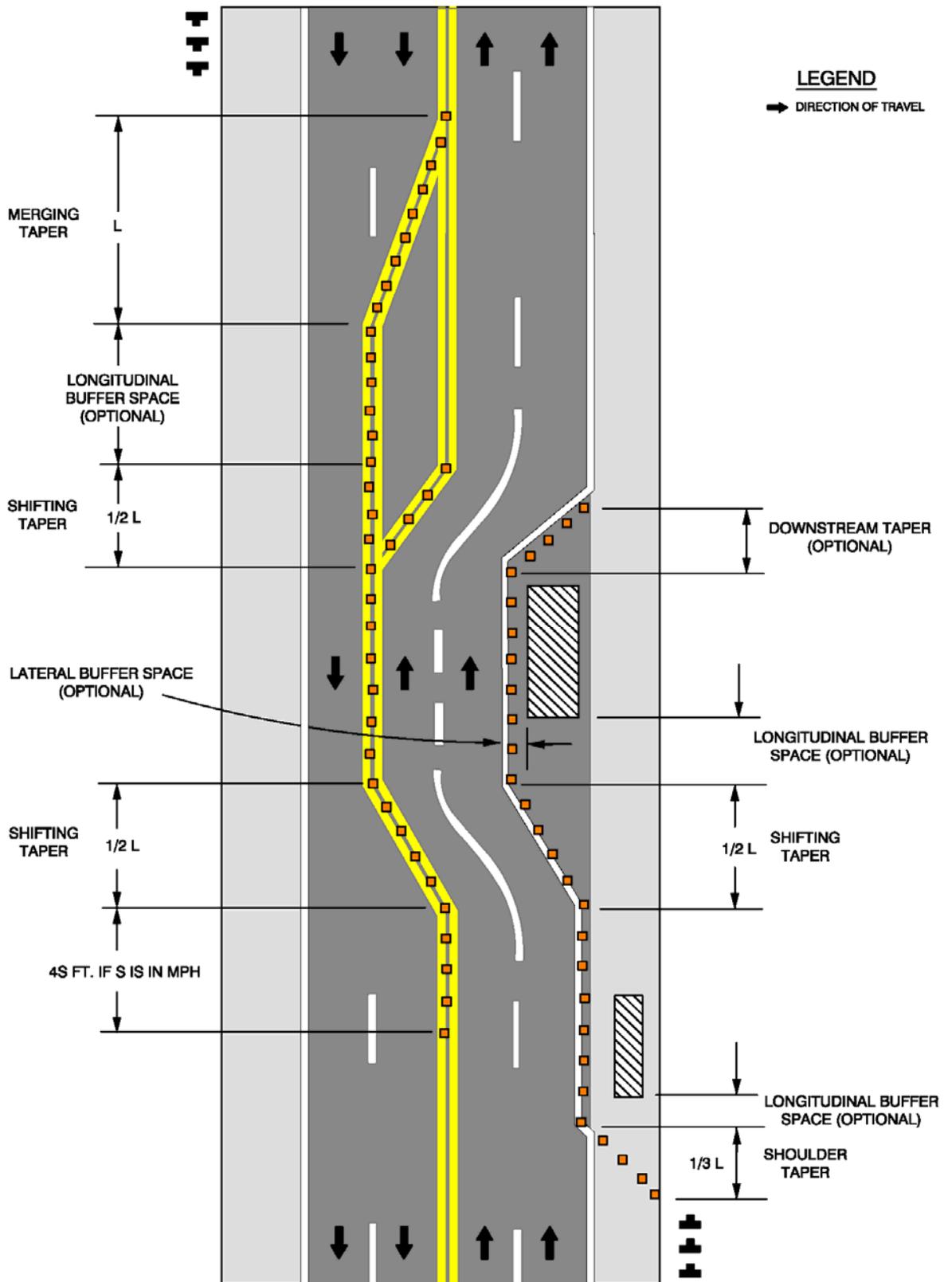
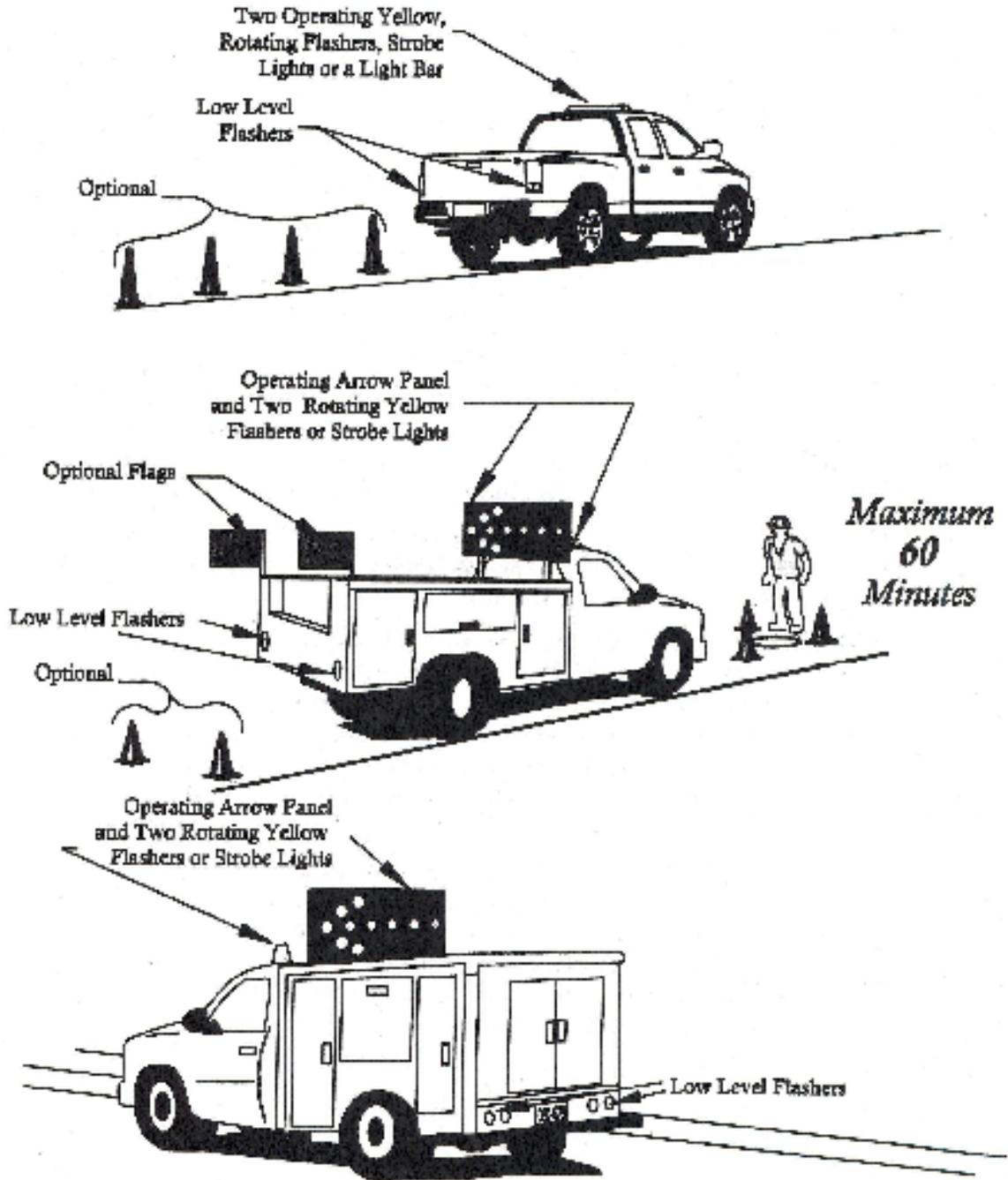


Figure 7b

Mobile and Short Duration Operations



## Section 8.0 Temporary Traffic Control Devices

### 8.1 General Requirements

Contractors **shall** be responsible for maintaining all TTC signs, devices and pavement markings in their construction zones and for restoring the permanent traffic signs and pavement markings upon completion of the work.

During temporary traffic control operations, it is important to make sure that existing traffic control devices remain compatible with temporary traffic controls being imposed. This includes, but is not limited to, signs, parking meters, traffic signals, and pavement markings. The devices that remain applicable to the affected traffic must be maintained, while other devices must be covered, relocated, or completely removed.

All TTC devices used within the City of Dallas **shall** meet the **crashworthiness requirements of the National Cooperative Highway Research Program (NCHRP) 350 Report**. This report recommends procedures for the safety performance and evaluation of highway devices. It is prepared by the Transportation Research Board and contains standards for the crashworthiness of all traffic control devices. Copies of the NCHRP 350 Report are available at the following website:

[http://safety.fhwa.dot.gov/roadway\\_dept/road\\_hardware/nchrp\\_350.htm](http://safety.fhwa.dot.gov/roadway_dept/road_hardware/nchrp_350.htm)

All Contractors **shall** keep documentation showing that their TTC devices meet the NCHRP 350 Report. Contractors **shall** make the documentation available for review by the Traffic Engineer. The Traffic Engineer **may** use engineering judgment to approve the use of TTC devices such as barricades, cones, drums, vertical panels, tubular markers, and edge line channelizers that are not listed in the NCHRP 350 Report. **All TTC devices must meet the requirements of the NCHRP 350 Report for crashworthiness by July 1, 2012.**

The Traffic Engineer **shall** have the authority to require additional TTC devices such as end treatments for concrete traffic barriers or water-filled barriers. The Contractor will pay for all expenses if the Traffic Engineer deems the device is necessary for the safety of the public.

Contractors **shall** comply with the *Quality Standards for Work Zone Traffic Control Devices*, published by the American Traffic Safety Services Association (ATSSA). **The Traffic Engineer shall issue a NOV or citation (maximum \$500.00) to the competent person if the appearance of a device is rated unacceptable by ATSSA standards or fails to meet minimum retroreflectivity standards.**

**The City of Dallas is encouraging contractors to use recycled products wherever possible. This would include UV/color-stabilized plastic products.**

## **8.2 Retroreflectivity Requirements**

All advance warning signs in a TTC zone **shall** be made of an **Orange/Fluorescent Orange High Intensity or Prismatic Sheeting equal to or better than ASTM Type III material**. This includes, but is not limited to, “Road Work Ahead”, “Right Lane Closed”, “Shoulder Work Ahead” or “Flagman Ahead” signs.

All other TTC devices, including, but not limited to, barricades, cones, and regulatory signs (such as “Road Closed”) **shall** meet the minimum retroreflectivity requirements for **High Intensity or Prismatic Sheeting equal to or better than ASTM Type III**. These changes were based on research which has shown that engineer-grade retroreflectivity sheeting does not provide the brightness needed in low light conditions. **All TTC devices shall meet the above requirements for high-intensity reflective sheeting by January 1, 2013.**

## **8.3 Regulatory Sign Authority**

Regulatory signs within a TTC zone **shall** be authorized and installed at the direction of the Traffic Engineer (**Chapter 28 of the City of Dallas Code**).

If a TTC zone requires a sign that conflicts with an existing sign, the permanent sign **shall** be temporarily removed or covered at the direction of the Traffic Engineer.

## **8.4 TTC Sign Characteristics**

Warning signs in TTC zones **shall** have a black legend and border on an orange background, except for existing warning signs that remain applicable in the TTC zone. Where the color orange is required, fluorescent red-orange, or fluorescent yellow-orange colors **may** be used. The fluorescent versions of orange provide higher visibility than standard orange, especially during twilight.

Advance warning signs **shall** have a size of 48 x 48 inches on roadways where speeds are 45 mph or higher. Advance warning signs on roadways where speeds are less than 45 mph **shall** have a minimum size of 36 x 36 inches. It is recommended that contractors use 48 x 48 inch signs for uniformity.

**All TTC warning signs used at night shall meet TMUTCD retroreflectivity and/or illumination standards.**

### 8.5 TTC Sign Placement (Figure 8a, pages 30-33)

Advance warning signs for TTC **should** be located on the right side of the roadway, unless otherwise specified by the Traffic Engineer. Where special emphasis is needed, signs **may** be placed on both the left and right sides of the roadway (**See chart to the right for proper spacing of advance warning signs**).

Unless prior approval is granted by the Traffic Engineer, a minimum of 48-inches of unobstructed sidewalk width **shall** be maintained in the CBD and the Victory Development area (American Airlines Center) when placing TTC devices. Throughout the rest of the City, 36-inches of unobstructed sidewalk width **shall** be maintained.

Advance Warning Signs Placement	
Posted Speed (MPH)	Sign Spacing (Feet)
25	100
30	120
35	160
40	240
45	320
50	400
55	500

Warning signs **should** be placed in advance of the TTC zone at varying distances, depending on roadway type, condition, and posted speed. On low-volume, urban streets, the Traffic Engineer's office may use engineering judgment to limit the number of advance warning signs and required taper lengths.

Advance warning signs on long-term stationary projects **shall** be placed on either wood or metal posts or on temporary supports and **shall** be mounted at **least 7 feet high**, measured from the bottom of the sign to the ground. At the direction of the Traffic Engineer, temporary supports that block sidewalks or pedestrian access will be mounted in the ground using wood or metal posts. Signs on temporary supports require more frequent inspections and maintenance. These sign supports **shall** be located on the shoulder of the roadway and contractors **shall** minimize interference with pedestrians and wheelchair accessibility.

On intermediate stationary projects within an urban setting it is prescribed, based on engineering judgment, that advance warning signs **may** be placed on portable supports at a mounting height of **1 foot** above the traveled way. Contractors **shall** take additional precautions and conduct more frequent maintenance while these signs are in the public right-of-way. On higher speed or heavy volume roadways contractors **should** consider placing signs at the **7 feet** mounting height.

Advance warning signs **shall** be placed on portable supports at a mounting height of **1 foot** above the traveled way on short-term stationary or short-duration projects.

Signs mounted on barricades, or other portable supports, **shall** be no less than **1 foot** above the traveled way. Signs mounted on Type 3 barricades **should not** cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.

The bottom of vehicle-mounted signs **shall** be placed at a minimum height of **4 feet** above the pavement (See Figure 8a, page 30). Signs **shall** be covered or removed when work is not in progress.

All TTC signs **shall** be maintained upright, clean, and in full view of the intended traffic by the contractor. **Signs that have lost significant legibility or reflectivity shall be promptly replaced.**

#### **8.6 Barricade Devices** (Figure 8b, pages 34-37)

A barricade is a portable or fixed device having from one to three rails with appropriate markings that control road users by closing, restricting, or delineating all or a portion of the roadway.

Barricade rails **shall** have alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. If the barricade is greater than 36 inches in length, the stripes **shall** be 6 inches wide. If the length is 36 inches or less, the stripes **shall** be 4 inches wide.

The minimum length for Type 1 and 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. Barricades used on freeways, expressways, and other high-speed roadways **shall** have a minimum of 270 square inches of retroreflective area facing motorists.

For complete street closures of any major or collector street, Type 3 barricades are required. Type 3 barricades **shall** extend entirely across a roadway with the stripes sloping downward in the direction that road users must turn. A Type 3 barricade **should** also be placed at the nearest intersection when the street is closed to through traffic. A sign stating "STREET CLOSED", "STREET CLOSED TO THRU TRAFFIC" or "DO NOT ENTER" can be placed on a Type 3 barricade.

Barricades are also used to separate vehicular traffic from the workspace, pavement drop-offs, pedestrians, and opposing traffic. They are not intended to be physical barriers. Barricade devices **should** always be used in groups to warn and guide traffic.

Flag, rope, and plastic caution tape **may** be used between barricade devices to provide additional guidance and security. In some major construction areas, and in areas with substantial pedestrian traffic, the use of fencing **may** be necessary for maximum safety.

All barricades **shall** be constructed and properly supported to prevent overturning. Suitable materials for ballasting barricades are sandbags or water. Sandbags **may** be placed on the lower part of the frame of the stays of barricades to provide the required ballast. The use of water as a ballast shall be in accordance to application and installation requirements specific to the device. Counterweights **shall** not be placed on top of any striped rail. Barricades **shall** not be counterbalanced by non-deformable objects such as rocks or chunks of concrete.

Type 1 and 2 barricades are also used to delineate hazards in or near streets or sidewalks. Type 1 and 2 barricades can be used to close a minor street, sidewalk or alley. When used to delineate hazards parallel to traffic, spacing **should** not exceed **75 feet**. When used to close streets, sidewalks and/or alleys spacing **should** be close enough to make it clear access is closed.

#### **8.7 Cones** (Figure 8c, page 38)

Cones **shall** be predominantly orange and **shall** be made of material that can be struck without causing damage to the impacting vehicle. **For daytime and low-speed roadways, cones shall be not less than 18 inches in height. When cones are used on roadways of 45 mph or greater, or night on any roadway, or when more conspicuous guidance is needed, cones shall be a minimum of 28 inches in height.**

**For nighttime use, cones shall be retroreflectorized.** Retroreflectorization of cones that are 28 to 36 inches in height **shall** be provided with a 6-inch wide white band located 3- to 4-inches from the top of the cone and an additional 4-inch wide white band located approximately 2-inches below the 6-inch band.

Traffic cones **may** be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration work. Cones must provide a smooth, gradual transition, when moving traffic from one lane to another or when reducing the width of the street. This smooth gradual transition is referred to as the “taper length”.

Cones **should not** be used for pedestrian channelization or as pedestrian barriers. However, cones can be used in TTC zones when they are spaced close enough to be detectable by users of long cones.

Steps **should** be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic. Cones **may** be doubled up to increase their weight.

#### **8.8 Drums** (Figure 8c, page 38)

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 minimum width regardless of orientation. **Metal drums shall not be used.** The markings on drums **shall** be horizontal, circumferential, alternating orange and white retroreflective stripes 4- to 6-inches wide. Each drum **shall** have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflectorized spaces between the horizontal orange and white stripes **shall** not exceed 3-inches in width. Drums **shall** have closed tops that will not allow collection of debris. Weights **shall** not be placed on top of a drum.

Drums are highly visible, have good target value, give the appearance of being formidable obstacles, and therefore, command the respect of road users. They are generally used in situations where they will remain in place for a prolonged period of time.

**Drums are rarely used as channelizing devices on urban streets due to space constraints.**

### **8.9 Vertical Panels** (Figure 8c, page 38)

Reflective material on vertical panels **shall** be 8- to 12-inches in width and at least 24-inches in height. They **shall** have orange and white diagonal stripes and be retroreflectorized.

The top of vertical panels **shall** be a minimum of 36-inches above the roadway. Where the height of the reflective material on a vertical panel is greater than 36-inches, a panel stripe width of 6-inches **shall** be used. Where the height of the reflective material on a vertical panel is 36-inches or less, a panel stripe width of 4-inches **shall** be used.

Marking for vertical panels **shall** be alternating orange and white retroreflective stripes, sloping downward at an angle of 45 degrees in the direction vehicular traffic are to pass. Vertical panels used on high-speed roadways **shall** have a minimum of 270 square inches retroreflective area facing vehicular traffic.

**Where space is limited or closures last longer than 24 hours, vertical panels should be used in lieu of cones to channelize vehicular traffic or divide opposing lanes.**

Vertical panels are versatile because their height and amount of retroreflective sheeting makes them substantially more visible than cones or pavement markings. **Vertical panels are lightweight and use less street width than drums and are more suited to urban streets, when properly placed.**

### **8.10 Pavement Markings**

Existing pavement markings that cause driver confusion by conflicting with the intended vehicle path (indicated by barricades and channelization devices) **shall** be removed by the contractor, as directed by the Traffic Engineer. The City requires TTC devices to substitute for pavement markings within work zones because these devices dominate surface pavement markings to the point that they typically eliminate confusion. This usually means that substantial pavement marking removal is only required on street resurface projects, long-term or high-speed projects such as detours, special channelization for bridge construction, realignment for building construction, and similar fixed location projects. However, the Traffic Engineer reserves the right to require the removal of existing pavement markings anywhere they cause driver confusion.

If pavement marking removal is required, a method **should** be used which leaves a minimum of pavement scars. Sandblasting, high pressure washing, grinding, or other methods **may** be used to remove existing markings. Upon completion of construction, all pavement markings and channelization buttons removed or damaged **shall** be replaced by the contractor according to City specifications.

When existing pavement markings are removed and barricades or channelization devices are not used, then the contractor **shall** place temporary markings until permanent markings are installed. Suitable temporary markings include buttons, paint, tabs or tape.

### **8.11 Arrow Panel/Board**

An arrow panel **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 road users through or around a TTC zone.

An arrow panel **should** be used to advise approaching traffic of a lane closure along major multi-lane roadways with heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where motorists are less likely to expect such lane closures.

**Arrow panels should always be used in conjunction with appropriate signs, channelizing devices, or other TTC devices.**

If practical, an arrow panel **should** be placed on the shoulder of the roadway. It **should** be delineated with retroreflective TTC devices. When an arrow panel is not being used, it **should** be removed.

**At the direction of the Traffic Engineer, all projects involving heavy traffic, multi-lane closures, nighttime lane closures, limited sight distances or long-term stationary projects shall utilize arrow panels.**

### **8.12 Portable Changeable Message Signs (CMS)**

Portable CMS' **shall** be a TTC device with the flexibility to display a variety of messages. Each message **shall** consist of either one or two phases. A phase **shall** consist of up to three lines of eight characters per line.

A portable CMS' can have a wide variety of applications including: TTC zones, roadway, lane or ramp closures, crash or emergency incident management, width restriction information, speed control or reductions, advisories on work scheduling, road user management and diversion, warning of adverse conditions or special events, and other operational control.

Portable CMS' **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 CMS' **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 height of a stationary CMS **shall** be a minimum of **7 feet** above the roadway when in operating mode. The mounting height of a portable CMS on a trailer, truck, or a service patrol truck **shall** be such that the bottom of the panel is a minimum of **4 feet** above the roadway when it is in the operating mode.

The text of a CMS **shall** not scroll or travel horizontally or vertically across the face of the sign.

Portable CMS' **may** be used as a supplement, but **not** as a substitute for conventional signs and pavement markings.

**At the direction of the Traffic Engineer, all projects involving complete street closures or extended traffic delays will require a portable CMS to be installed at least one week prior to the event.**

### **8.13 High-Level Warning Lights**

As used in this *Manual*, warning lights will be considered portable, lens directed, and enclosed lights. The color of the light emitted **shall** be yellow and **may** operate either in the flash or steady burn mode. These devices **shall** be in accordance with the current **ITE *Purchase Specification for Flashing and Steady-Burning Warning Lights***.

All warning lights **shall** have a **minimum mounting height of 30-inches** to the bottom of the lens. They **shall** be mounted on sign supports or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

#### **WARNING LIGHTS TYPE**

- **Type A** - Are low intensity flashing warning lights, most commonly mounted on the advance warning signs, type 2 barricades, vertical panels, or on independent supports. They are used to warn road users of an extremely hazardous situation.
- **Type B** - Used to warn motorists during daylight and nighttime hours when extremely hazardous site conditions exist. Lights **may** be mounted on advance signs, or independent supports. Type B is designed to operate 24 hours per day.

- **Type C** - Steady burn lights, are intended to be used to delineate the edge of the traveled way on lane changes, lane closures, and on other similar conditions. When mounted on vertical panels they may be used to separate opposing flows of traffic.

When barricades or channelizing devices are used to close a sidewalk, a type A or B flashing light **shall** be used if the closure expands into nighttime hours. The contractor **shall** provide an alternate pedestrian walkway.

Contractors who use Type A or B flashing lights **should** mount them to advance warning signs like the “Road Work Ahead” sign. This will provide a higher visibility for motorists. Contractors **should** have a maintenance program because these devices have a higher failure rate due to battery usage and dust from construction sites that tend to coat the lens making them less effective.

Type C warning lights on channelizing devices **may** be used in the roadway, but it is recommended that contractors use the “high intensity” prismatic reflectors. These prismatic reflectors have reflective properties similar to warning lights, but without the maintenance issues. Warning lights only come in yellow, whereas contractors can install either white or yellow reflectors depending on the edge-line they are closing.

#### **8.14 Reserved**

Figure 8a

# Sign Placement

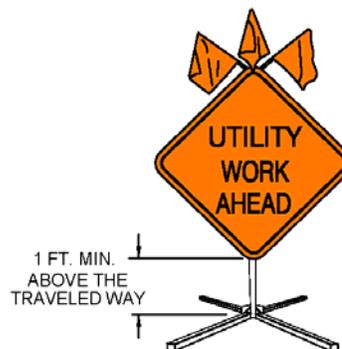
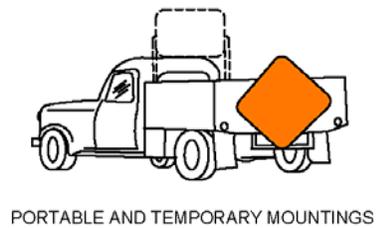
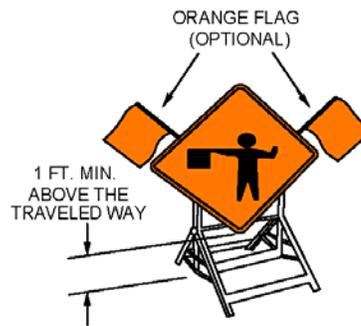
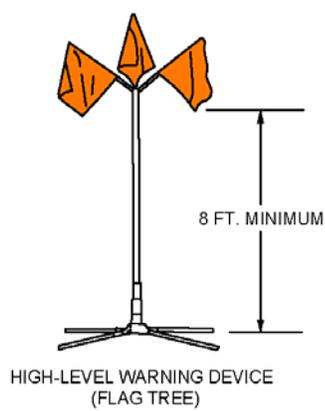
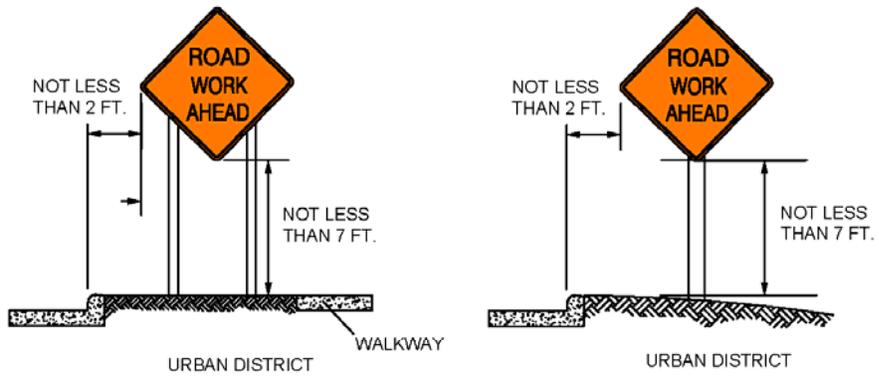
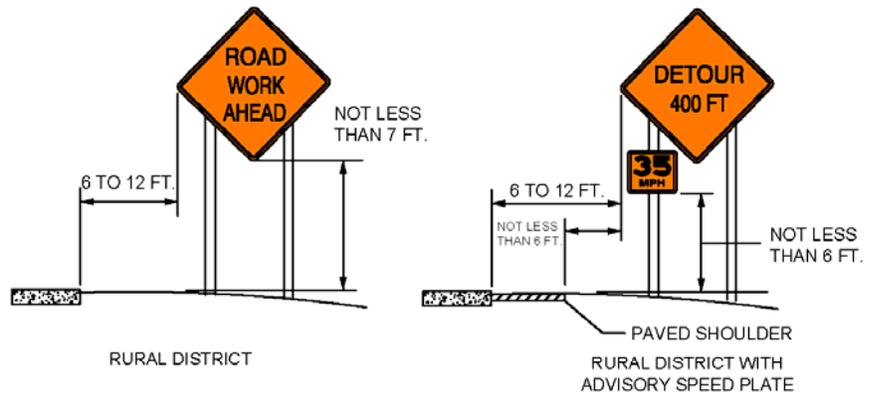
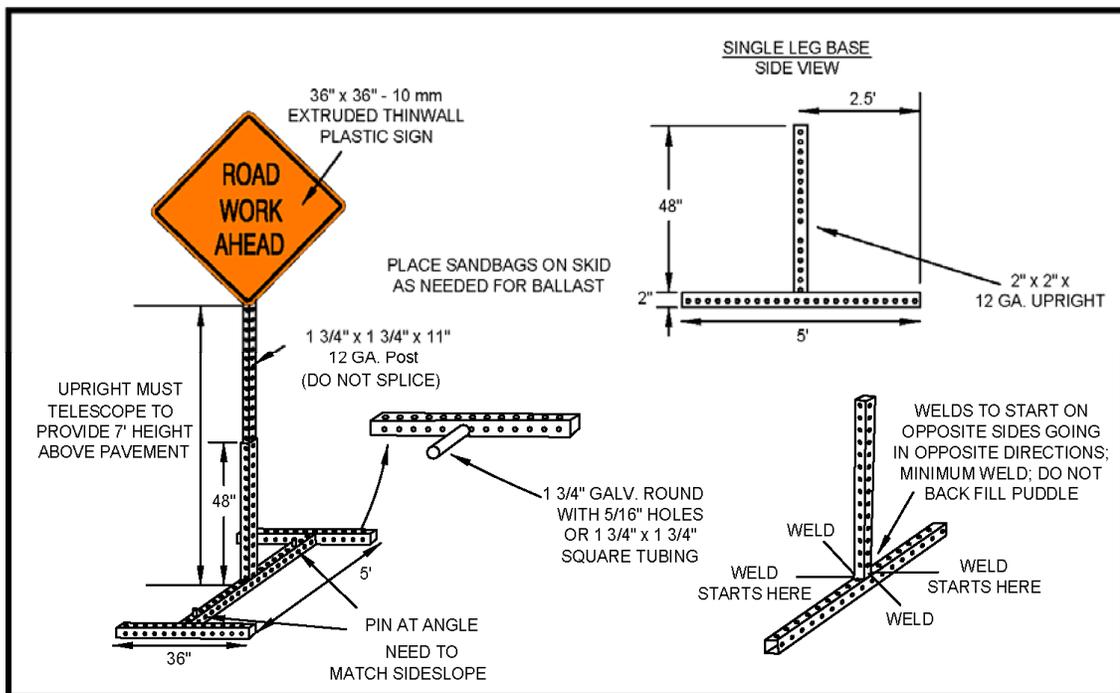
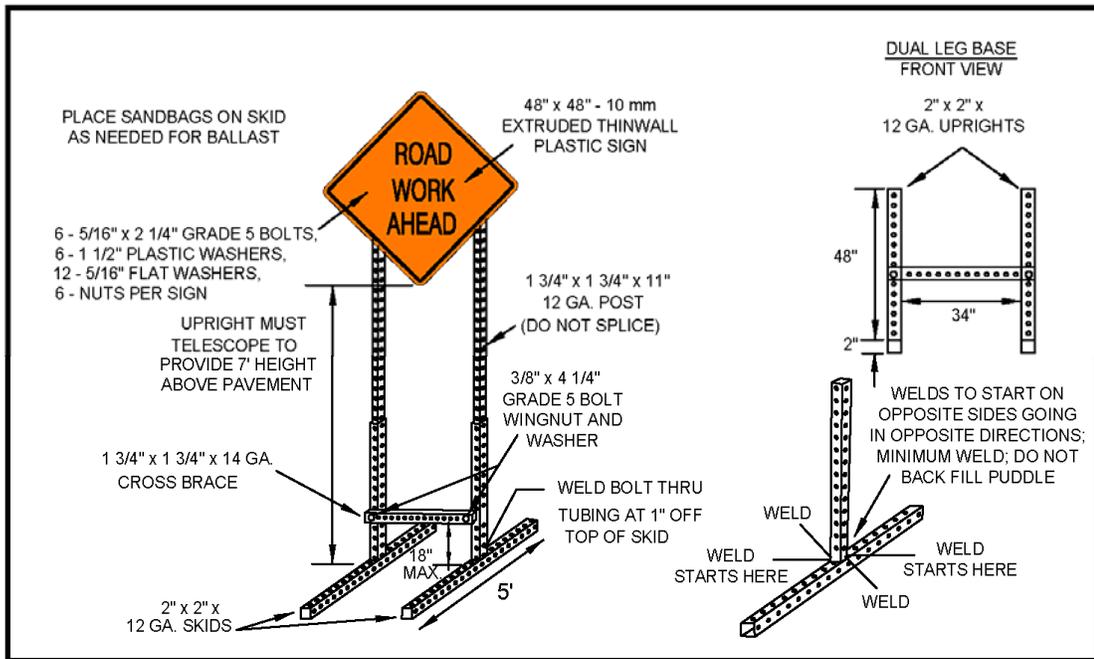


Figure 8a

# Sign Placement



Number of Posts in 7ft Span	14 Gauge	12 Gauge
1 post (directly embedded)	1-3/4, 2, or 2-1/4 inch	1-1/2, 1-3/4 or 2 inch
2 posts (directly embedded)	1-3/4 or 2 inch	1-1/2 or 1-3/4 inch
1 post (with anchor)	1-3/4, 2, or 2-1/4 inch	1-1/2, 1-3/4, 2, or 2-1/4 inch
2 posts (with anchor)	1-3/4 or 2 inch	1-1/2, 1-3/4, or 2 inch
3 posts (with anchor)	1-3/4 inch	1-1/2 or 1-3/4 inch

Figure 8a

## Sign Placement

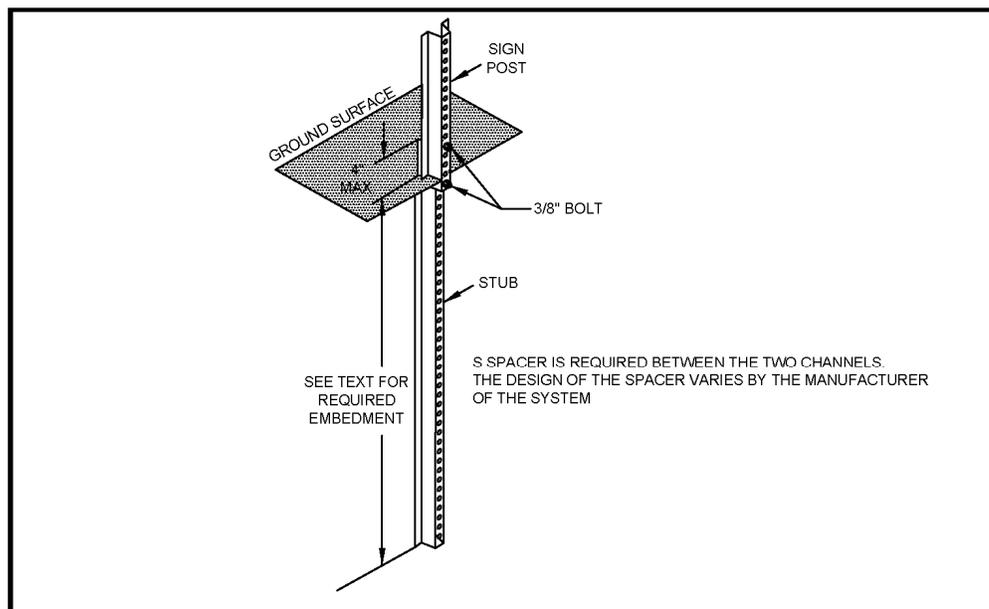
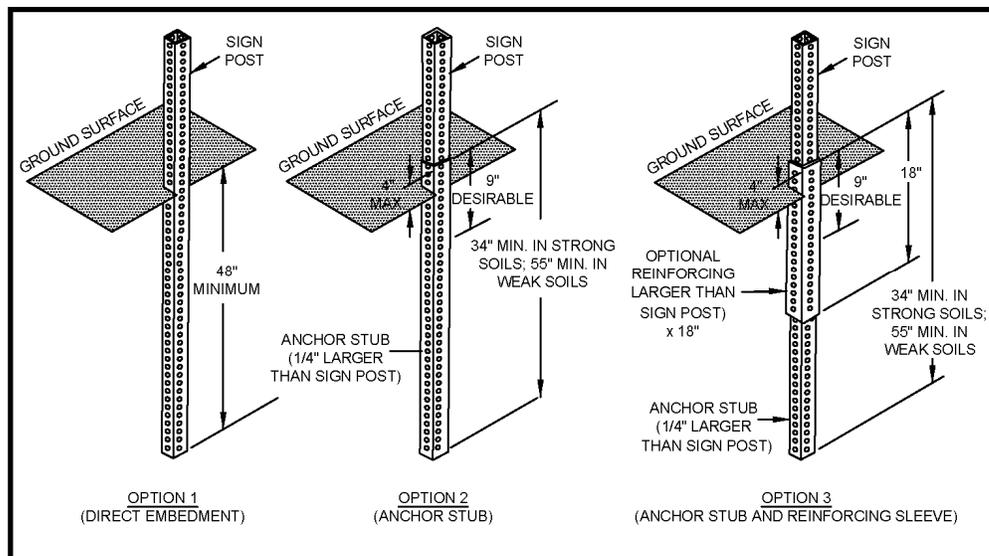


Figure 8a

# Sign Placement

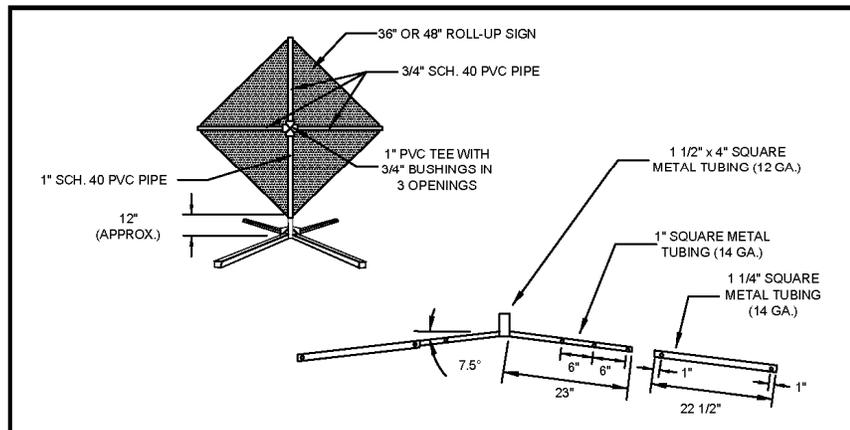
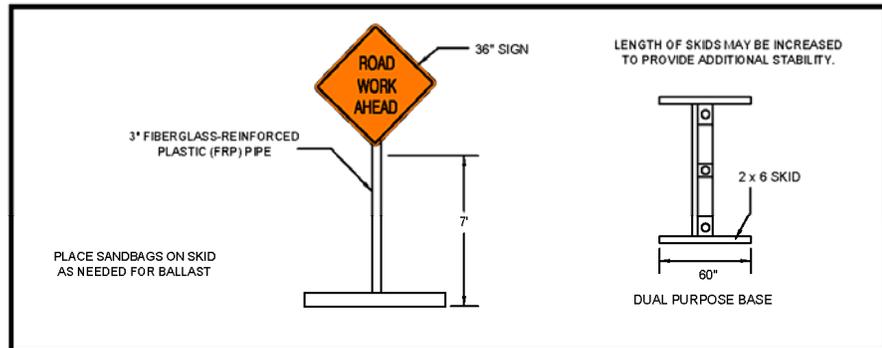
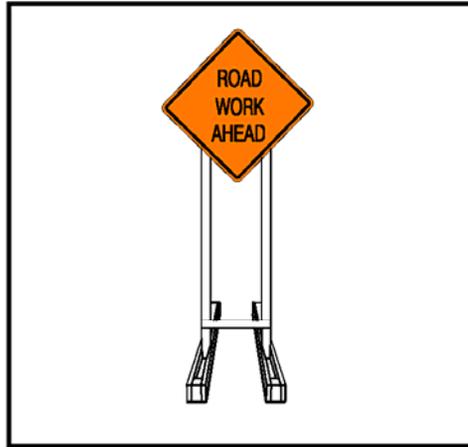
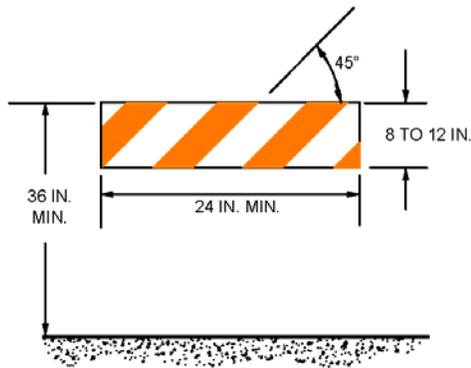
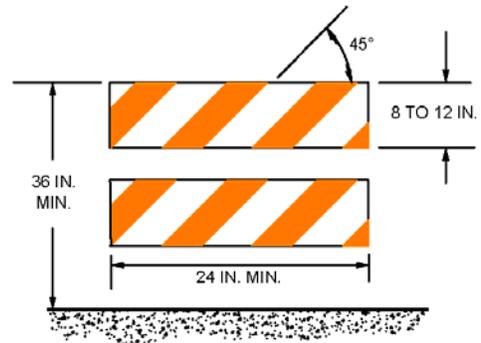


Figure 8b

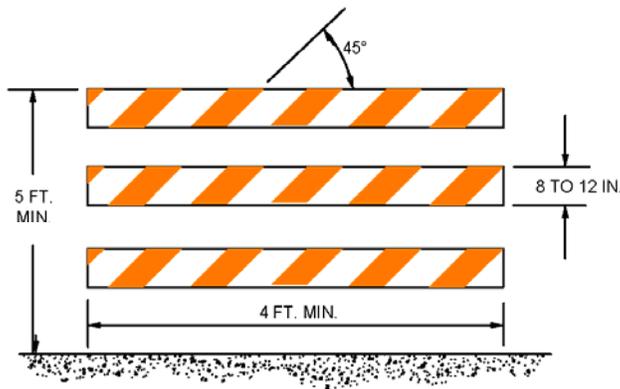
# Barricades



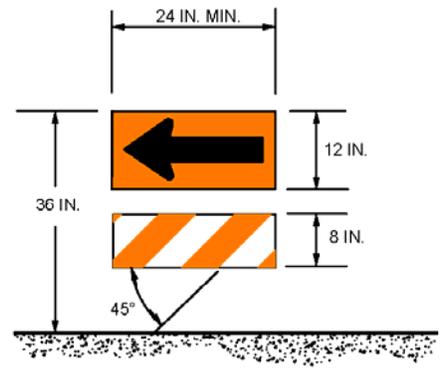
TYPE I BARRICADE\*\*



TYPE II BARRICADE\*\*



TYPE III BARRICADE\*\*



DIRECTION INDICATOR BARRICADE\*\*

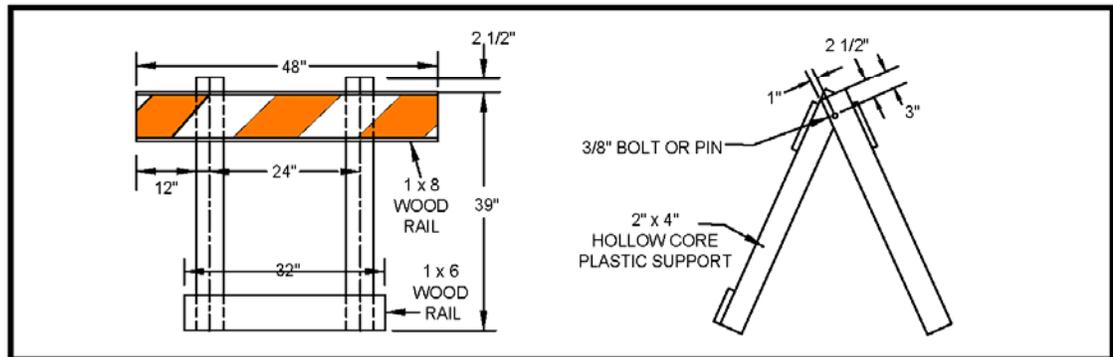


Figure 8b

## Barricades Type 1

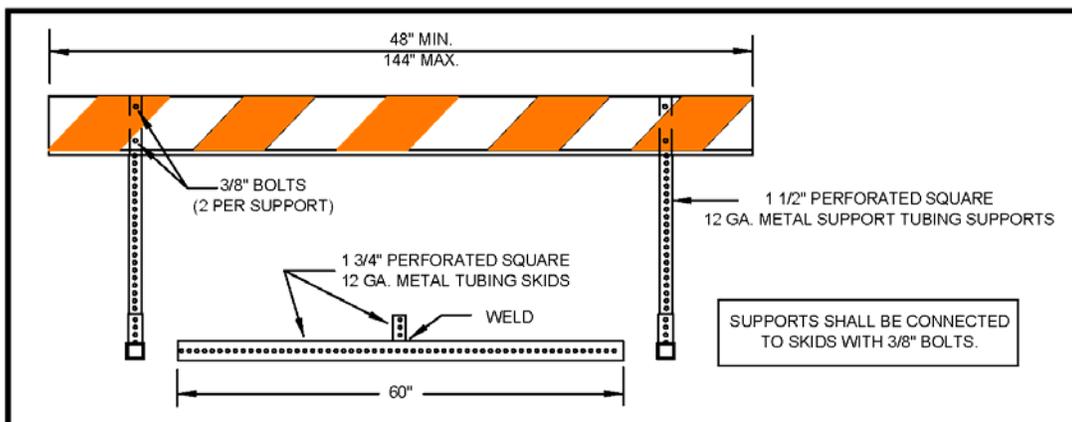
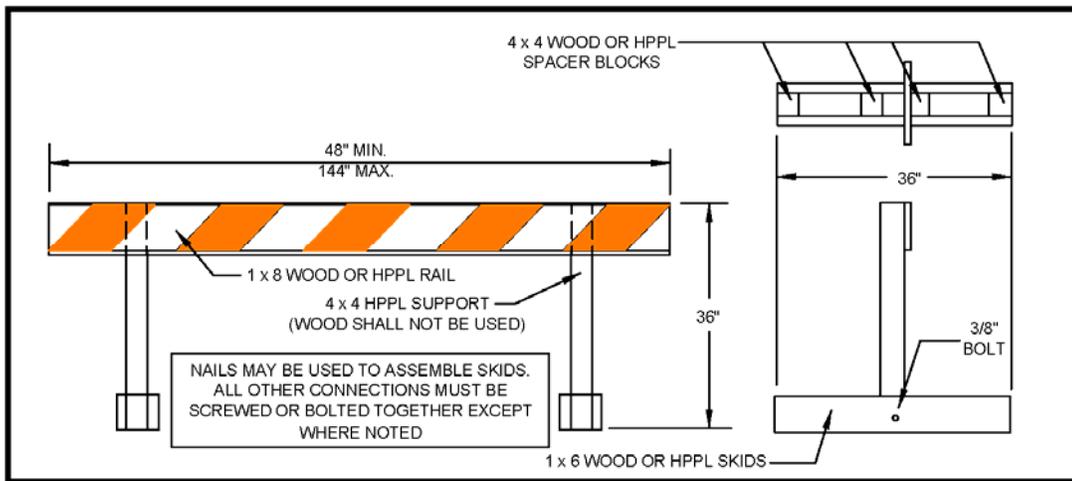
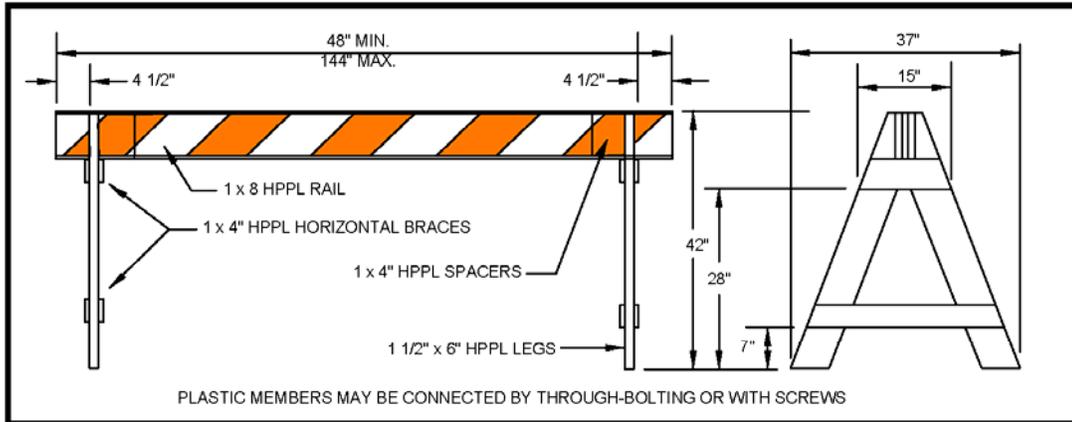


Figure 8b

# Barricades

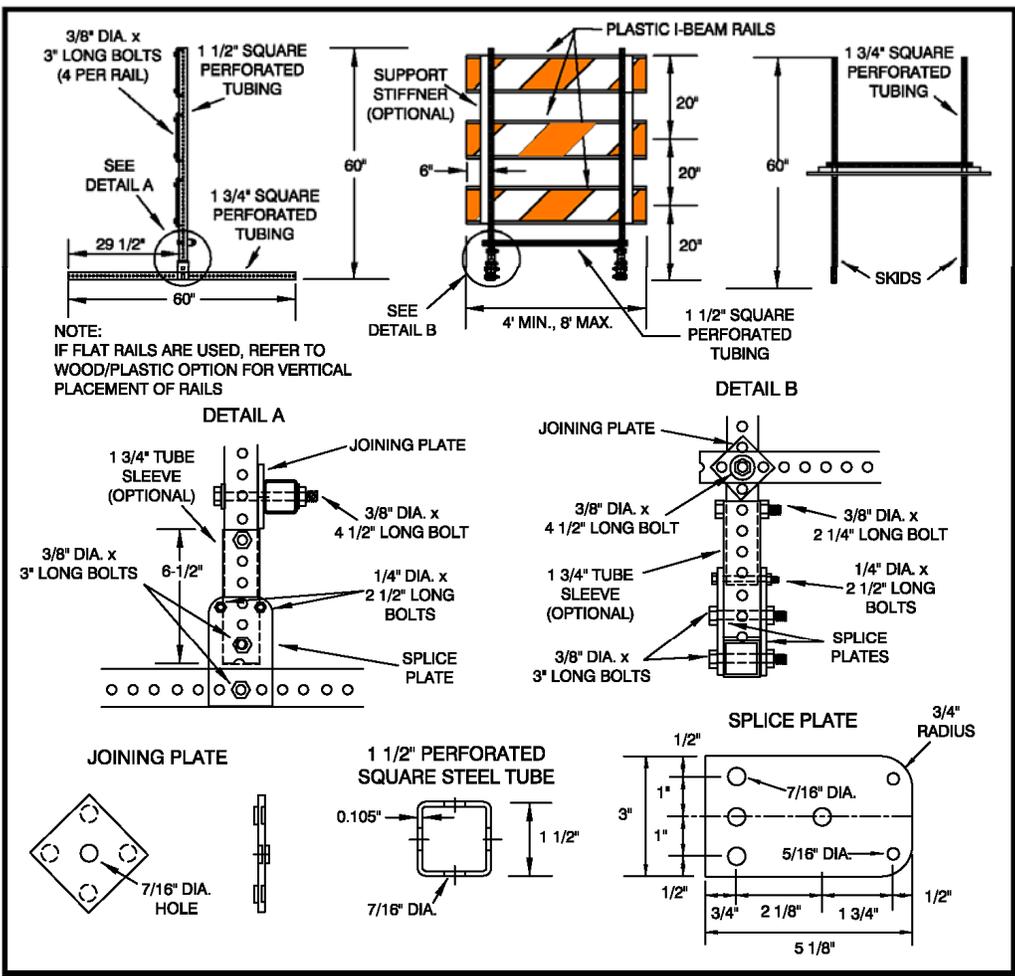
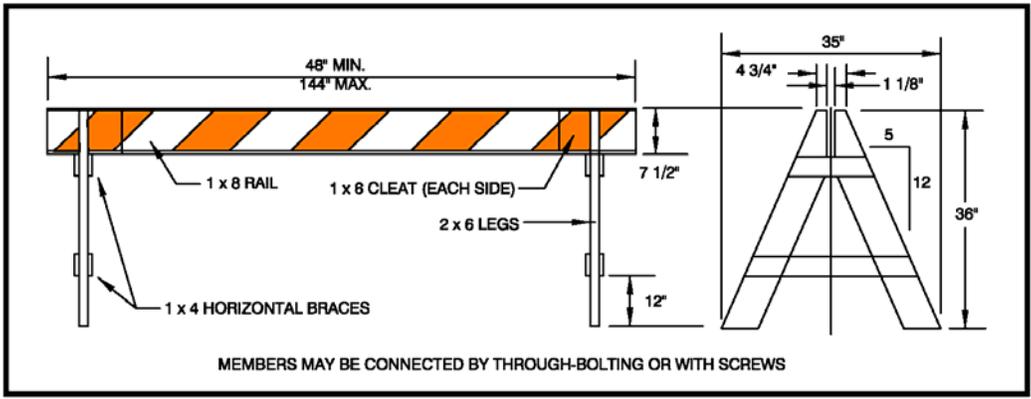


Figure 8b

### Barricades Type 3

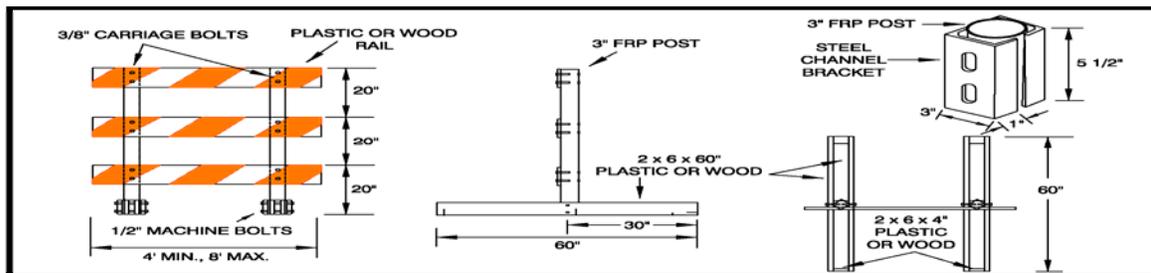
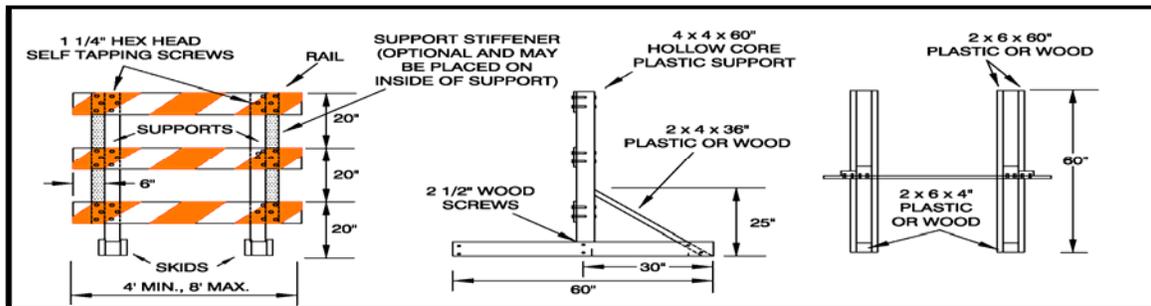
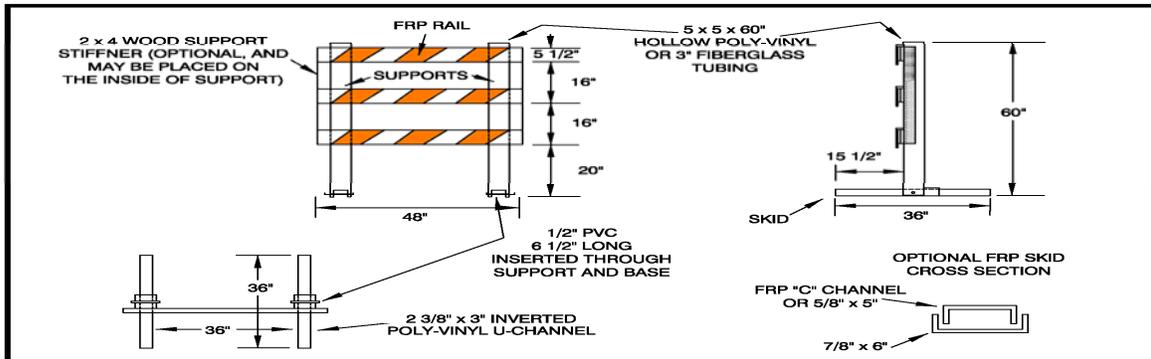
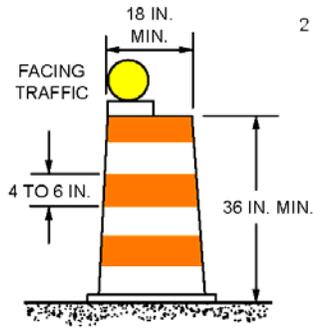
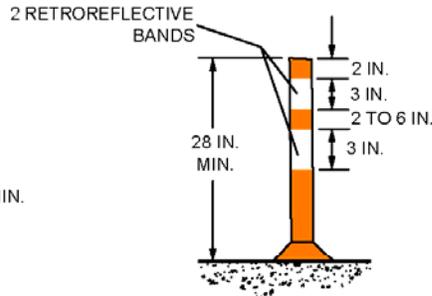


Figure 8c

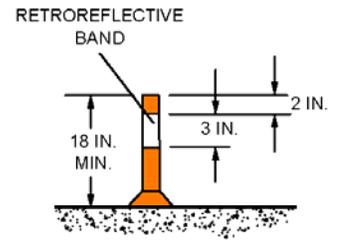
# Channelizing Devices



DRUM

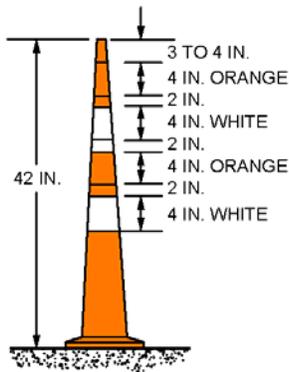


NIGHT AND/OR FREEWAY  
HIGH SPEED ROADWAY  
45 MPH

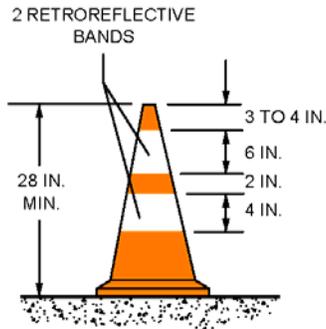


DAY AND LOW-SPEED  
ROADWAY 40 MPH

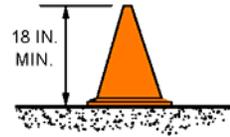
## TUBULAR MARKERS



2 RETROREFLECTIVE BANDS  
(2 WHITE AND 2 ORANGE)

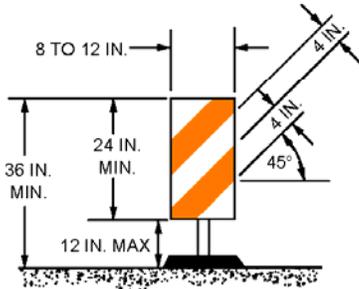


NIGHT AND/OR FREEWAY  
HIGH-SPEED ROADWAY  
45 MPH

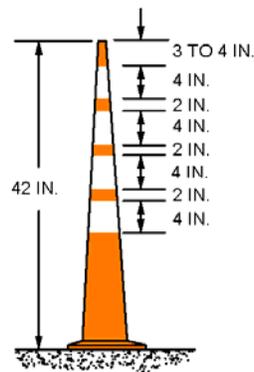


DAY AND LOW-SPEED  
ROADWAY 40 MPH

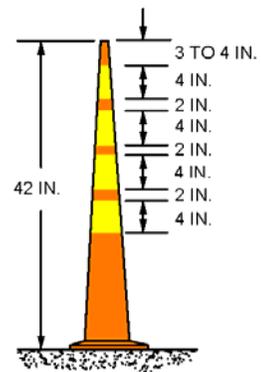
## CONES



VERTICAL PANEL



4 WHITE RETROREFLECTIVE  
BANDS FOR WHITE EDGELINE



4 YELLOW RETROREFLECTIVE  
BANDS FOR YELLOW EDGELINE

## EDGELINE CHANNELIZERS

## Section 9.0 Traffic Control in Incident Management Areas

### 9.1 General

A traffic incident management area is a section of highway where temporary traffic controls are imposed by authorized officials in response to an emergency road user occurrence, a natural disaster, hazardous material spill, or other unplanned event that affects or impedes the normal flow of traffic. This type of TTC zone extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.

### 9.2 Primary Functions of Incident Management Area

The primary functions of TTC at a traffic incident management area are to move road users reasonably safely and expeditiously past or around the traffic incident, to reduce the likelihood of secondary traffic crashes and to limit unnecessary use of the surrounding road systems.

### 9.3 Incident Management Training

On-scene responders **should** be trained in the latest procedures and best practices to minimize closures and reduce secondary traffic accidents. Responders **should** always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or provide appropriate warning.

### 9.4 Major Traffic Incidents

Major traffic incidents are typically events involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a **period exceeding 4 hours**. If the traffic incident is anticipated to last **more than 24 hours**, applicable procedures and devices **should** be used.

Motorists are usually diverted through lane shifts or detoured around the traffic incident and back to the original roadway. A combination of traffic engineering and enforcement preparations is needed to determine the detour route, and to install, maintain, and then to remove the necessary traffic control devices when the detour is terminated. Large trucks are a significant concern in such a detour, especially when diverting them from a controlled access roadway onto local or arterial streets.

If manual traffic control is needed, it **should** be provided by qualified flaggers or uniformed law enforcement officers. If flaggers are used to provide traffic control for an incident management situation, the flaggers **may** use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

Some traffic incidents such as hazardous material spills might require closure of an entire highway. Through traffic must have adequate guidance around the traffic incident. Maintaining good public relations is desirable. The cooperation of the news media in publicizing the existence, of and reasons for, traffic incident management areas and their TTC can be of great assistance in keeping road users and the general public well informed.

When flares or other approved substituted devices are used to initiate TTC at traffic incidents, permanent traffic control devices **should** replace them as soon as practical.

### **9.5 Intermediate Traffic Incidents**

Intermediate traffic incidents typically affect travel lanes for a time **period of 1 to 4 hours**, and usually require traffic control on the scene to divert road users past the blockage. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks.

All traffic control devices required to set up the TTC at a traffic incident **should** be available so that they can be readily deployed. The TTC **should** include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the end of a queue.

If manual traffic control is needed, it **should** be provided by qualified flaggers or uniformed law enforcement officers. If flaggers are used to providing traffic control for an incident management situation, the flaggers **may** use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

When flares or other approved substituted devices are used to initiate TTC at traffic incidents, more permanent traffic control devices **should** replace them as soon as practical.

### **9.6 Minor Traffic Incidents**

Minor traffic incidents are typically disabled vehicles and minor crashes that result in lane closures of **less than 60 minutes**. On-scene responders are typically law enforcement and towing companies and occasionally highway agency service patrol vehicles.

Diversion of traffic into other lanes is often not needed or needed briefly. It is not generally possible or practical to set up a lane closure with traffic control devices for a minor traffic incident. Traffic control is the responsibility of on-scene responders.

When a minor traffic incident blocks a travel lane, it **should** be removed from that lane to the shoulder as quickly as possible.

## 9.7 Use of Emergency-Vehicle Lighting

The use of emergency-vehicle lighting (such as high-intensity rotating, flashing, oscillating, or strobe lights) is essential for a traffic incident scene. Proper use of emergency-vehicle lighting insures the safety of emergency responders and persons involved in the traffic incident, as well as approaching motorists. Emergency-vehicle lighting, however, provides a warning only and provides no effective traffic control. It is often confusing to road users, especially at night. Road users approaching the traffic incident from the opposite direction on a divided facility are often distracted by emergency-vehicle lighting. Motorists tend to slow their vehicles to look at the traffic incident, posing a hazard to themselves and others traveling in their direction.

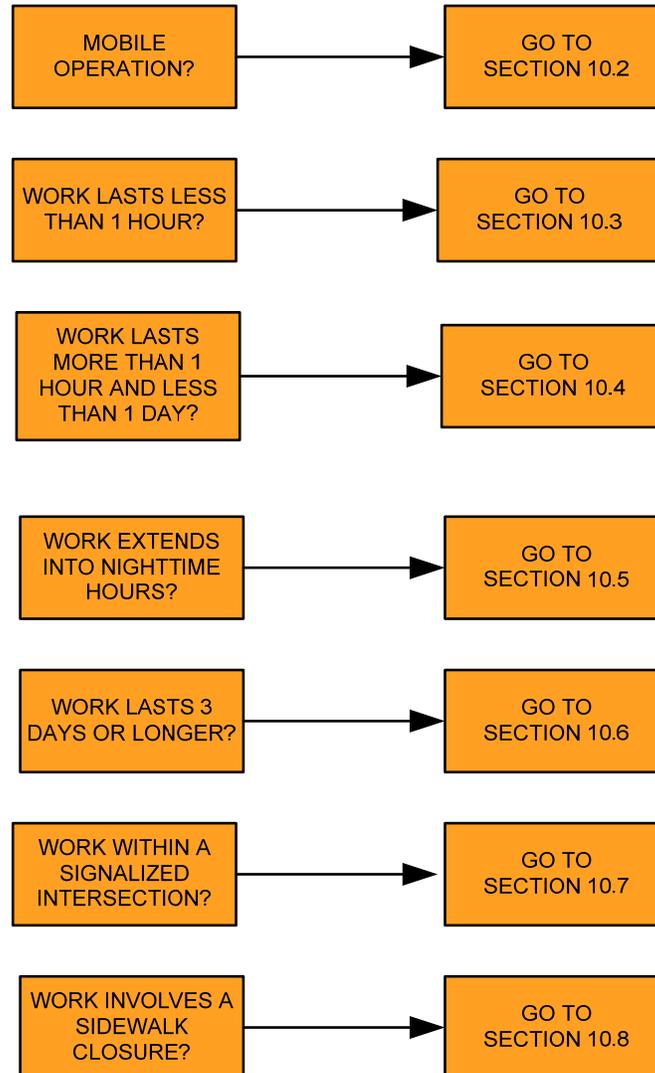
The use of emergency-vehicle lighting can be reduced if good traffic control has been established at a traffic incident scene. This is especially true for major traffic events where a number of emergency-vehicles respond. If proper traffic control is established to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency-vehicle lighting.

Special consideration **should** be given to reducing or extinguishing forward facing emergency-vehicle lighting, especially on divided roadways, to reduce distractions to on-coming road users. Vehicle headlights not needed for illumination **should** be turned off at night.

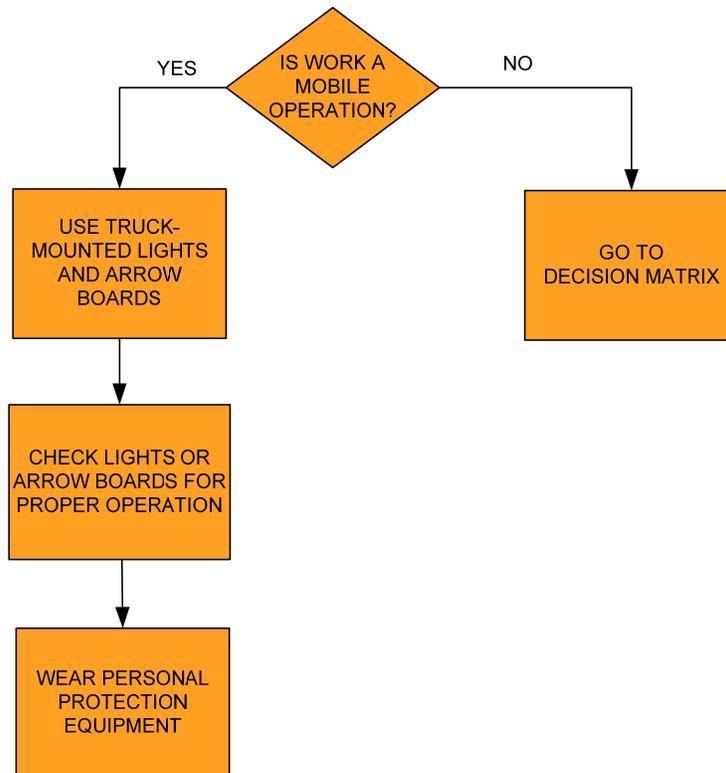
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# Section 10.0 Decision-Making Process

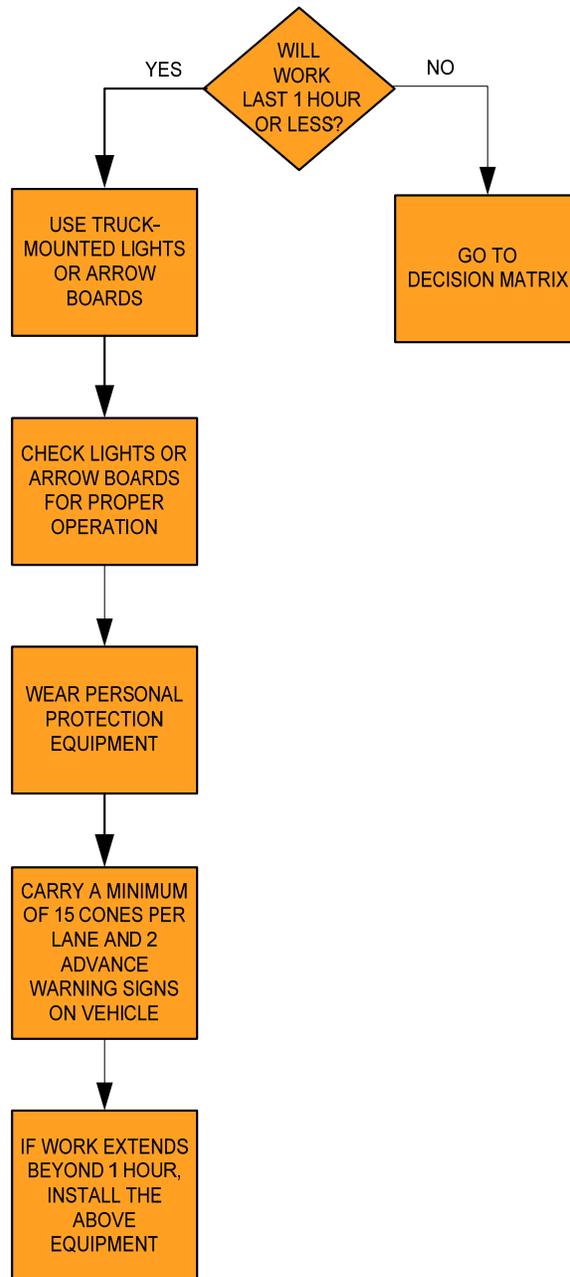
## 10.1 Decision Matrix



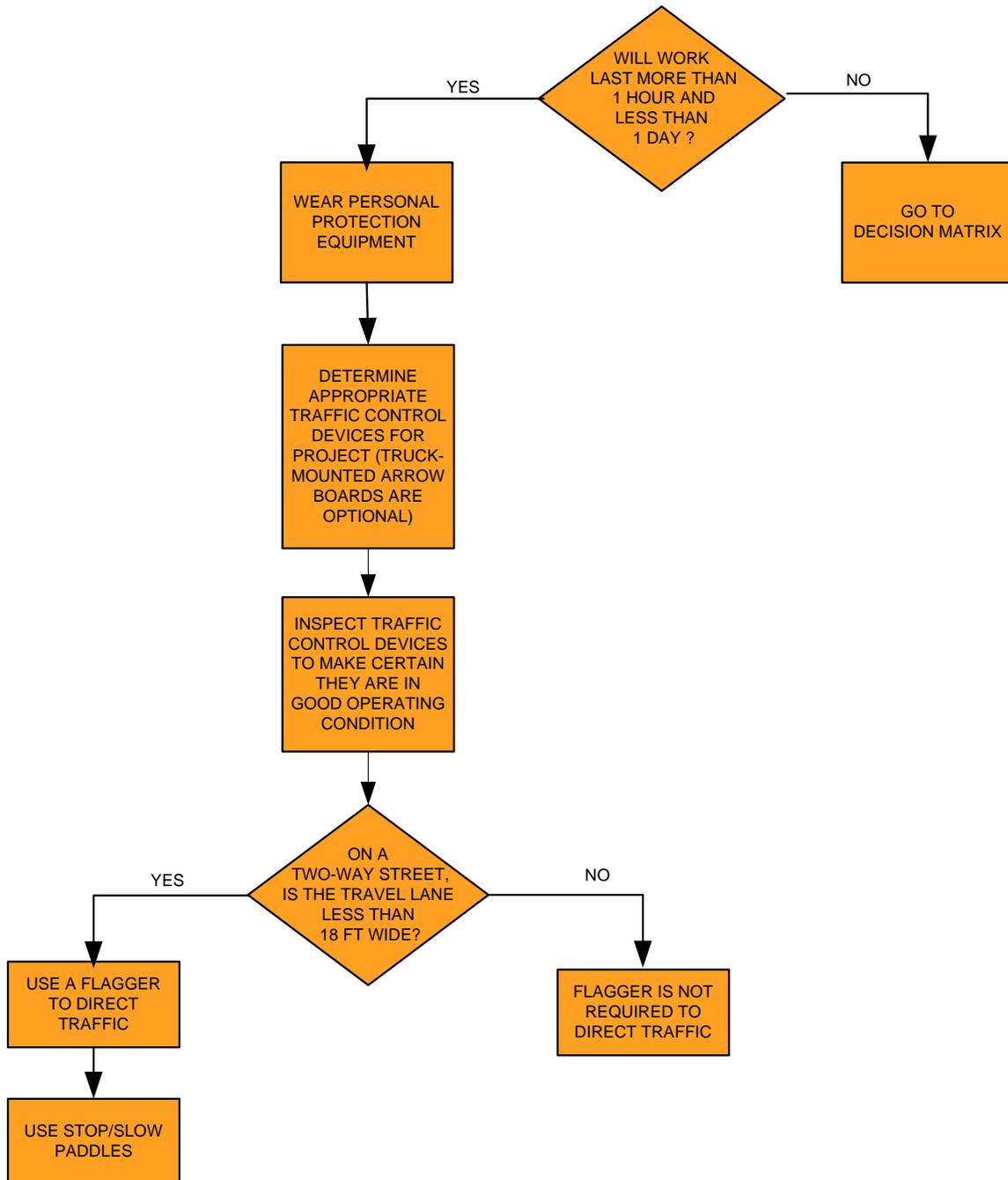
## 10.2 Mobile Operation Flow Chart



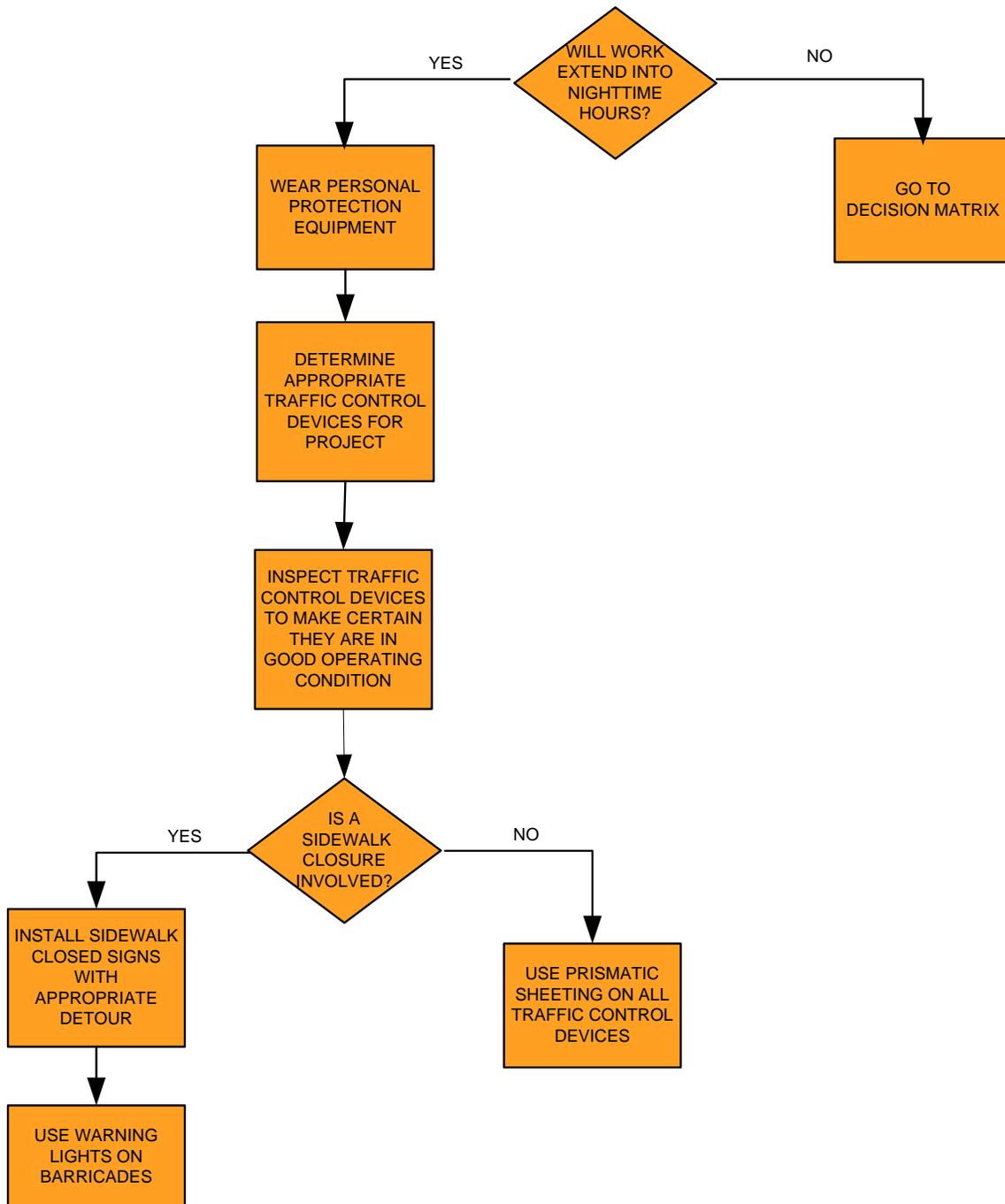
### 10.3 Short Duration Flow Chart



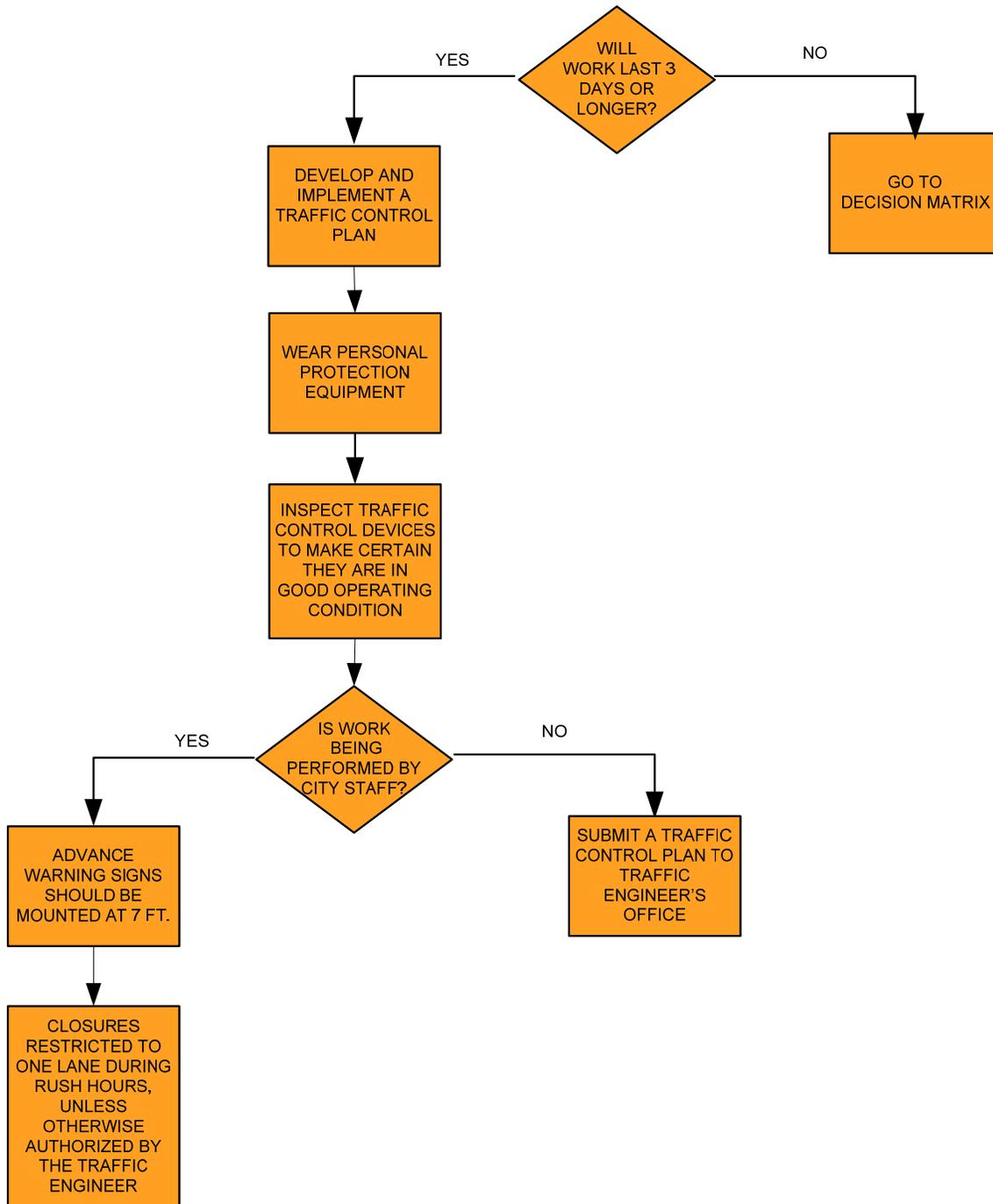
## 10.4 Short-Term Stationary Flow Chart



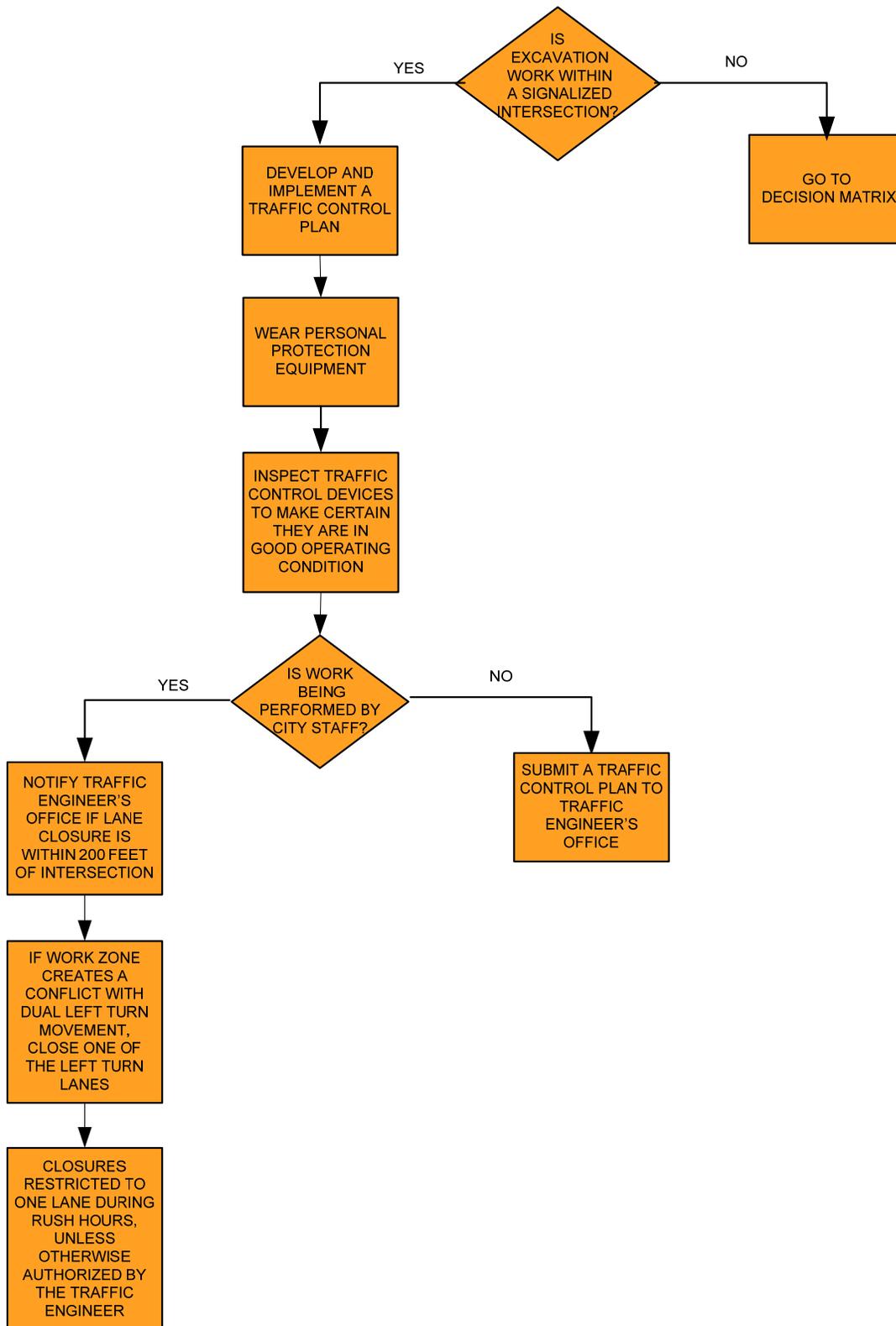
## 10.5 Nighttime Work Flow Chart



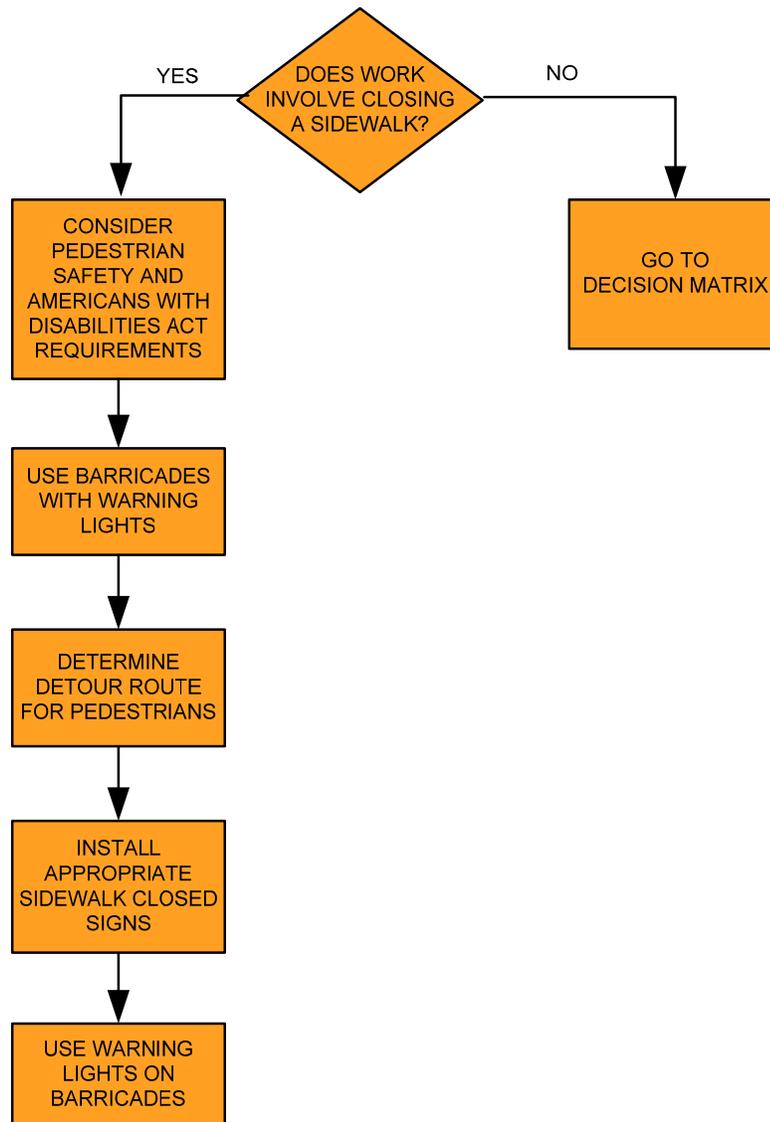
## 10.6 Long-Term Stationary Flow Chart



## 10.7 Work near a Signalized Intersection Flow Chart



## 10.8 Sidewalk Closure Flow Chart



# **City of Dallas Barricade Manual**

## **APPENDIX**

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**TABLE- A**  
ADVANCE WARNING SIGN SPACING

POSTED SPEED IN MPH	25	30	35	40	45	50	55
SIGN SPACING IN FEET (A)	100	120	160	240	320	400	500

**TABLE-B**  
LENGTH AND DEVICE SPACING FOR LANE CLOSURE AND CHANNELIZATION TAPERS

SPEED LIMIT	MINIMUM TAPER LENGTH (L)			MIN. NO OF DEVICES FOR TAPER ONLY (12FT. LANE)	MAXIMUM DEVICE SPACING IN FEET	
	LANE WIDTH IN FT				ON TAPER	ON TANGENT
MPH	10'	11'	12'			
20	70	75	80	7	20	40' – 55'
25	105	115	125	7	25	50' – 65'
30	150	165	180	7	30*	60' – 75'
35	205	225	245	13	35	70' – 90'
40	270	295	320	13	40	80' – 100'
45	450	495	540	13	45	90' – 110'
50	500	550	600	13	50	100' – 125'
55	550	605	660	13	55	110' – 140'
*It is recommended that the distance between traffic cones used for tapers should not exceed 30 feet regardless of speed						

**TABLE- C**  
TAPER LENGTH CALCULATIONS

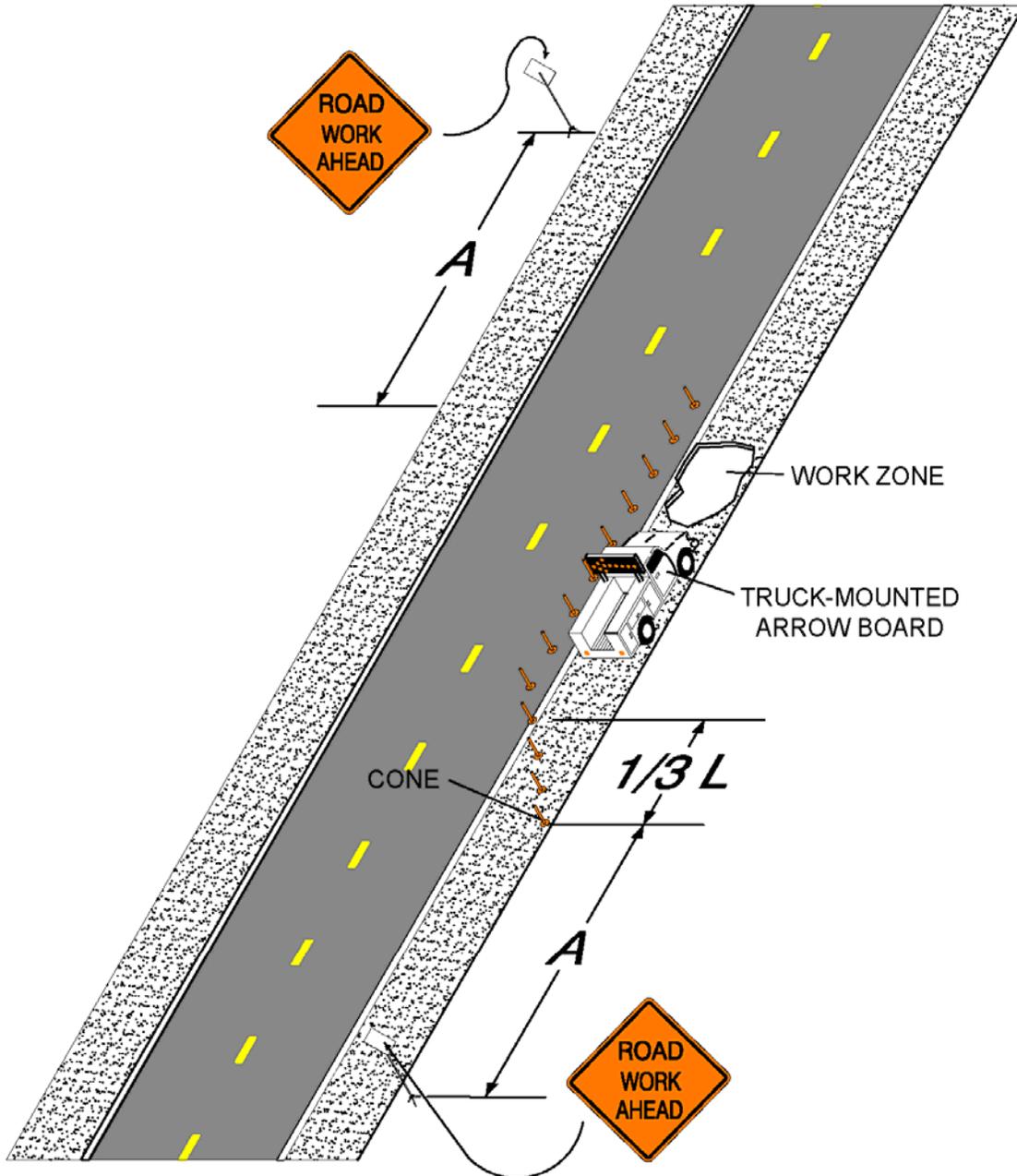
SPEED LIMIT	FORMULA
40 mph or under	$L = \frac{WS^2}{60}$
45 mph or over	$L = WS$
TYPE OF TAPER	TAPER LENGTH (L)
Merging Taper	at least L
Shifting Taper	at least 0.5L
Shoulder Taper	at least 0.33L
One-Lane, Two-Way Traffic Taper	50 to 100 ft
Downstream Taper	100 ft per lane

L = Length of Taper (Ft)  
W = Width of Offset (Ft)  
S = Posted Speed (MPH)

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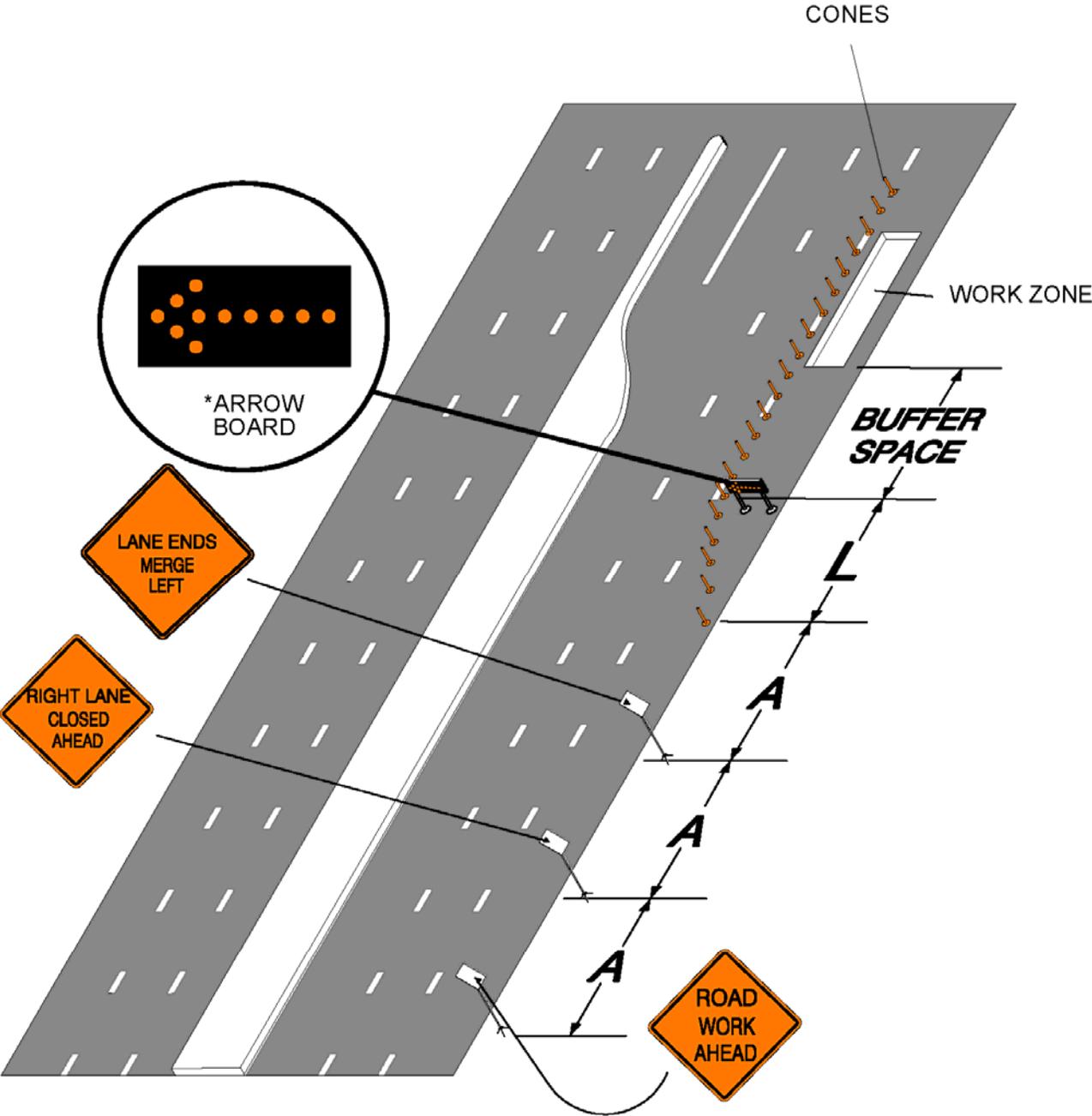
# **Traffic Control Barricade Illustrations**

# SHORT DURATION PROJECT OR MOBILE OPERATION ON SHOULDER



A = SIGN SPACING (SEE TABLE A, PAGE 53)  
L = TAPER LENGTH (SEE TABLE C, PAGE 53)

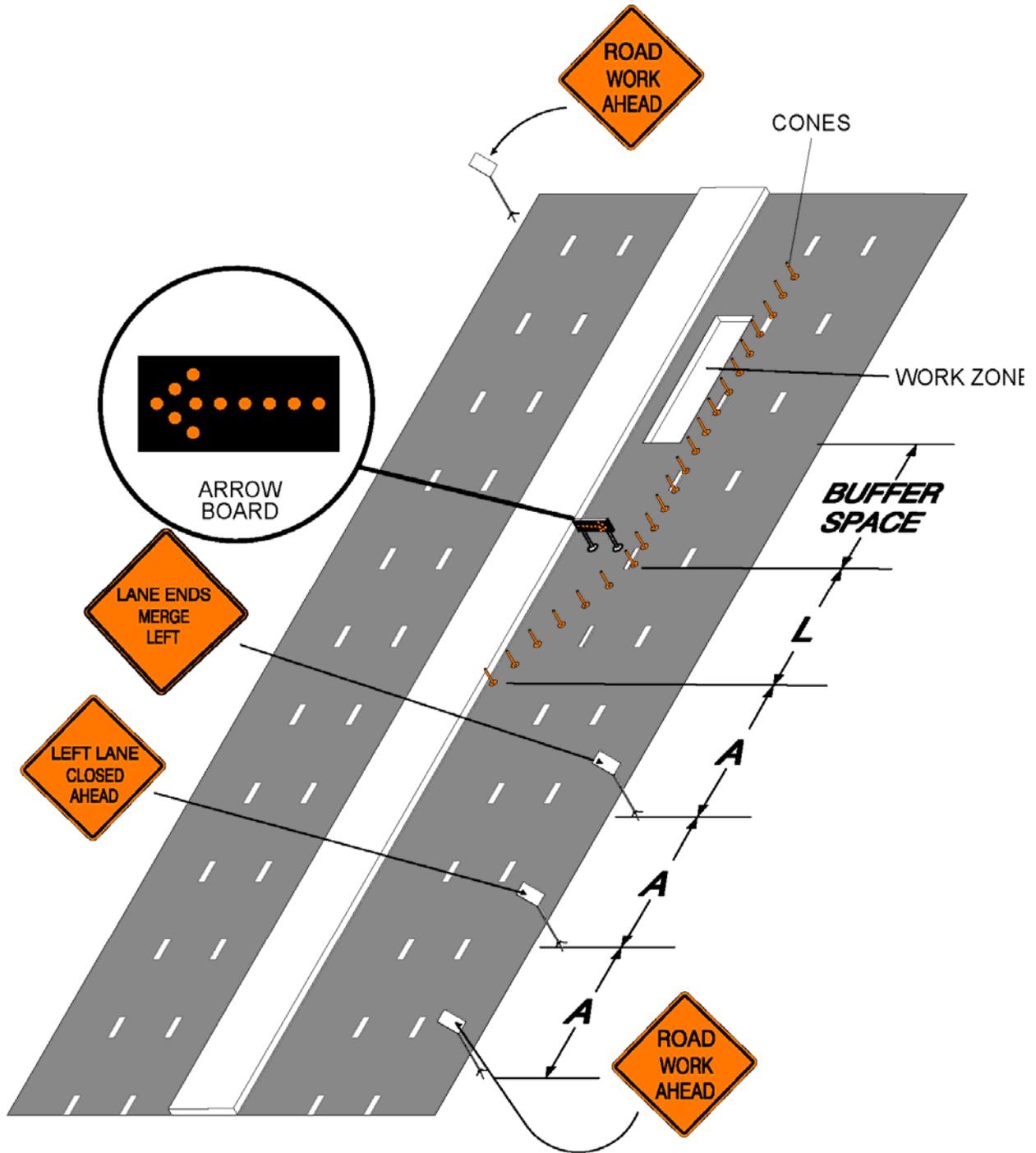
# RIGHT LANE CLOSURE ON A MAJOR STREET



**\*NOTE:**  
 OPTION FOR DAY TIME: ARROW BOARD  
 MAY BE REQUIRED BY DIRECTION  
 OF THE TRAFFIC ENGINEER

A = SIGN SPACING (SEE TABLE A, PAGE 53)  
 L = TAPER LENGTH (SEE TABLE C, PAGE 53)

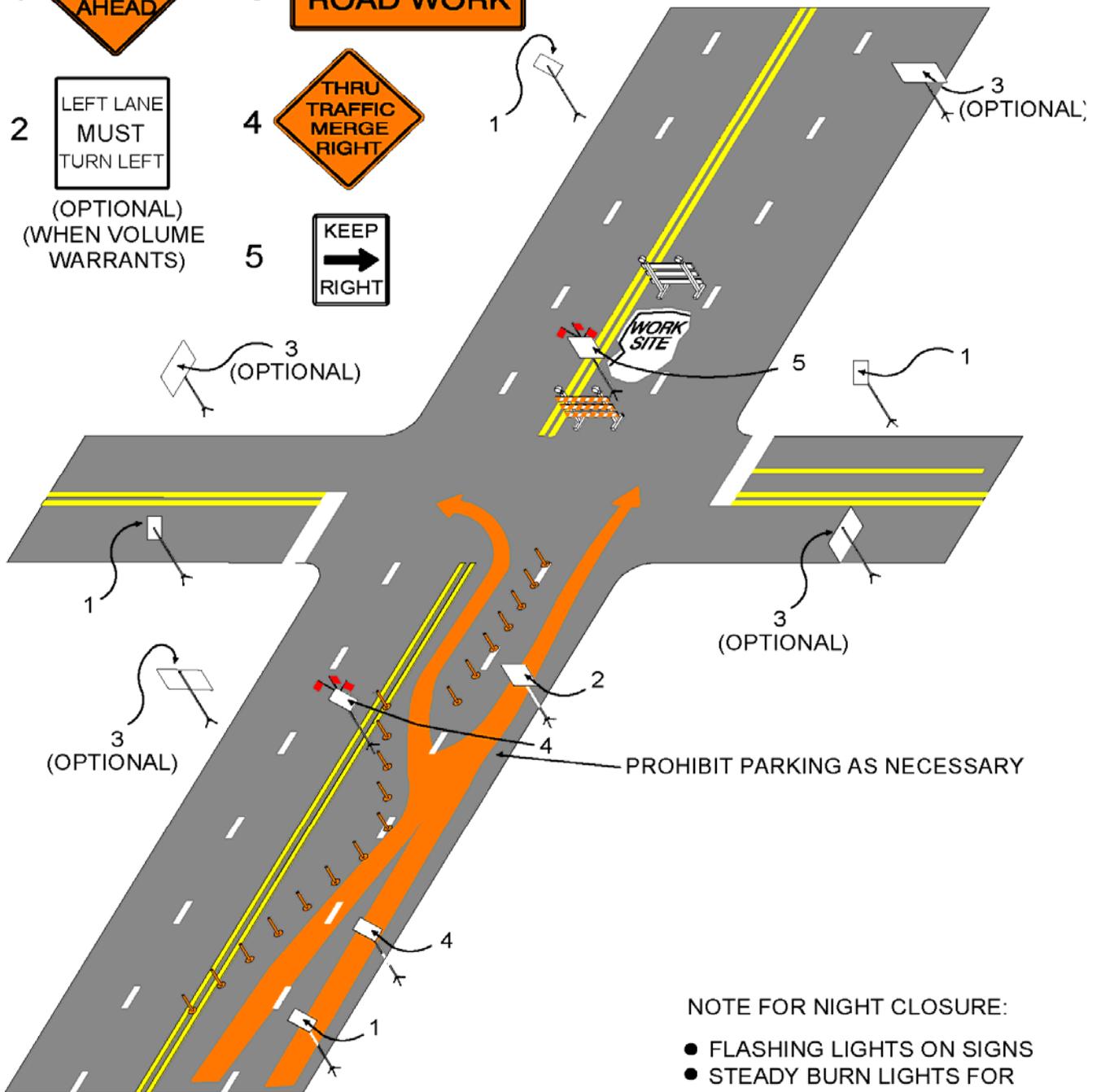
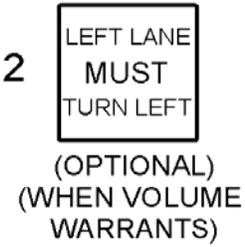
# LEFT LANE CLOSURE ON A MAJOR STREET



A = SIGN SPACING (SEE TABLE A, PAGE 53)  
L = TAPER LENGTH (SEE TABLE C, PAGE 53)

# FAR SIDE LEFT LANE CLOSURE

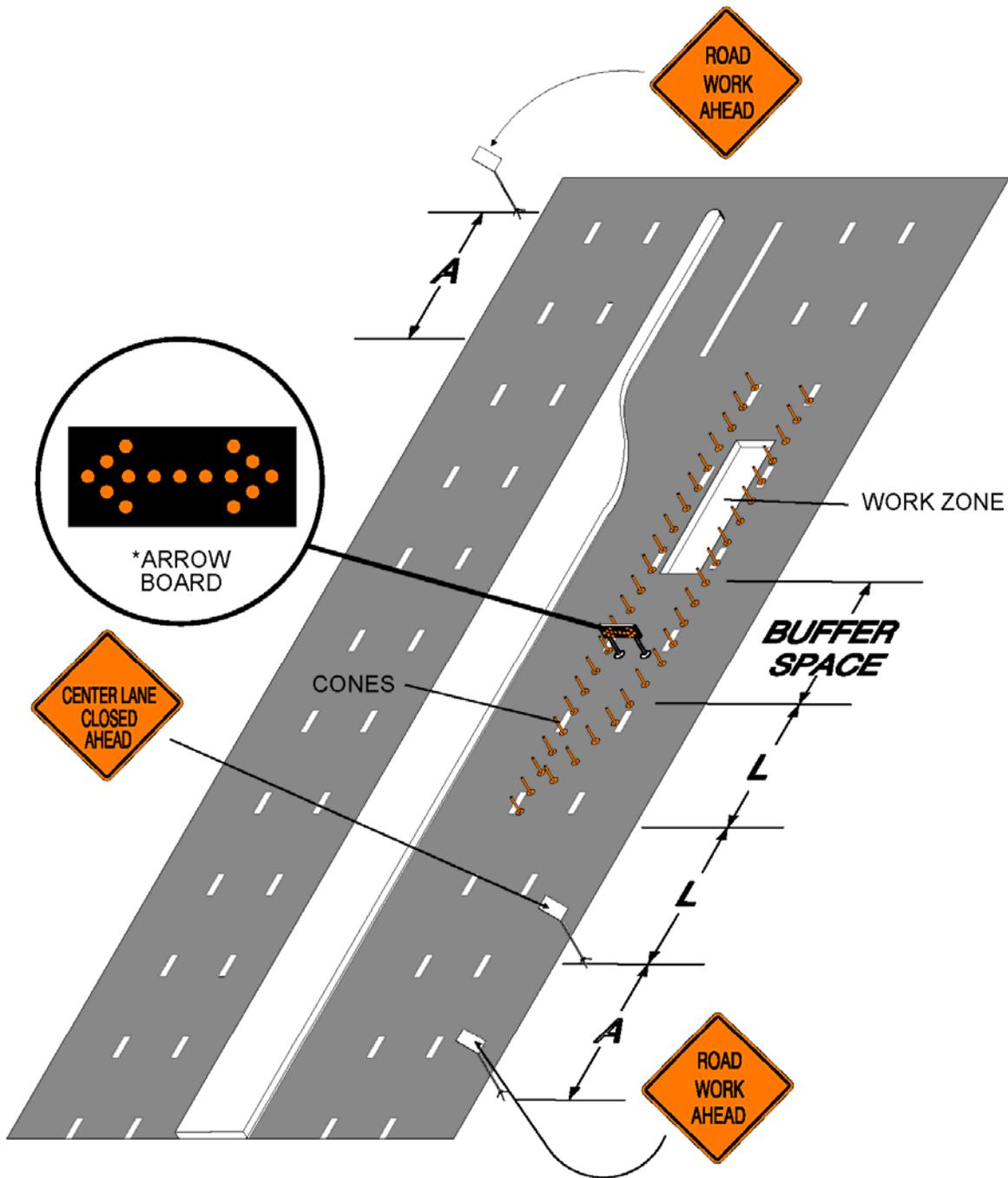
SIGNS:



**NOTE FOR NIGHT CLOSURE:**

- FLASHING LIGHTS ON SIGNS
- STEADY BURN LIGHTS FOR DELINEATION AND CHANNELIZATION

## CENTER LANE CLOSURE ON A MAJOR STREET

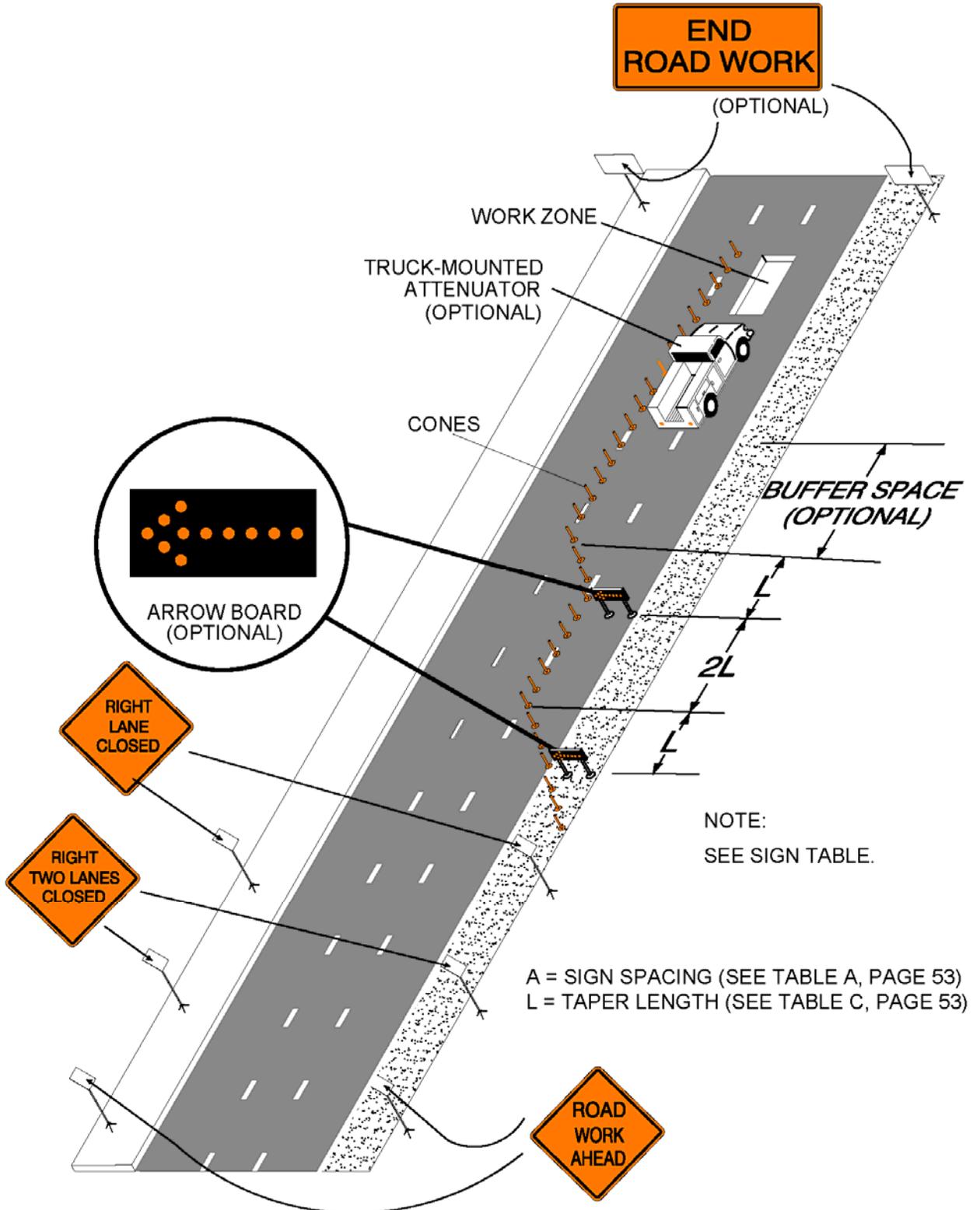


**\*NOTE:**

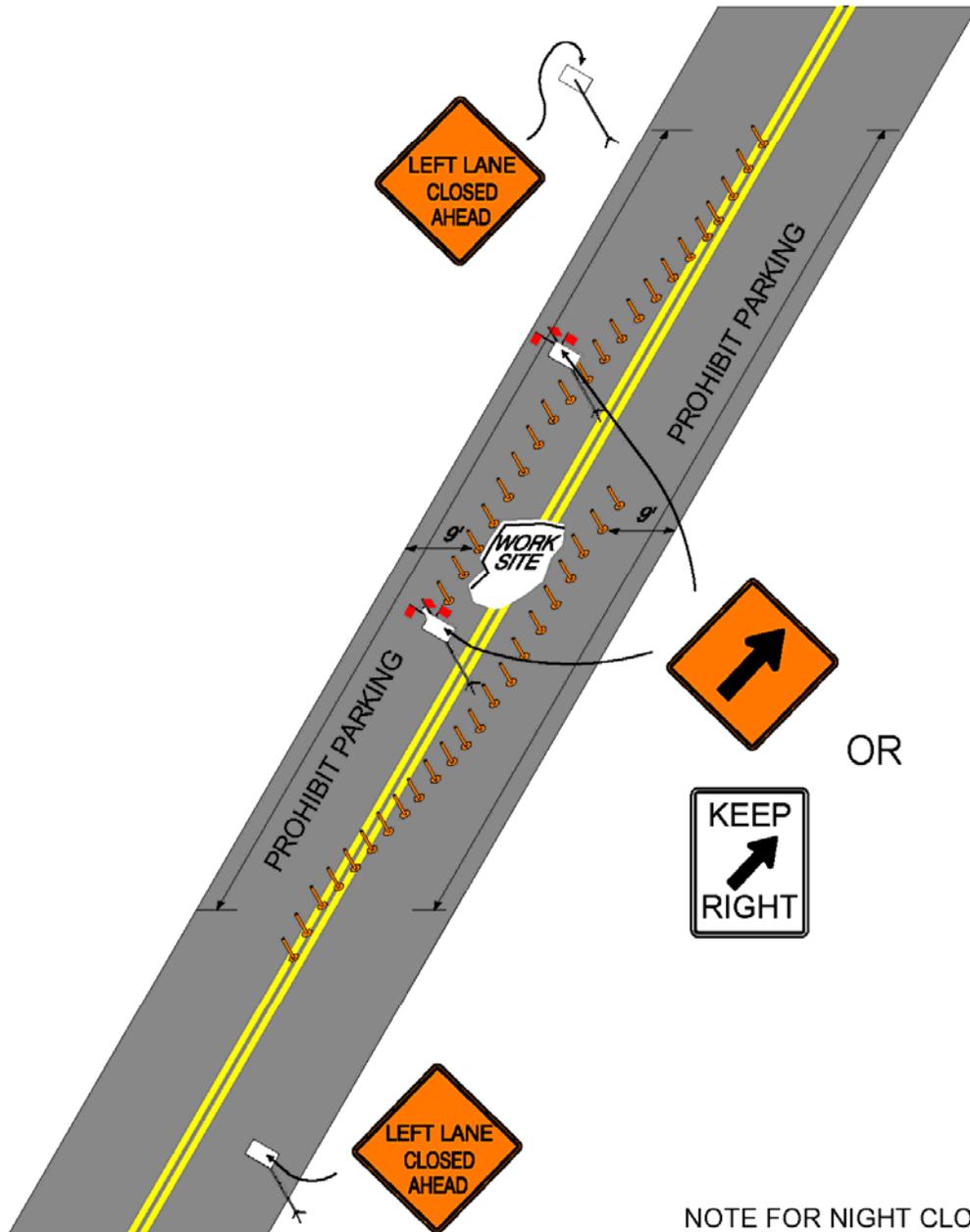
OPTION FOR DAY TIME: ARROW BOARD  
MAY BE REQUIRED BY DIRECTION  
OF THE TRAFFIC ENGINEER

*A* = SIGN SPACING (SEE TABLE A, PAGE 53)  
*L* = TAPER LENGTH (SEE TABLE C, PAGE 53)

# DOUBLE LANE CLOSURE



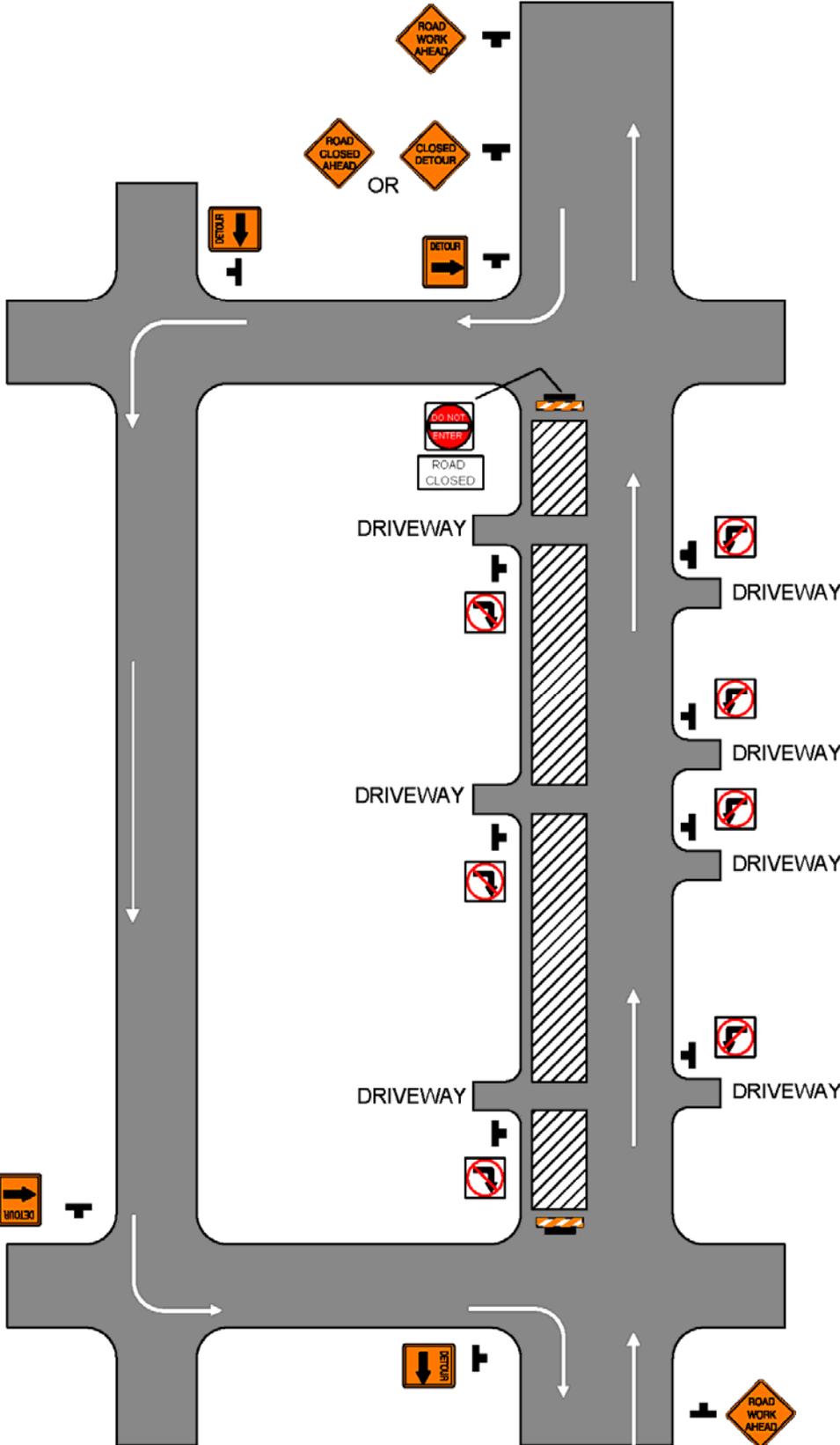
# CENTER STREET CLOSURE, MID-BLOCK (LOW-VOLUME)



- NOTE FOR NIGHT CLOSURE:
1. FLASHING LIGHTS ON SIGNS
  2. STEADY BURN LIGHTS FOR DELINEATION AND CHANNELIZATION

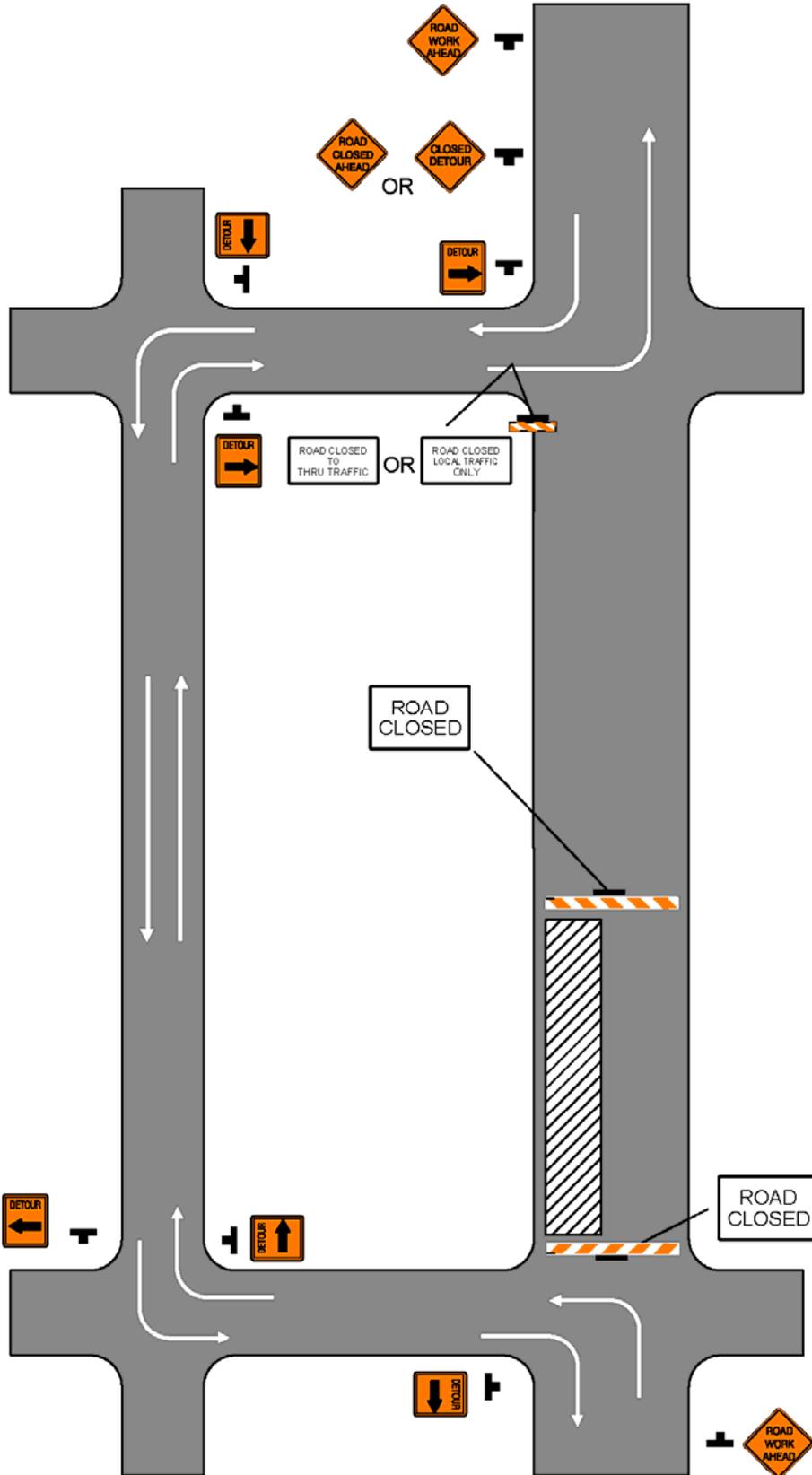


# LOW VOLUME HALF STREET CLOSURE

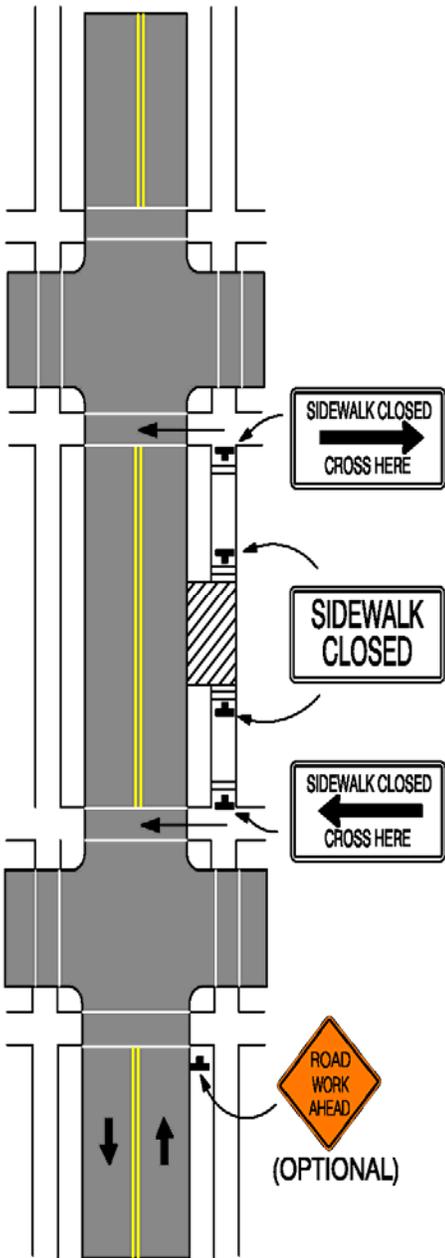




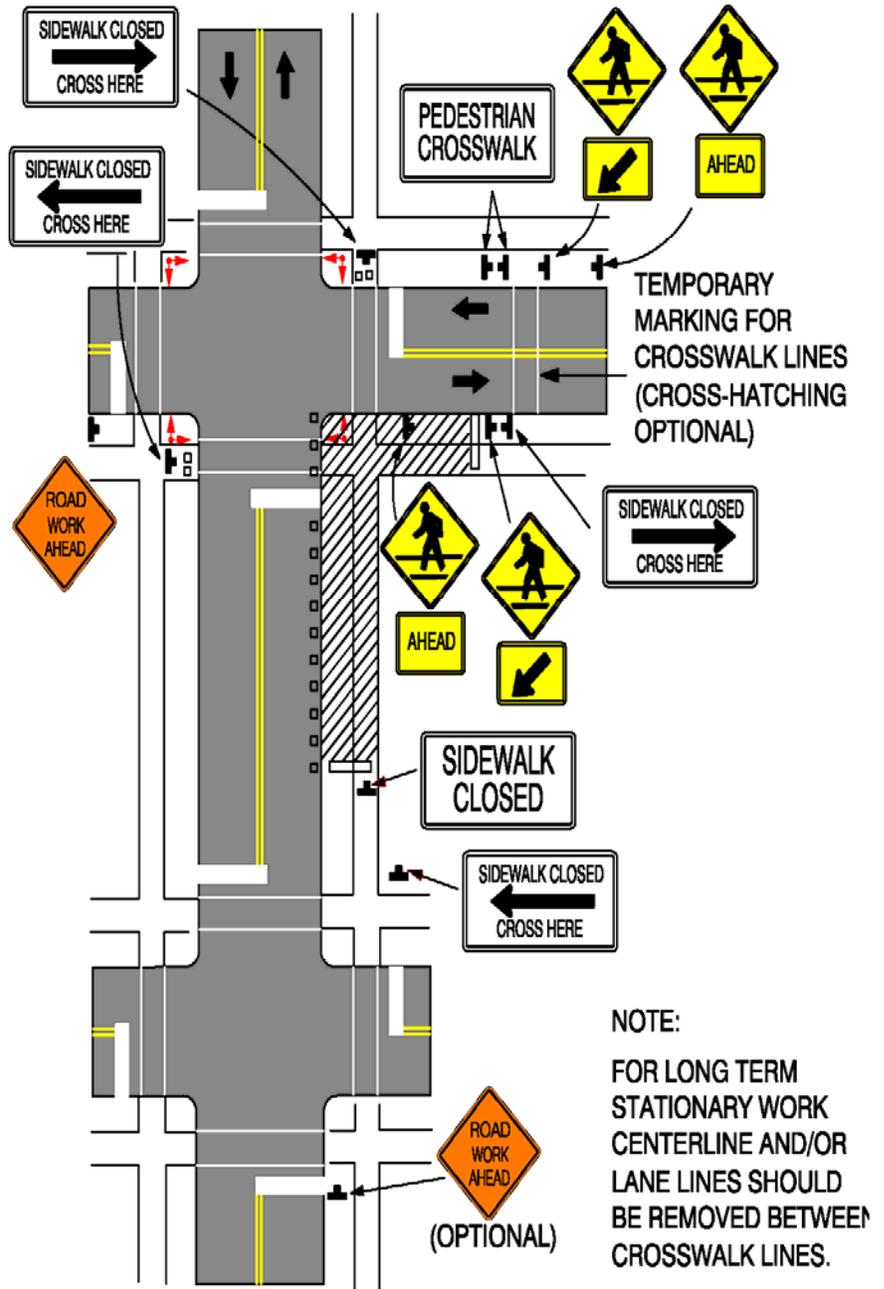
# RESIDENTIAL ROAD CLOSED TO THROUGH TRAFFIC



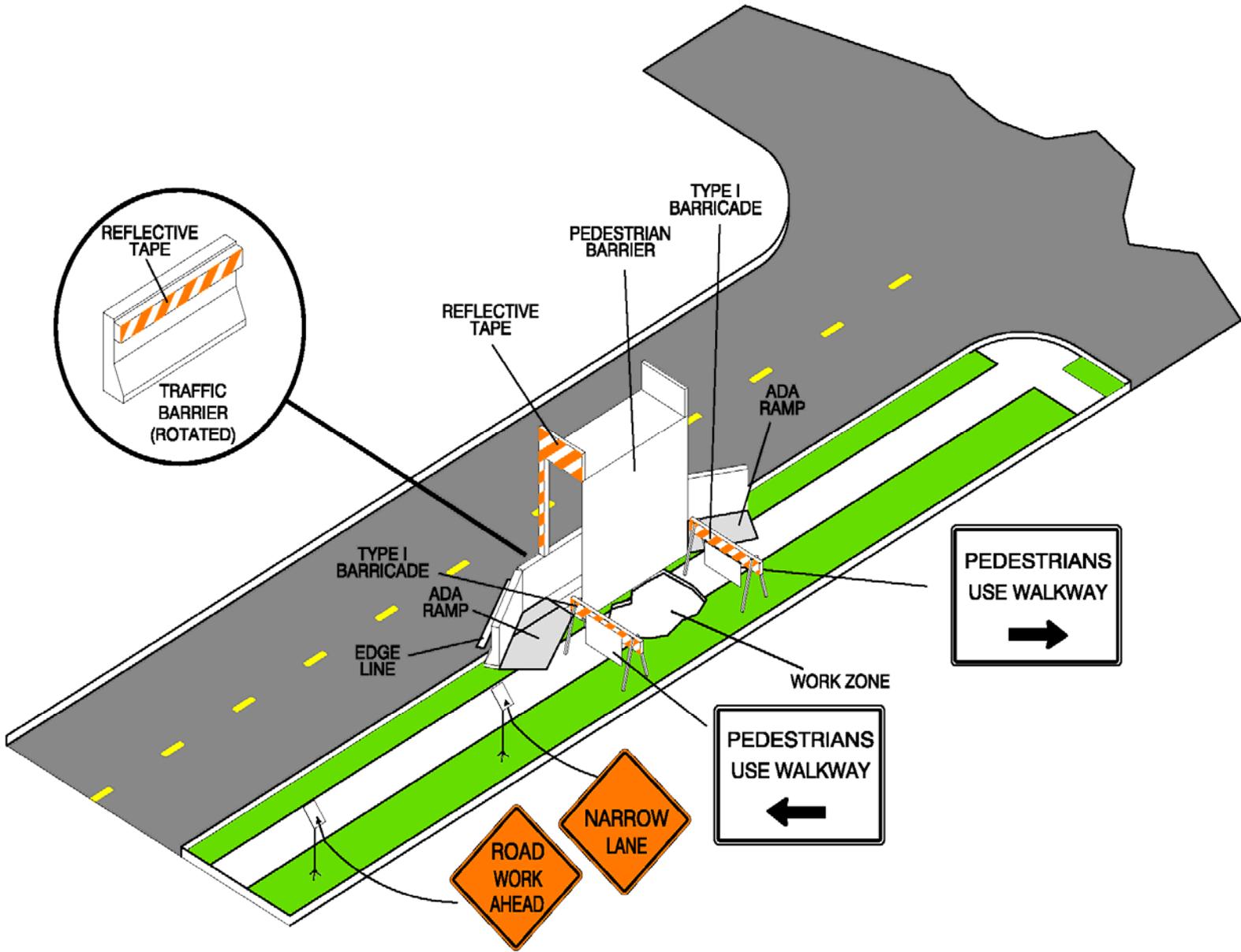
## SIDEWALK DETOUR



## CROSSWALK CLOSURES AND PEDESTRIAN DETOURS



# MID-BLOCK SIDEWALK DIVERSION



## DEFINITION OF TERMS

**ADA:** Americans with Disabilities Act.

**ASTM:** American Society for Testing and Materials.

**ANSI:** American National Standards Institute.

**ATTENUATOR:** A device for reducing the strength of a wave, especially when struck by an errant vehicle.

**ATSSA:** American Traffic Safety Services Association.

**CBD:** Central Business District- Bordered by Woodall Rodgers Freeway to the north, Interstate 30 to the south, Interstate 35 to the west, and Interstate 45/Texas State Highway 75 to the east of downtown Dallas.

**CHANNELINZING DEVICE:** Channelizing devices consist of TTC devices such as vertical panel, traffic cones, or drum which allows for the redirecting of a motorist through a TTC work zone.

**CMS:** A sign that is capable of displaying more than one message, changeable manually, by remote control, or by automatic control. These signs are also referred to as DMS (Dynamic Message Sign). These signs can be portable.

**COLLECTOR STREET:** Provides access and traffic circulation within residential, commercial, and business areas and connects to major streets.

**COMPETENT PERSON:** A person who has acquired through training, qualification or experience, or a combination of them, the knowledge and skills to carry out a particular task.

**CONTRACTOR:** Unless otherwise stated in this *Manual*, a contractor is a person who contracts to furnish supplies or perform work within the City of Dallas right-of-way (utilities, Dallas Area Rapid Transit, City of Dallas employees, County, etc).

**CRASHWORTHY:** A characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the National Cooperative Highway Research Program Report 350, "*Recommended Procedures for the Safety Performance Evaluation of Highway Features.*"

**ENGINEERING JUDGMENT:** The evaluation of available pertinent information and the application of appropriate principles, standards and practices as contained in the *TMUTCD* and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.

**HIGHWAY:** A general term for denoting a public way for purposes of travel by vehicular travel, including the entire area within the right-of-way.

**ISEA:** International Safety Equipment Association.

**ITE:** Institute of Transportation Engineers.

**MAJOR STREET:** A street normally carrying the higher volume of vehicular traffic.

**NCHRP:** National Cooperative Highway Research Program. It conducts research in problem areas that affect highway planning, design, construction, and maintenance nationwide.

**NOV:** Notice of violation.

**PEACE OFFICER:** A civil officer appointed to preserve the public peace, as a constable, police, or sheriff.

**PEDESTRIAN:** A person afoot, in a wheelchair, on skates, or on a skateboard.

**PRISMATIC SHEETING:** It is a product with high reflectivity that reflects light back to the light source.

**REGULATORY SIGN:** A sign that gives notice to road users of traffic laws or regulations.

**RESIDENTIAL STREET:** A low-speed, low-volume street with signal and multi-family homes adjacent to the street.

**RETROREFLECTIVITY:** A property of a surface that allows a large portion of the light coming from a point source to be returned directly back to a point near its origin.

**ROAD:** See Roadway.

**ROADWAY:** That portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk or shoulder.

**SHADOW VEHICLE:** A shadow vehicle is a vehicle usually used in a mobile operation. It stays within a safe distance from the actual work zone creating a buffer zone for the workers. The vehicle may have an attenuator mounted to it for additional safety.

**SIDEWALK:** That portion of a street between the curb line, and the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved and intended for use by pedestrians.

**STREET:** See Highway.

**TANGENT:** A line or surface that touches another line or curved surface, but does not cross or intersect it.

**TAPER:** It is the process of gradually narrowing a lane or lanes to redirect motorists. The property possessed by a shape that narrows toward a point (as a wedge or cone).

**TCP:** Traffic Control Plan.

**TMUTCD:** Texas Manual on Uniform Traffic Control Devices.

**TRAFFIC CONTROLLERS:** A traffic and parking controller is authorized, in the same manner as a police officer, to issue citations for any traffic or parking violation, impound any vehicle for a parking or fire lane violation, and is authorized to direct traffic by voice, hand or signal, in conformance with traffic laws or may direct traffic as conditions require notwithstanding the provisions of the traffic laws.

**TRAFFIC CONTROL DEVICE:** A sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over or adjacent to a street, highway, pedestrian facility, or shared-used path by authority of a public agency having jurisdiction.

**TRAFFIC ENGINEER:** The person designated by the City Manager to perform the functions of traffic engineer or his authorized representative.

**TTC:** Temporary Traffic Control.

**URBAN STREETS:** A term used to denote streets with larger number of pedestrians, bicyclists, and larger volume of vehicles on low-speed streets. Urban streets are usually located near business or commercial districts.

**VICTORY DEVELOPMENT:** The area around the American Airlines Center. The boundaries are Harry Hines Boulevard to the north and east/ Woodall Rodgers Freeway to the south/ Interstate 35 to the west.