Work Zone Certification

Presented by:

International Municipal Signal Association

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Course Learning Objectives

LESSON 5 Adjusting, Monitoring, and Managing Traffic flow and work zone

LESSON 6 Removing Equipment and Notifying Authority Having Jurisdiction (AHJ),

LESSON 7 Conducting Final Inspection and Post Activity Review

Review

Course Goals

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Introduction

Students will understand basic Temporary Traffic Control (TTC) terms and where and how to use the standards that govern which TTC plans and devices should be installed.

Our mission

- For each Student to know the purpose of a Work Zone

- For each student to be able to find TTC standards in the MUTCD and how to use the MUTCD to find layouts, TTC devices, taper formulas, and the correct way to install a TTC zone SAFELY and with minimal disruption to the traveling public.

- Students will have understanding of how to install the different types of TTC Devices within the chosen TTC design . Will understand functions of maintaining and adjusting existing TTC Zones.

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INTRODUCTION

Purpose of a Work Zone

Temporary traffic work zones are established on roadways to facilitate construction, maintenance, repair, or any other activities that require temporary changes to the normal flow of traffic. The purpose of these work zones is to create a safe environment for both the workers and the traveling public. Here are some key purposes of temporary traffic work zones:

- **Safety:** The primary purpose of work zones is to ensure the safety of workers and road users. By creating a designated area for construction or maintenance activities, work zones help separate workers and equipment from moving traffic, reducing the risk of accidents and injuries.
- **Traffic Flow Management:** Work zones are designed to manage and direct traffic flow effectively. They may involve lane closures, detours, reduced speed limits, and temporary traffic control devices like cones, barriers, and signs. These measures help maintain traffic organization and minimize congestion, despite the ongoing work.
- **Worker Protection:** Work zones provide a controlled environment for workers to carry out their tasks safely. They establish a physical barrier between workers and passing vehicles, reducing the likelihood of accidents or incidents caused by close proximity.
- **Infrastructure Maintenance:** Temporary work zones are often established for maintenance and repair activities such as road resurfacing, bridge repairs, or utility installations. These zones allow for necessary infrastructure improvements while minimizing disruptions to the overall transportation network.

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INTRODUCTION

Purpose of a Work Zone

- **Public Awareness and Communication:** Work zones also serve as a means of communicating information to the public. They display signs and warnings to inform drivers about upcoming changes, such as lane shifts, closures, or alternate routes. This helps drivers navigate through the work zone and adapt to the temporary traffic patterns.

Overall, the purpose of temporary traffic work zones is to ensure the safety of workers and road users, manage traffic flow, and enable the completion of necessary construction or maintenance activities while minimizing disruptions to transportation networks

Safety and Safety Equipment

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INTRODUCTION

Introduction

Work Zone Facts

- Every 14 minutes, there is an injury in a work zone.
- During the past 5 years, work zone crashes have caused more than:
  - 4,400 Deaths(85 percent of which were the driver or passenger)
  - 200,000 injuries
- Drivers are the most frequent fatality in work zone crashes
- Most work zone fatalities involve working-age adults
- Rear-end crashes (running into the rear of a slowing or stopping vehicle) are the most common type of work zone crash.
- Fatal work zone crashes occur most often in summer and fall.
- The majority of fatal work zone crashes occurred on roads with speed limits greater than 50 mph.
- Stopping distance for motor vehicles at 50 mph:
  - Dry roadway~300 ft
  - Wet roadway~400 ft
  - Icy pavement~1,250 ft
- A loaded 80,000 lb. tractor-trailer requires almost 50% more stopping distance.
- It takes only an extra 25 seconds to cover 1 mile at 45 mph compared to 65 mph.
- Areas where traffic is entering or leaving work zones are often more dangerous because drivers may be changing lanes and merging.

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Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) requirements in work zones can vary depending on the nature of the work being performed and the specific safety regulations in place. PPE requirements should always be discussed at the Pre-Activity Meeting, most commonly known as the Tailgate Meeting, prior to any work being performed. However, here are some of the most common types of PPE used in work zones:

- **Hard Hat:** A hard hat is essential to protect the head from falling objects, overhead hazards, and potential impacts.
- **High-Visibility Clothing:** Workers in work zones often wear high-visibility clothing, such as vests or jackets, to make themselves more visible to other workers and motorists, especially in low-light conditions.
- **Safety Glasses or Goggles:** These protect the eyes from flying debris, dust, chemicals, or other hazards that may cause eye injuries.
- **Ear Protection:** In noisy work zones, ear protection such as earplugs or earmuffs is used to safeguard against hearing damage caused by loud machinery or equipment.
- **Gloves:** Workers may wear gloves to protect their hands from cuts, abrasions, chemicals, or other hazardous substances.
- **Steel-Toed Boots:** Sturdy footwear with reinforced toes provides protection against heavy objects, falling materials, or accidental impacts.

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Personal Protective Equipment (PPE)

- **Respiratory Protection:** Depending on the work being performed, respiratory protection such as dust masks, respirators, or self-contained breathing apparatus (SCBA) may be required to protect against dust, fumes, chemicals, or airborne contaminants.
- **Fall Protection Equipment:** For work at heights, fall protection equipment like safety harnesses, lanyards, and lifelines are used to prevent falls and mitigate the risk of serious injuries.
- **Protective Clothing:** In certain work zones, specialized protective clothing such as flame-resistant clothing, chemical-resistant suits, or coveralls may be necessary to protect against specific hazards.

It's important to note that specific PPE requirements may vary depending on the industry, job tasks, and local safety regulations. Workers should always consult the relevant safety guidelines and regulations specific to their work zone

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LESSON 1

Personal Protective Equipment (PPE)

According to the Occupational Safety & Health Administration (OSHA), a hard hat must be worn "when working in areas where there is a potential for injury to the head from falling objects." In addition, a hard hat must also be worn in working areas where there is the risk of exposure to electrical conductors that can potentially contact the head. In these types of environments, specially designed protective helmets are required in order to counteract the dangers of electrical shock hazards. Hard hats that are considered to be "OSHA approved" meet the minimum criteria established by the American National Standards (ANSI) and the International Safety Equipment Association (ISEA), in accordance with the most current ANSI/ISEA Z89.1-2014 (R2019) standard.

If a hard hat is necessary the next step is selecting the most appropriate hard hat for your work environment. ANSI divided protective helmets into different types and classes. A hard hat type indicates the designated level of impact protection, while a hard hat class indicates the degree of electrical performance. The sections that follow explain the various types and classes of hard hats in further detail.

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LESSON 1

Personal Protective Equipment (PPE)

Hard Hat Types

Hard hat impact protection is divided into two categories:

Type I Hard Hats are intended to reduce the force of impact resulting from a blow only to the top of the head. This form of impact, for example, may result from a hammer or nail gun falling from above.

Type II Hard Hats are intended to reduce the force of lateral impact resulting from a blow which may be received off-center, from the side, or to the top of the head. This form of impact, for example, may result from contact with the sharp corner of a side beam.

Electrical Classes

According to ANSI/ISEA Z89.1-2014 (R2019) and Canadian CSA Z94.1-2005 standards, hard hat electrical performance is divided into three categories: Class E, Electrical; Class G, General, and; Class C, Conductive.

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Personal Protective Equipment (PPE)

Class E (Electrical) Hard Hats are designed to reduce exposure to high voltage conductors, and offer dielectric protection up to 20,000 volts (phase to ground). This amount of voltage protection, however, is designated to the head only, and is not an indication of voltage protection allocated to the user as a whole. Class E hard hats may also be considered to have a Class G (General) rating, as their increased level of voltage protection surpasses the (lower) required standards of the Class G testing procedure.

Class G (General) Hard Hats are designed to reduce exposure to low voltage conductors, and offer dielectric protection up to 2,200 volts (phase to ground). As is the case with Class E hard hats, this amount of voltage protection is designated to the head only, and does not account for voltage protection allocated to the user as a whole. The MSA Skullgard Hard Hat is an example of a Class G hard hat commonly worn by iron workers who require a certain degree of dielectric protection.

Class C (Conductive) Hard Hats differ from their counterparts in that they are not intended to provide protection against contact with electrical conductors. On the contrary, Class C hard hats may include vented options, which not only protect the wearer from impact, but also provide increased breathability through their conductive material (such as aluminum) or added ventilation.

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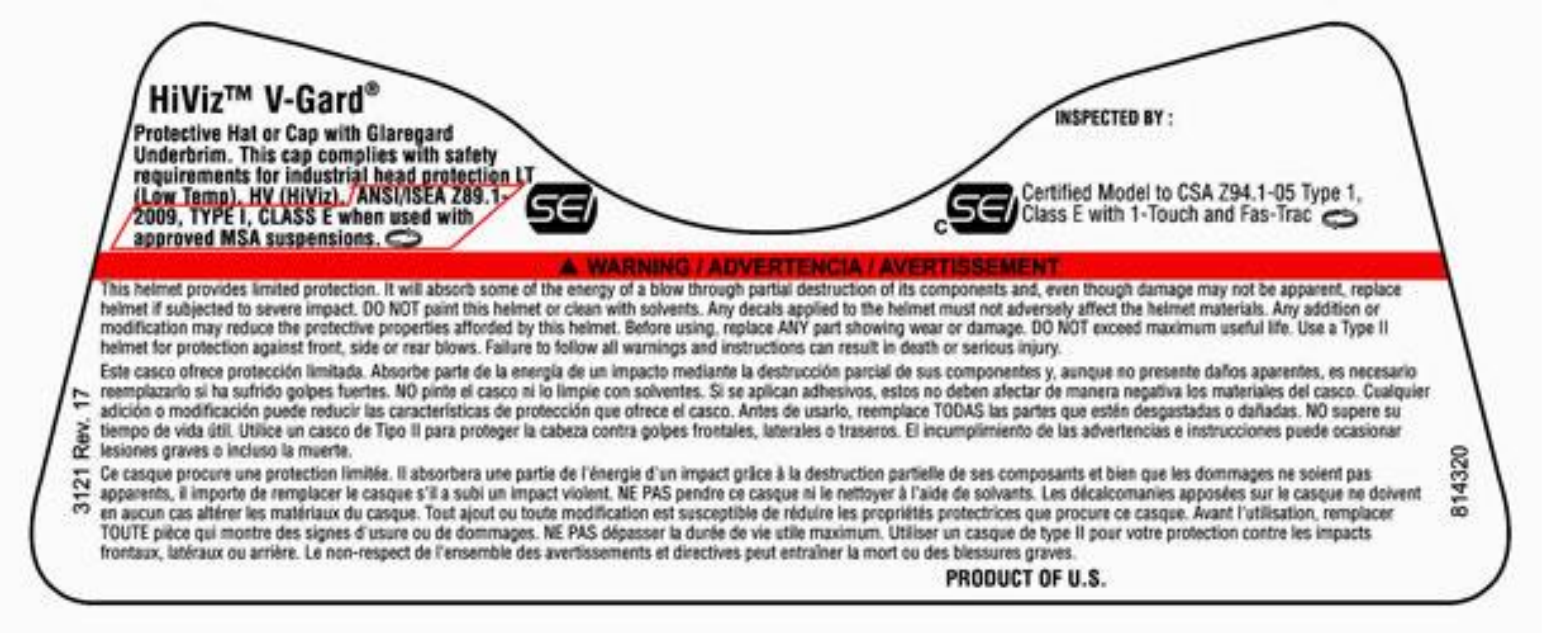
Personal Protective Equipment (PPE)

How can I identify the type and class of my current hard hat?

It is important to know that all hard hats that adhere to ANSI/ISEA standards contain a label of certification on the inside of the hard hat shell. This label identifies the type and class standards the hard hat was designed to meet. If your current hard hat label is missing or is no longer legible, it is recommended that you replace your hard hat as soon as possible. The image below is an example of a hard hat ANSI/ISEA label of certification, and how the label indicates the applicable type, class, and ANSI standards met.



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Personal Protective Equipment (PPE)

Who wears high-visibility clothing?

These occupations include railway and road workers, airport workers and emergency services. Cyclists and motorcyclists may also use high-visibility clothing to increase their visibility when operating amongst traffic.

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Personal Protective Equipment (PPE)

Choose The Hearing Protection That's Right For You

- *Expandable foam plugs*
- *Pre-molded, reusable plugs*
- *Canal caps*
- *Earmuffs*

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Personal Protective Equipment (PPE)

ANSI Z87. 1: OSHA-Approved Safety Glasses.

On every pair of safety glasses, you should see the marking "Z87+. This marking on safety glasses validate that the eye protection has been tested to the ANSI Z87. 1 standard.

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Personal Protective Equipment (PPE)

Safety gloves add a layer of protection against dirt, grime, abrasion, cuts, and burns. Specialized gloves have a variety of coatings and linings to provide additional benefits, such as heat-, cut-, and needlestick-resistance. Gloves are sometimes used with sleeve protectors to extend protection up the arm.

Personal Protective Equipment (PPE)

Safety toe protective footwear must be worn at all times regardless of the presence of a hazard; and the safety toe protective footwear must meet the following requirements - leather uppers, oil resistant, non-skid soles, electrical hazard protection if needed, and American Society for Testing and Materials (ASTM) F2413-05 with an impact resistance rating.

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Personal Protective Equipment (PPE)

An ANSI-approved safety vest refers to a high-visibility garment designed to enhance the visibility of workers in hazardous environments or low-light conditions. The American National Standards Institute (ANSI) has established standards for safety vests to ensure consistent levels of visibility and protection. ANSI-approved safety vests are commonly used by construction workers, road crews, surveyors, and others who work near moving vehicles or in areas with poor visibility.

The ANSI standards classify safety vests into three types: Type 1, Type 2, and Type 3

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Personal Protective Equipment (PPE)

Type 1 Class Vest:

· Also known as "off-road" or "breakaway" vests.

· Provides the least amount of coverage among the three types.

· Designed for workers who need high visibility but are not exposed to heavy traffic.

· Primarily used in non-roadway environments or areas with minimal vehicle traffic.

· Typically have the most basic design, with a single reflective stripe around the torso.

Personal Protective Equipment (PPE)

Type 2 Class Vest:

· Offers more coverage and visibility than Type 1 vests.

· Features additional reflective material on the front and back.

· Usually have a solid fluorescent background color for better visibility.

· Widely used by roadway construction workers, utility workers, and emergency responders.

· Can provide more visibility in complex work environments.

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Personal Protective Equipment (PPE)

Class 2 safety vests are designed to provide enhanced visibility in environments with moderate to high traffic speeds and where background visibility is reduced. They typically have a minimum of 775 square inches of background material and 201 square inches of reflective tape. Class 2 safety vests should be worn in the following situations:

- Road Construction: Workers on road construction sites, including flaggers and surveyors, should wear Class 2 safety vests to enhance their visibility to passing motorists.
- Airport and Port Workers: Employees working on airport runways, taxiways, and aprons, as well as port workers, should wear Class 2 vests to ensure their visibility around moving vehicles and equipment.
- Utility Workers: Utility workers, such as those employed by electric or telecommunications companies, should wear Class 2 vests when working near roadways or in areas with vehicular traffic.
- Parking Lot Attendants: Individuals directing traffic or managing parking lots should wear Class 2 safety vests to increase their visibility and ensure their safety.

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Personal Protective Equipment (PPE)

Type 3 Class Vest:

· Provides the highest level of visibility and coverage.

· Covers a larger portion of the upper body, including the front, back, and sides.

· Incorporates a significant amount of reflective material.

· Designed for workers in high-risk environments with heavy traffic or complex backgrounds.

· Often used by road construction workers, traffic control personnel, and tow truck operators.

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LESSON 1

Personal Protective Equipment (PPE)

A Class 3 safety vest is a high-visibility garment designed for workers who require maximum visibility in high-risk environments, particularly on roadways. These vests have a minimum of 1240 square inches of background material and 310 square inches of reflective tape. Here are the situations when you should wear a Class 3 safety vest:

- Working in High-Speed Traffic Zones: If you work on or near roadways where traffic speeds exceed 50 miles per hour, it is recommended to wear a Class 3 safety vest. These areas pose a higher risk due to the fast-moving vehicles, and the enhanced visibility provided by the vest helps ensure that you are easily seen by drivers.
- Poor Lighting Conditions: Class 3 safety vests are especially crucial in low-light or nighttime conditions when visibility is significantly reduced. The vest's fluorescent color and reflective striping reflect light from headlights, making you more visible to drivers and increasing your safety.
- Inclement Weather: During adverse weather conditions such as rain, fog, or snow, visibility can be severely impaired. Wearing a Class 3 safety vest in these situations ensures that you stand out, even in challenging weather, and helps drivers spot you from a distance.
- Work Zones and Construction Sites: If you are working in a construction zone or any other area where roadwork is taking place, wearing a Class 3 safety vest is essential. These vests are often required by safety regulations in such environments to protect workers who are exposed to vehicular traffic.

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Personal Protective Equipment (PPE)

All ANSI-approved safety vests must meet specific criteria regarding color, retroreflective material, and the placement of reflective stripes. They are typically available in fluorescent colors like orange, yellow, or lime green to enhance visibility during the day, and the reflective stripes ensure visibility in low-light or nighttime conditions.

All workers, including emergency responders, within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure.

It's important to note that the specific requirements for safety vests may vary depending on the industry and local regulations. Therefore, it's crucial to consult relevant safety guidelines and regulations applicable to your specific work environment to ensure compliance and adequate protection.

Safety and Safety Equipment Review Questions

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Knowledge Check: Personal Protective Equipment (PPE)

PPE is an important topic during _____

A. Acquisition Phase
B. Break Scheduling Overview
C. Pre-Activity Meeting
D. Planned Addendum Review

Knowledge Check: Multiple Choice

Workers within a TTC zone who are exposed to traffic
MUST

a. Remain in buffer space

b. Wear proper high-visibility apparel

c. Use engineering judgement

d. Remain in the activity area

Knowledge Check: Multiple Choice

How often should PPE be inspected and replaced in a work zone to maintain its effectiveness?

a. Never

b. Monthly

c. Weekly

d. After every use

Knowledge Check: Multiple Choice

Which class of reflective vest **MUST** be worn for Nighttime work?

a. No Class

b. Class 2

c. Hi-Class

d. Class 3

Knowledge Check: Multiple Choice

When shall pedestrians be provided with access and safe passage through the work zone?

a. When two or more lanes are closed

b. When multiple turn lanes are closed

c. When the work is being done on expressways

d. When an existing pedestrian way exists within the work zone

Knowledge Check: Multiple Choice

Why is it important to wear safety glasses or goggles in a work zone?

a. To protect against dust and debris

b. to be stylish

c. because you were told to

d. Glasses are not needed

Safety Devices

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TEMPORARY TRAFFIC CONTROL DEVICES

These trucks are often deployed in various traffic work zones where workers are present on the road, for example:

1. Road maintenance or road construction zones: These could be long-term construction projects or short-term maintenance work. Attenuator trucks are used to create a safety buffer between the flow of traffic and the workers and equipment in the work zone.

2. Incidents or emergencies: In case of a car accident or a vehicle breakdown, an attenuator truck can be deployed to provide a safe environment for first responders and the individuals involved in the incident.

3. Highway operations: During operations such as line painting or asphalt repair, attenuator trucks can protect workers from the flow of traffic.

Attenuator trucks are usually brightly colored or have high-visibility striping and flashing lights to be easily seen by approaching motorists. They may also display signs or arrows to guide drivers safely around the work zone

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TEMPORARY TRAFFIC CONTROL DEVICES

An attenuator truck, also known as a crash truck, impact protection vehicle, or safety truck, is a vehicle used in construction zones, especially in highway and freeway maintenance operations, to improve safety for workers and motorists. The purpose of these trucks is to absorb and minimize the impact of a vehicle collision in a roadwork zone to protect the workers and equipment on-site.

The key feature of an attenuator truck is the crash cushion, also known as an impact attenuator, installed on the rear of the vehicle. The attenuator is a specially designed device, often accordion-like in design, that crumples and absorbs the energy of a colliding vehicle. It can reduce the severity of an accident by slowing down the colliding vehicle in a controlled manner, which can potentially save lives and reduce property damage.

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TEMPORARY TRAFFIC CONTROL DEVICES

Here are a few points about Attenuators to consider

1. Effectiveness: Attenuator trucks have been found to be effective in reducing the severity of crashes in work zones. The cushion or barrier absorbs the kinetic energy generated during a collision, which helps minimize damage to vehicles and injuries to occupants.

2. Work Zone Safety: Attenuator trucks are primarily used in work zones to protect workers and provide a buffer between traffic and construction activities. By absorbing or redirecting the force of impact, they can significantly reduce the likelihood of serious injuries or fatalities.

3. Variations in Crash Statistics: Crash statistics can vary depending on several factors, such as the specific design and type of attenuator truck used, the traffic conditions, the behavior of motorists, and adherence to safety protocols. It's important to note that crash statistics can change over time as new safety measures and technologies are implemented.

To obtain the most accurate and recent crash statistics involving attenuator trucks in traffic work zones, I recommend reaching out to local traffic safety authorities, transportation departments, or relevant research organizations. They will have access to the latest data and studies specific to your region.

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LESSON 2

TEMPORARY TRAFFIC CONTROL DEVICES

An arrow board is a type of visual signaling device used in traffic management, particularly within construction zones or areas where traffic needs to be directed due to a disruption or special event. It typically consists of a series of lights arranged in an arrow shape, which can be programmed to indicate a specific direction for vehicles to follow or to display cautionary messages.

TEMPORARY TRAFFIC CONTROL DEVICES

Arrow boards are primarily used for:

1. Guiding Traffic: They direct vehicles away from road works or obstacles and towards a new temporary traffic path. They're a highly visible way of informing drivers of a change in normal road layout, ensuring that the traffic continues to flow smoothly.

2. Enhancing Safety: By providing clear, visible signs, they reduce the likelihood of accidents, as drivers have advanced warning about changes to the road layout or possible hazards.

3. Displaying Messages: In some cases, arrow boards may be designed to display specific messages related to road conditions, hazards, or other important information.

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TEMPORARY TRAFFIC CONTROL DEVICES

Within a traffic work zone, an arrow board is typically located ahead of the actual work area, to provide drivers with enough warning and time to respond to the changed conditions. It's often mounted on a vehicle or trailer so it can be easily moved and positioned as needed. The placement of the arrow board is very important, and it needs to be visible from a reasonable distance to ensure drivers have ample time to react. If the work zone is particularly large or complex, multiple arrow boards might be used at various points to guide traffic effectively.

Some arrow boards are also solar-powered to allow for extended use without the need for frequent battery changes or a continuous power source, making them a practical and efficient tool for traffic management.

Remember, arrow boards are just one part of a comprehensive traffic control plan in a work zone, which can also include road cones, barricades, signage, flaggers, and more, depending on the size and complexity of the project.

TEMPORARY TRAFFIC CONTROL DEVICES

Figure 6F-6. Advance Warning Arrow Display Specifications

Operating Mode		Panel Display (Type C panel illustrated) (Right arrow shown; left is similar)
I.	At least one of the three following modes shall be provided:	
	Flashing Arrow	 Move/Merge Right
	Sequential Arrow	 Move/Merge Right
	Sequential Chevron	 Move/Merge Right
II.	The following mode shall be provided: Flashing Double Arrow	 Move/Merge Right or Left
III.	The following mode shall be provided: Flashing Caution	 Caution or  Caution

Panel Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements
A	1200 x 600 mm (48 x 24 in)	0.8 km (1/2 mi)	12
B	1500 x 750 mm (60 x 30 in)	1.2 km (3/4 mi)	13
C	2400 x 1200 mm (96 x 48 in)	1.6 km (1 mi)	15
D	None*	0.8 km (1/2 mi)	12

*Length of arrow equals 1200 mm (48 in), width of arrowhead equals 600 mm (24 in)

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Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide road users, placed on, over, or adjacent to a street, highway, private roads open to public travel, pedestrian facility, or bikeway by authority of a public body or official having jurisdiction.

All traffic control devices used for construction, maintenance, utility, or incident management operations on a street, highway, or private road open to public travel shall comply with the applicable provisions of the MUTCD.

FHWA policy requires that all roadside appurtenances such as traffic barriers, barrier terminals and crash cushions, bridge railings, sign and light pole supports, and work zone hardware used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

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TEMPORARY TRAFFIC CONTROL DEVICES

Setting up a temporary traffic work zone can be a complex task and typically requires the use of various devices to ensure safety and efficient traffic flow. Here are some of the key devices and equipment you might need:

A channelizing device is a piece of equipment used in roadwork and construction zones to control the flow of traffic, providing both visual and physical guidance for motorists. They can be used to direct drivers around a work zone, restrict access to certain areas, or serve as barriers between traffic and workers.

Examples of channelizing devices include:

1. Cones: Typically orange and reflective, used to redirect traffic or indicate hazards.
2. Drums: Large, highly-visible devices that provide a more substantial physical presence.
3. Vertical Panels: Tall, slim devices that serve as visual guides.
4. Barricades: Robust structures that physically block access to certain areas.
5. Delineators: Smaller devices often used to outline the edge of a road or path.

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TEMPORARY TRAFFIC CONTROL DEVICES

When it comes to specifications for these devices in temporary traffic control within work zones, the U.S. Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) provides detailed standards. The MUTCD specifies the following general requirements:

1. Color: Channelizing devices should be orange, white, or yellow for visibility.
2. Reflectivity: They should be made of retroreflective material so they're visible at night.
3. Stability: Devices need to resist displacement by wind or passing traffic.
4. Height and size: Cones and tubes should be at least 28 inches tall in high-speed areas. Drums should have a minimum diameter of 18 inches and a minimum height of 36 inches.

The specifications can vary depending on the specific application, and local or state regulations might have additional or different requirements. Always check the most recent guidelines and local laws when planning a roadwork project.

Please note that the above specifications are subject to change, and you should refer to the most recent version of the MUTCD or your local equivalent for the most current guidance.

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TEMPORARY TRAFFIC CONTROL DEVICES

Traffic Cones: These are used to divert or guide traffic away from the work zone.

They should be high-visibility, often with reflective stripes.

Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings that can be dropped over the cones and onto the base to provide added stability.

Guidance: Ballast should be kept to the minimum amount needed.

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TEMPORARY TRAFFIC CONTROL DEVICES

A drum device, in the context of temporary traffic control for work zones, refers to a type of channelizing device used to direct vehicular and pedestrian traffic in and around construction sites or other temporary roadway alterations. Drums are particularly suited for use in situations where higher visibility is needed, such as freeway or high-speed road situations, due to their large size and reflective surfaces.

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TEMPORARY TRAFFIC CONTROL DEVICES

The specifications for a drum device typically follow guidelines set by agencies such as the Federal Highway Administration (FHWA) in the United States, through its Manual on Uniform Traffic Control Devices (MUTCD), or similar regulatory bodies in other countries. While these guidelines can change over time, here are some common elements that are likely to be included:

- Size and Shape: Drums are typically cylindrical in shape and should be a minimum of 36 inches (approximately 91 cm) in height with a minimum diameter of 18 inches (approximately 46 cm).
- Color: Drums should have a white or orange background. Orange is usually preferred because it is highly visible and has become internationally recognized as a sign of potential road hazards or construction.
- Retroreflective Sheeting: To ensure visibility both during the day and at night, drums should be covered with retroreflective sheeting. The sheeting should create one or more bands of white on the drum with the remainder of the drum being orange.
- Weight and Stability: Drums should be lightweight for ease of transport and setup, but also should be sufficiently stable or weighted down so they won't be easily knocked over by wind or passing vehicles. The method used to stabilize the drum should not pose a hazard if hit by a vehicle.
- Placement: The placement of drums will depend on the specific circumstances of the work zone, but they should be placed in such a way to provide clear and early guidance to drivers and pedestrians about the altered traffic path. Drums should not be used where they might be an obstacle to road users, such as within the path of bicycle or pedestrian traffic.

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TEMPORARY TRAFFIC CONTROL DEVICES

Vertical Panels: A vertical panel is a type of traffic control device used in work zones to guide road users. It's generally tall and thin, hence the term "vertical", and often has one or more reflective stripes for visibility. These panels serve to guide drivers through work zones by indicating changes in the path of travel or diverting traffic away from hazards.

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TEMPORARY TRAFFIC CONTROL DEVICES

The specifications for vertical panels in temporary traffic control situations in work zones can vary based on jurisdiction and local standards, but they are often guided by standards outlined in the Manual on Uniform Traffic Control Devices (MUTCD) in the United States or similar documents in other countries. The specifications address aspects such as the height, width, color, reflectivity, and positioning of the panels.

- Design: Vertical panels should be at least 8 inches wide and 24 inches high. They are often orange with white or yellow reflective stripes, in a diagonal pattern sloping down towards the side where traffic is to pass.
- Reflectivity: Panels should be reflective so that they are visible at night and during other low-light conditions.
- Placement: The panels should be placed in a way that gives drivers sufficient time to react to the change in traffic pattern. The exact distance can depend on factors like the speed of the road and the complexity of the work zone.
- Stability: Panels must be able to resist wind and not be easily knocked over.

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TEMPORARY TRAFFIC CONTROL DEVICES

Barricades: A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way. These are more substantial and used to provide a physical barrier to entry into certain areas of the work zone. *Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass.*

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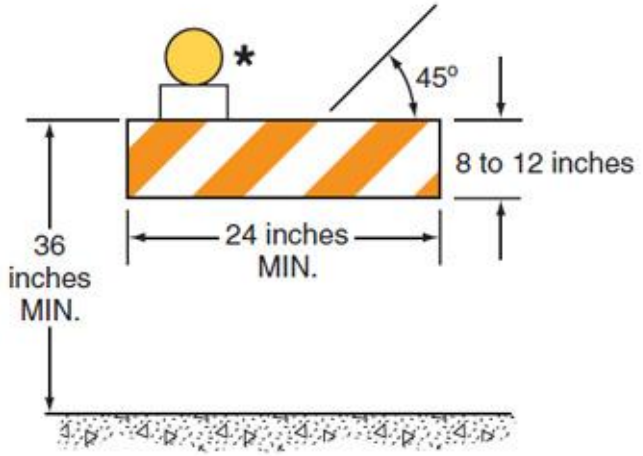
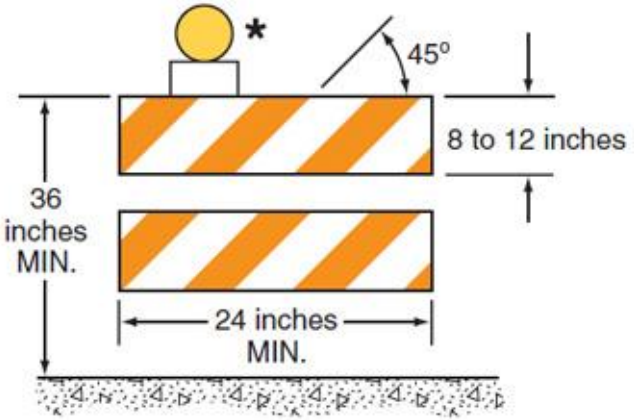
LESSON 2

TEMPORARY TRAFFIC CONTROL DEVICES



TYPE 1 BARRICADE **



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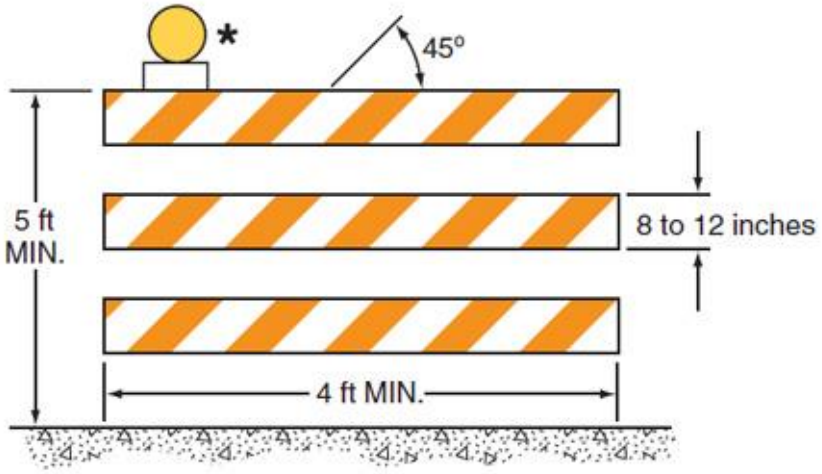
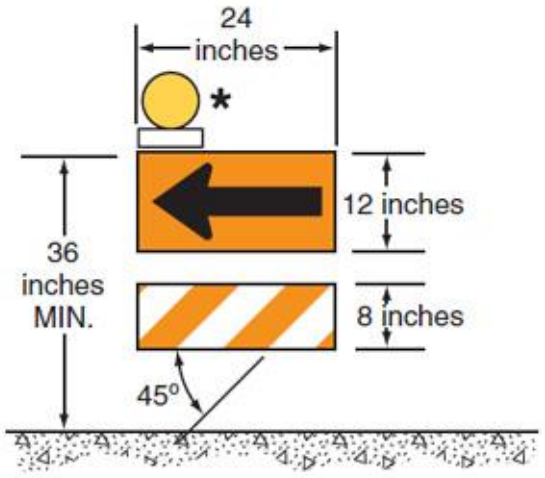


TYPE 3 BARRICADE **



DIRECTION INDICATOR BARRICADE **

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LESSON 2

TEMPORARY TRAFFIC CONTROL DEVICES

Delineators: These devices provide drivers with guidance along the travel path within a work zone.

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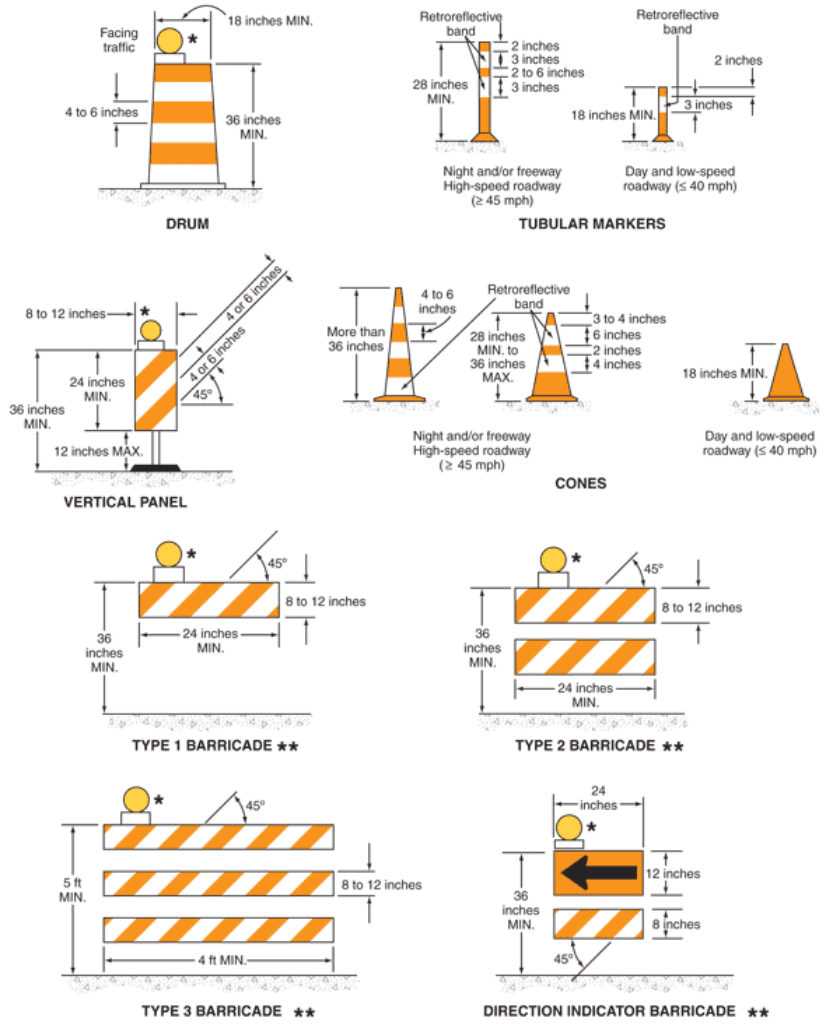
LESSON 2

TEMPORARY TRAFFIC CONTROL DEVICES

Figure 6F-7. Channelizing Devices



* Warning lights (optional)
** Rail stripe widths shall be 6 inches, except that 4-inch wide stripes may be used if rail lengths are less than 36 inches. The sides of barricades facing traffic shall have retroreflective rail faces.

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LESSON 2

TEMPORARY TRAFFIC CONTROL DEVICES

Portable Changeable Message Sign (PCMS): These devices provide drivers information in regards to upcoming conditions or changes in traffic pattern.

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TEMPORARY TRAFFIC CONTROL DEVICES

Other devices that may be used in a TTC:

- **Changeable Message Signs (CMS):** These can be used to provide real-time updates to drivers about conditions ahead, such as delays, detours, or road closures.
- **Lighting Devices:** For nighttime work, various types of lighting devices are needed to illuminate the work zone and make it clearly visible to approaching drivers.
- **Temporary Traffic Signals:** These can be used for single-lane work zones where alternating traffic flow is needed.
- **Rumble Strips:** Temporary rumble strips can be used to alert drivers that they are approaching a work zone.
- **Portable Barriers:** These can protect workers from errant vehicles and can also be used to segregate different areas of the work zone.
- **End of Queue Warning Systems:** These systems detect when queue lengths approach unsafe conditions and activate warning messages on changeable message signs.

REVIEW

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Knowledge Check: Multiple Choice

Per the MUTCD, what would be the recommended ballast weight for cones?

A. The maximum weight allowed

B. The minimum weight needed

C. 36lbs

D. 18lbs

Knowledge Check: Multiple Choice

When the work zone is completed, the temporary traffic control devices should be

a. Sent to recycling

b. Left in the right of way for the maintaining agency

c. Reused regardless of condition since they are considered temporary devices

d. Inspected, cleaned, repaired, or replaced

Knowledge Check: Multiple Choice

What should be done if a problem is found with the arrow panel during the post-activity review?

a. The panel should be corrected immediately

b. The panel should be covered or removed until it can be corrected

c. The panel should be left as is to see if the motorist notice

d. The panel should be left as is until the change is approved

Knowledge Check: Multiple Choice

In which of the following situations can truck-mounted Attenuators (TMAs) be used?

a. Mobile Operations

b. Pedestrian Detour routes

c. Work performed 10 feet away from pavement

d. Work zone lengths longer than 1,000 feet

Knowledge Check: Multiple Choice

According to the MUTCD Section 6F.60.01, what is a PCMS?

a. Portable Changeable Message sign

b. Portable Channeling Message sign

c. Portable Charging Message sign

d. Portable Collapsing Message Sign

Knowledge Check: Multiple Choice

On Type I and Type II barricades, the stripes on the horizontal reflective rail directs drivers in which direction?

a. Away from the direction of travel

b. Downward towards the direction of travel

c. Towards a stop ahead condition

d. Upward towards the lane closure signs

Knowledge Check: Multiple Choice

FHWA policy requires that all roadside appurtenances used on the National Highway System meet which criterion?

a. Adjustability

b. Crashworthy

c. Cleanliness

d. Age

Designing Work Zones, Obtaining Proper Permits, and Public Relations Needs

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The seven fundamental principles of TTC:

1. General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment, with the following factors being considered:

A. The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of TTC zones. The goal should be to route road users through such zones using roadway geometrics, roadside features, and TTC devices as nearly as possible comparable to those for normal highway situations.

B. A TTC plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied. Any changes in the TTC plan should be approved by an official who is knowledgeable (for example, trained and/or certified) in proper TTC practices.

2. Road user movement should be inhibited as little as practical, based on the following considerations:

A. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6C.01).

B. Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be avoided.

C. Work should be scheduled in a manner that minimizes the need for lane closures or alternate routes, while still getting the work completed quickly and the lanes or roadway open to traffic as soon as possible.

D. Attempts should be made to reduce the volume of traffic using the roadway or freeway to match the restricted capacity conditions. Road users should be encouraged to use alternative routes. For high volume roadways and freeways, the closure of selected entrance ramps or other access points and the use of signed diversion routes should be evaluated.

E. Bicyclists and pedestrians, including those with disabilities, should be provided with access and reasonably safe passage through the TTC zone.

F. If work operations permit, lane closures on high-volume streets and highways should be scheduled during off-peak hours. Night work should be considered if the work can be accomplished with a series of short-term operations.

G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur if significant impacts to roadway operations are anticipated.

3. Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites. The following principles should be applied:

A. Adequate warning, delineation, and channelization should be provided to assist in guiding road users in advance of and through the TTC zone or incident site by using proper pavement marking, signing, or other devices that are effective under varying conditions. Providing information that is in usable formats by pedestrians with visual disabilities should also be considered.

B. TTC devices inconsistent with intended travel paths through TTC zones should be removed or covered. However, in intermediate-term stationary, short-term, and mobile operations, where visible permanent devices are inconsistent with intended travel paths, devices that highlight or emphasize the appropriate path should be used. Providing traffic control devices that are accessible to and usable by pedestrians with disabilities should be considered.

C. Flagging procedures, when used, should provide positive guidance to road users traversing the TTC zone.

4. To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:

A. Individuals who are knowledgeable (for example, trained and/or certified) in the principles of proper TTC should be assigned responsibility for safety in TTC zones. The most important duty of these individuals should be to check that all TTC devices of the project are consistent with the TTC plan and are effective for motorists, bicyclists, pedestrians, and workers.

B. As the work progresses, temporary traffic controls and/or working conditions should be modified, if appropriate, in order to provide mobility and positive guidance to the road user and to provide worker safety. The individual responsible for TTC should have the authority to halt work until applicable or remedial safety measures are taken.

C. TTC zones should be carefully monitored under varying conditions of road user volumes, light, and weather to check that applicable TTC devices are effective, clearly visible, clean, and in compliance with the TTC plan.

D. When warranted, an engineering study should be made (in cooperation with law enforcement officials) of reported crashes occurring within the TTC zone. Crash records in TTC zones should be monitored to identify the need for changes in the TTC zone.

5. Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:

A. To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical.

B. Channelization of road users should be accomplished by the use of pavement markings, signing, and crashworthy, detectable channelizing devices.

C. Work equipment, workers' private vehicles, materials, and debris should be stored in such a manner to reduce the probability of being impacted by run-off-the-road vehicles.

6. Each person whose actions affect TTC zone safety, from the upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make. Only those individuals who are trained in proper TTC practices and have a basic understanding of the principles (established by applicable standards and guidelines, including those of this Manual) should supervise the selection, placement, and maintenance of TTC devices used for TTC zones and for incident management.

7. Good public relations should be maintained by applying the following principles:

A. The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.

B. The cooperation of the various news media should be sought in publicizing the existence of and reasons for TTC zones because news releases can assist in keeping the road users well informed.

C. The needs of abutting property owners, residents, and businesses should be assessed and appropriate accommodations made.

D. The needs of emergency service providers (law enforcement, fire, and medical) should be assessed and appropriate coordination and accommodations made.

E. The needs of railroads and transit should be assessed and appropriate coordination and accommodations made.

F. The needs of operators of commercial vehicles such as buses and large trucks should be assessed and appropriate accommodations made.

Standard:

Before any new detour or temporary route is opened to traffic, all necessary signs shall be in place. All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered.

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TYPES OF WORK ZONES

Work zones are areas where roadwork takes place and usually involve lane closures, detours, or reduced speeds for safety purposes. They are marked by signs, traffic cones, barrier walls, and other safety devices. The type of work zone typically determines its duration. The Minimum standard that shall be used when developing or implementing a temporary traffic control plan can be found in the MUTCD.

Below are a few types of work zones and their average durations:

1. **Long-term Stationary:** These are established work that occupies a location more than 3 days.. In these zones, traffic patterns can be significantly affected for an extended period. These zones can last several months to several years. Examples include major highway construction or expansion, significant bridge reconstruction, or large-scale infrastructure improvements.

2. **Intermediate Stationary:** These zones are set up for work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.

3. **Short-term Stationary:** These are established for daytime work that occupies a location for more than 1 hour within a single daylight period. Examples include minor road repairs, utility work, or tree trimming near the roadway.

4. **Short Duration:** This is work that occupies a location for up to 1 hour.

5. **Mobile:** These zones move along the road as work is completed. They are typically used for operations like pothole repair, road striping, or road sweeping. The duration of these zones can range from a few minutes to a few hours, depending on the extent of the work being done.

Please note that the durations provided above are general estimates and can vary significantly depending on the complexity of the project, unforeseen challenges, and other factors. In many cases, work is done during off-peak hours or overnight to minimize disruption to traffic, so even for longer-term work zones, motorists may not encounter them at all times.

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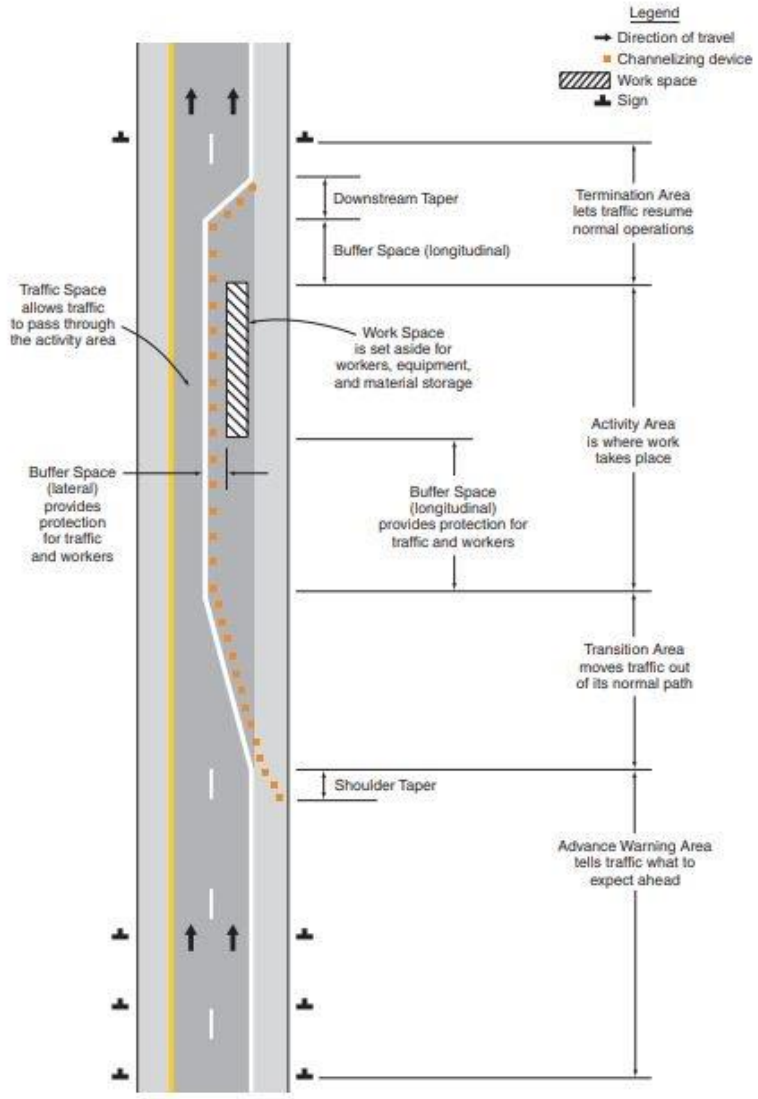
LESSON 3

TEMPORARY TRAFFIC CONTROL

Figure 6C-1. Component Parts of a Temporary Traffic Control Zone



Components of Temporary Traffic Control Zones

Most TTC zones are divided into four areas: the advance warning area, the transition area, the activity area, and the termination area.

TEMPORARY TRAFFIC CONTROL

Advance Warning Area

The advance warning area is the section of highway where road users are informed about the upcoming work zone or incident area.

The advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the TTC zone activity area.

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In a work zone, advance warning signs are crucial for alerting drivers in advance about upcoming changes in the road conditions or potential hazards. Here are some different types of advance warning signs commonly used in work zones:

- Orange Warning Signs: These signs are typically diamond-shaped and have an orange background with black symbols or text. They convey general warnings and provide information about the work zone ahead.
- Road Work Ahead: This sign warns drivers that they are approaching a work zone where road construction or maintenance is taking place. It helps drivers prepare for potential lane closures, reduced speed limits, or detours.
- Lane Closure Ahead: This sign indicates that one or more lanes are closed ahead due to construction work or other activities. Drivers should be prepared for a reduction in available lanes and adjust their driving accordingly.
- Detour: This sign directs drivers to follow an alternate route, usually due to a complete road closure or a long-term work zone. Detour signs guide drivers around the work zone and back onto the regular route.

TEMPORARY TRAFFIC CONTROL

- Flaggers Ahead: This sign alerts drivers that there are flaggers or traffic control personnel present in the work zone. It advises drivers to be prepared to stop and follow the instructions provided by the flaggers.
- Road Work Symbol: This sign features an image of road construction equipment, such as a bulldozer or road roller. It indicates that roadwork is in progress and drivers should exercise caution, slow down, and be prepared for changing conditions.

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- Reduced Speed Limit: Work zones often have reduced speed limits to ensure the safety of both workers and drivers. Signs indicating the reduced speed limit are placed well in advance of the work zone to give drivers ample time to slow down.
- Road Closed: When a road is completely closed due to construction or other reasons, this sign indicates that drivers cannot proceed any further. Alternate routes should be followed, as indicated by detour signs.

It's important to note that specific signs and their placement can vary based on local regulations and the nature of the work being performed. Always pay attention to signs, follow instructions provided by traffic control personnel, and exercise caution when driving through work zones.

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Figure 6F-4. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 1 of 3)

Figure 6F-4. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 2 of 3)

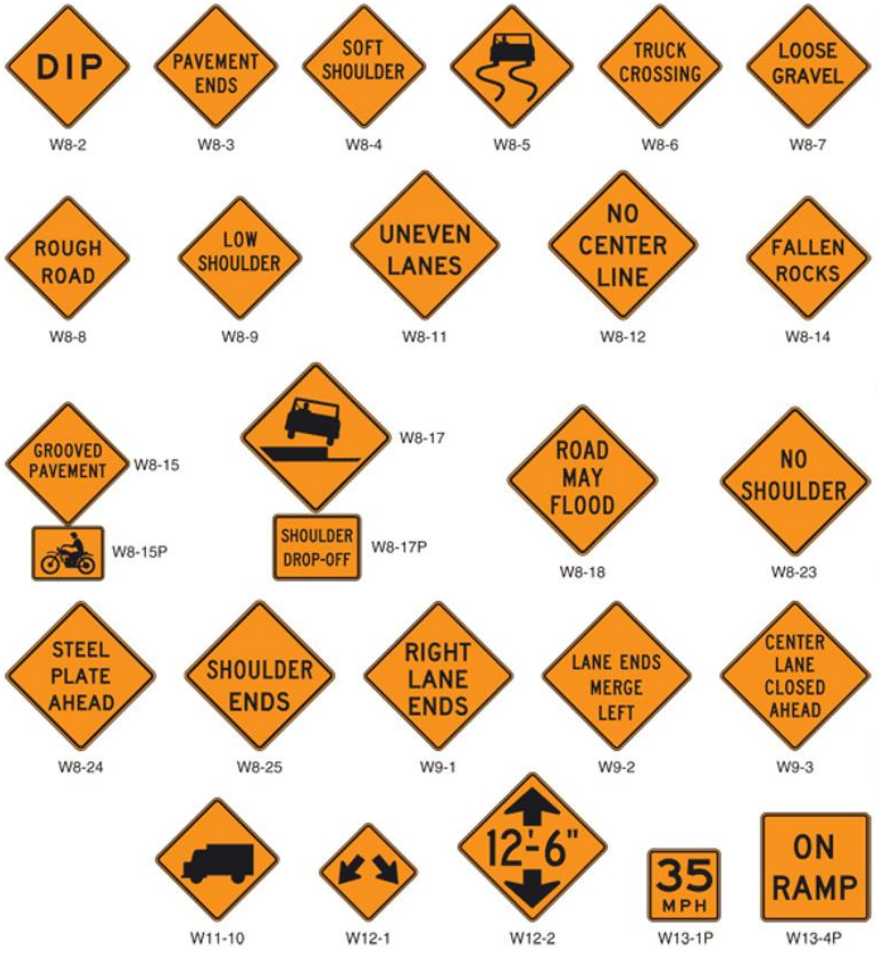


Figure 6F-4. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 3 of 3)

* An optional STREET WORK word message sign is shown in the "Standard Highway Signs and Markings" book.
** An optional STREET CLOSED word message sign is shown in the "Standard Highway Signs and Markings" book.
*** An optional FLAGGER (W20-7a) word message sign is shown in the "Standard Highway Signs and Markings" book.
**** An optional FRESH TAR word message sign is show in the "Standard Highway Signs and Markings" book.

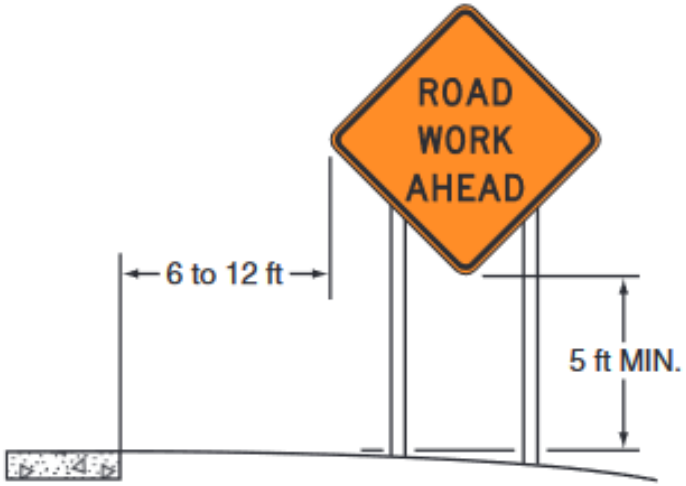
Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)*	100 feet	100 feet	100 feet
Urban (high speed)*	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

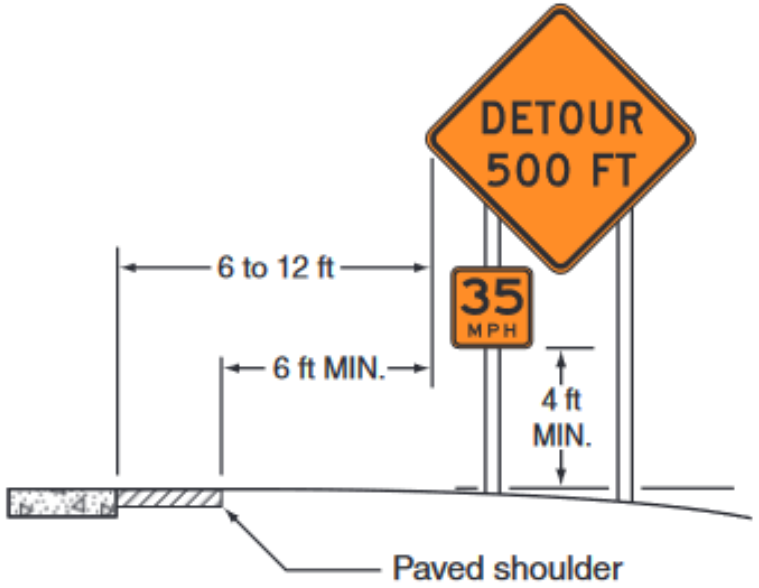
* Speed category to be determined by the highway agency
** The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

TEMPORARY TRAFFIC CONTROL

Figure 6F-1. Height and Lateral Location of Signs—Typical Installations



A - RURAL AREA



B - RURAL AREA WITH ADVISORY SPEED PLAQUE

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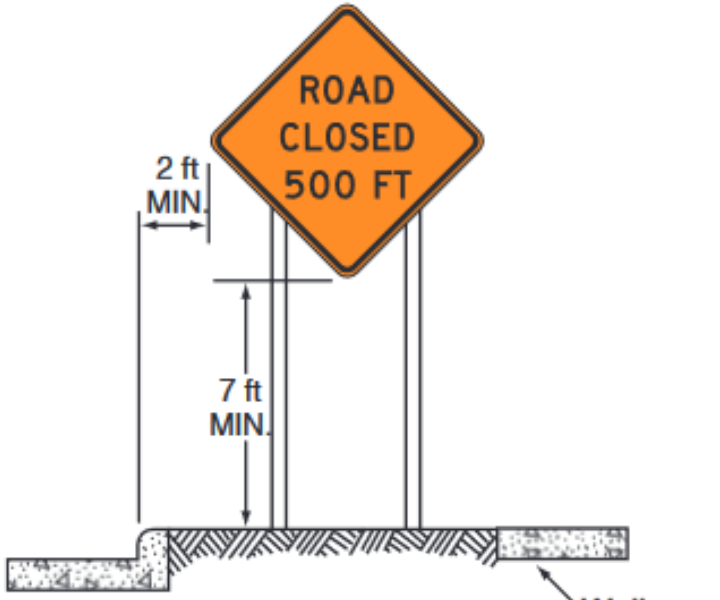
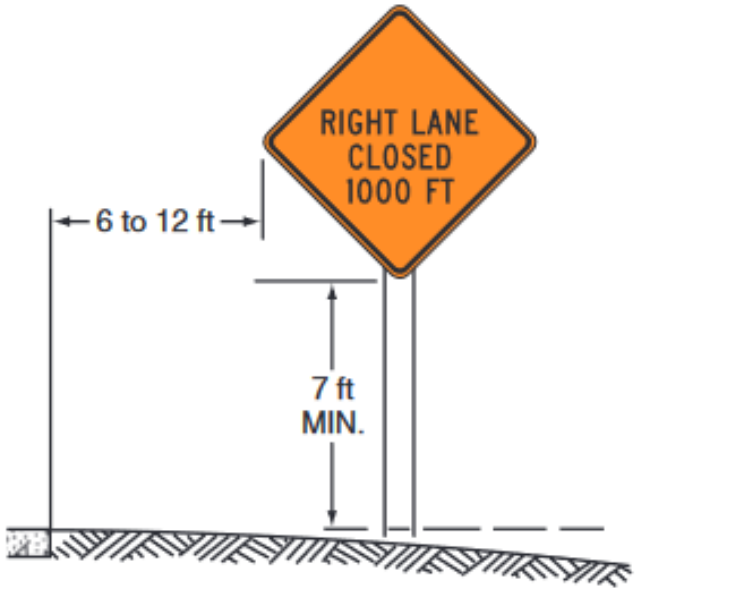


C - BUSINESS, COMMERCIAL, OR RESIDENTIAL AREA



D - BUSINESS, COMMERCIAL, OR RESIDENTIAL AREA (WITHOUT CURB)

TEMPORARY TRAFFIC CONTROL

The advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the TTC zone activity area.

Guidance:

- Typical distances for placement of advance warning signs on freeways and expressways should be longer because drivers are conditioned to uninterrupted flow. Therefore, the advance warning sign placement should extend on these facilities as far as 1/2 mile or more.

- On urban streets, the effective placement of the first warning sign in feet should range from 4 to 8 times the speed limit in mph, with the high end of the range being used when speeds are relatively high. When a single advance warning sign is used (in cases such as low-speed residential streets), the advance warning area can be as short as 100 feet. When two or more advance warning signs are used on higher-speed streets, such as major arterials, the advance warning area should extend a greater distance (see Table 6C-1).

TEMPORARY TRAFFIC CONTROL

- Since rural highways are normally characterized by higher speeds, the effective placement of the first warning sign in feet should be substantially longer—from 8 to 12 times the speed limit in mph. Since two or more advance warning signs are normally used for these conditions, the advance warning area should extend 1,500 feet or more for open highway conditions (see Table 6C-1).

- The distances contained in Table 6C-1 are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted for field conditions, if necessary, by increasing or decreasing the recommended distances.

Transition Area

The transition area is that section of highway where road users are redirected out of their normal path.

Transition areas usually involve strategic use of tapers, which because of their importance are discussed separately in detail.

Because it is impractical in mobile operations to redirect the road user's normal path with stationary channelization, more dominant vehicle-mounted traffic control devices, such as arrow boards, portable changeable message signs, and high-intensity rotating, flashing, oscillating, or strobe lights, may be used instead of channelizing devices to establish a transition area.

Activity Area

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

- The work space is that portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers. The work space may be stationary or may move as work progresses.
- The traffic space is the portion of the highway in which road users are routed through the activity area.
- The buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle. Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.

Buffer Space

Table 6C-2. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

Buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow. The activity area may contain one or more lateral or longitudinal buffer spaces. A longitudinal buffer space may be placed in advance of a work space. The longitudinal buffer space may also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in Figure 6C-2. If a longitudinal buffer space is used, the values shown in Table 6C-2 may be used to determine the length of the longitudinal buffer space.

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

Termination Area

The termination area is the section of the highway where road users are returned to their normal driving path. The termination area extends from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

An END ROAD WORK sign, a Speed Limit sign, or other signs may be used to inform road users that they can resume normal operations.

A longitudinal buffer space may be used between the work space and the beginning of the downstream taper.

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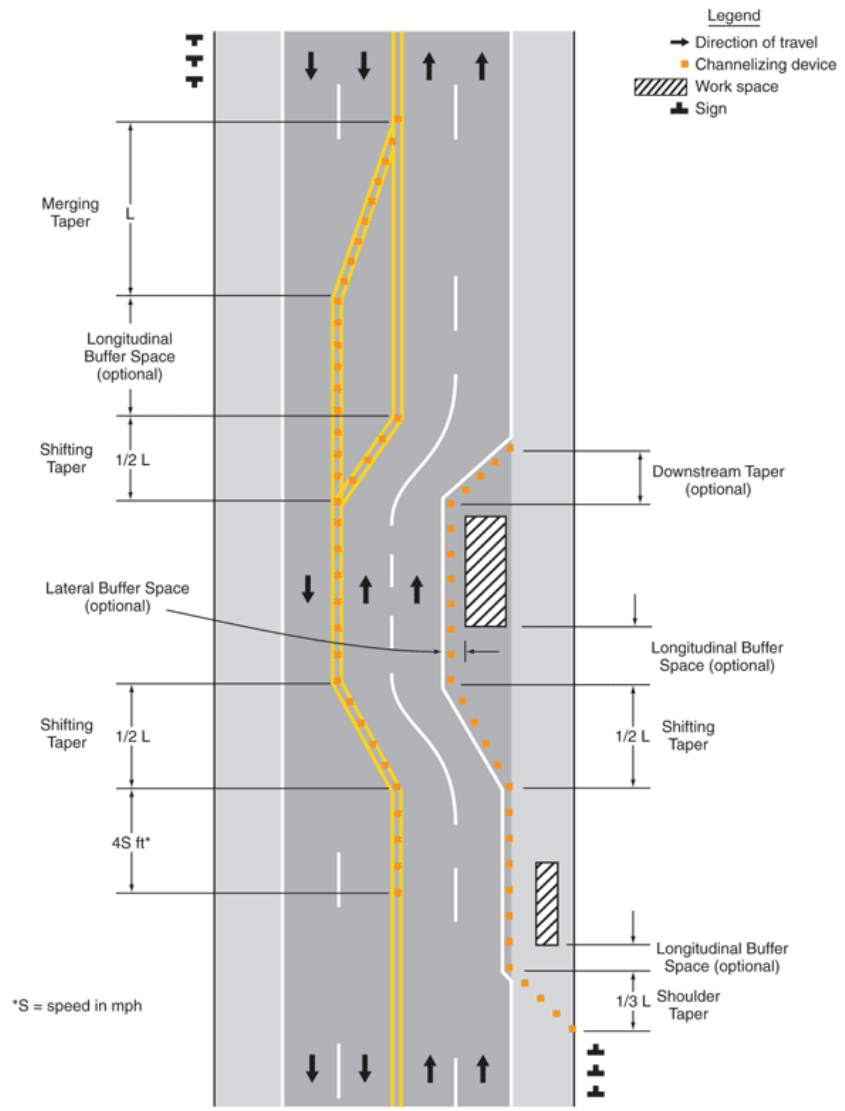
LESSON 3

TEMPORARY TRAFFIC CONTROL

Figure 6C-2. Types of Tapers and Buffer Spaces



Tapers

Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted. Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in Figure 6C-2.

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In work zone management, tapers are used to guide traffic safely and smoothly through construction or maintenance areas. Tapers help drivers transition from normal traffic conditions to a reduced number of lanes or detours. Here are some common types of tapers used in work zones:

Lane Closure Taper: This is the most basic type of taper used when closing one or more lanes. It involves a gradual reduction in the number of lanes through the use of signs, cones, and/or barrels to guide drivers into the available lanes.

Merge Taper: A merge taper is used when two lanes of traffic are being funneled into one. It is typically formed by a series of diagonal lines of cones or barrels, directing vehicles to merge into the open lane.

Shift Taper: A shift taper is used when traffic needs to be shifted from its normal path to an adjacent lane or detour. It involves a gradual shifting of lanes through the use of signs, pavement markings, and delineators.

Shoulder Taper: In some cases, the shoulder of the road may be used as an additional travel lane to accommodate traffic during work zones. A shoulder taper is employed to guide vehicles onto the shoulder and maintain a safe distance from the work area.

Bypass Taper: A bypass taper is used when a temporary bypass or detour is created to divert traffic away from the work zone. It involves clear signage, pavement markings, and traffic control devices to direct drivers onto the alternate route.

Entrance/Exit Taper: When a work zone affects entrance or exit ramps of a highway or road, entrance and exit tapers are used to guide vehicles safely into or out of the work zone. These tapers provide advance warning and proper lane guidance.

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Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The test concerning adequate lengths of tapers involves observation of driver performance after TTC plans are put into effect. *The appropriate taper length (L) should be determined using the criteria shown in Tables 6C-3 and 6C-4.*

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

It's important to note that the specific design and layout of tapers can vary depending on factors such as the speed limit, volume of traffic, work zone length, and local regulations. Work zone managers and traffic engineers carefully plan and design tapers to ensure the safety and efficiency of traffic flow through construction or maintenance areas

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

Table 6C-4. Formulas for Determining Taper Length

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

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

TEMPORARY TRAFFIC CONTROL

Detours and Diversions

A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone. Detours should be clearly signed over their entire length so that road users can easily use existing highways to return to the original highway.

A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work area.

MUTCD CHAPTER 6H. TYPICAL APPLICATIONS

Chapter 6G of the MUTCD contains discussions of typical TTC activities. This Chapter presents typical applications for a variety of situations commonly encountered. While not every situation is addressed, the information illustrated can generally be adapted to a broad range of conditions. In many instances, an appropriate TTC plan is achieved by combining features from various typical applications. For example, work at an intersection might present a near-side work zone for one street and a far-side work zone for the other street. These treatments are found in two different typical applications, while a third typical application shows how to handle pedestrian crosswalk closures.

Figures and tables found throughout Part 6 provide information for the development of TTC plans. Also, Table 6H-3 is used for the determination of sign spacing and other dimensions for various area and roadway types. Table 6H-1 is an index of the 46 typical applications. Typical applications are shown on the right-hand page with notes on the facing page to the left. The legend for the symbols used in the typical applications is provided in Table 6H-2. In many of the typical applications, sign spacing and other dimensions are indicated by letters using the criteria provided in Table 6H-3. The formulas for determining taper lengths are provided in Table 6H-4.

Most of the typical applications show TTC devices for only one direction.

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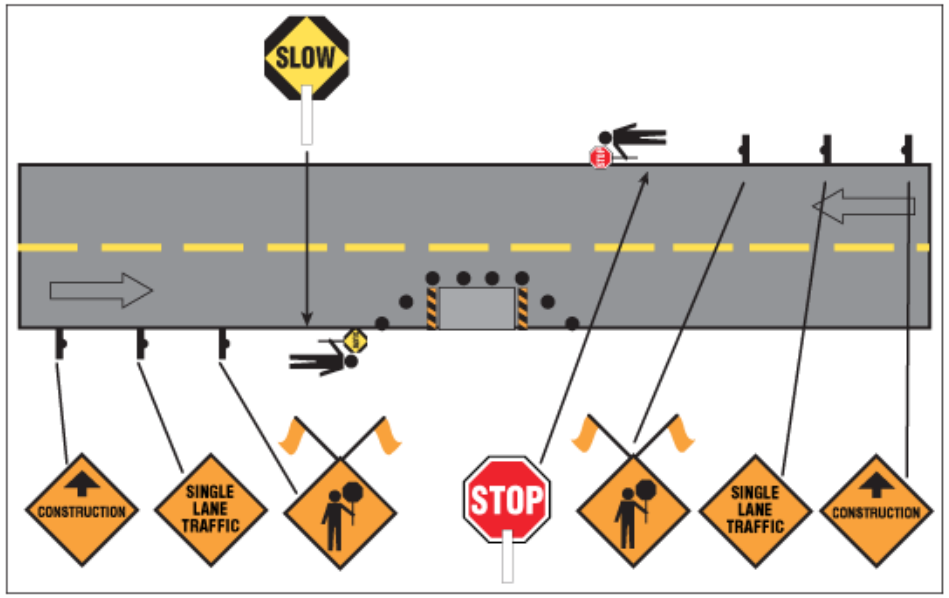
LESSON 3

TEMPORARY TRAFFIC CONTROL



A TTC plan describes TTC measures to be used for facilitating road users through a work zone or an incident area. TTC plans play a vital role in providing continuity of effective road user flow when a work zone, incident, or other event temporarily disrupts normal road user flow. Important auxiliary provisions that cannot conveniently be specified on project plans can easily be incorporated into Special Provisions within the TTC plan.

TTC plans range in scope from being very detailed to simply referencing typical drawings contained in the MUTCD Manual, standard approved highway agency drawings and manuals, or specific drawings contained in the contract documents. The degree of detail in the TTC plan depends entirely on the nature and complexity of the situation.

TTC plans should be prepared by persons knowledgeable (for example, trained and/or certified) about the fundamental principles of TTC and work activities to be performed. The design, selection, and placement of TTC devices for a TTC plan should be based on engineering judgment.

TEMPORARY TRAFFIC CONTROL

Traffic control planning should be completed for all highway construction, utility work, maintenance operations, and incident management including minor maintenance and utility projects prior to occupying the TTC zone. Planning for all road users should be included in the process.

Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC process. Where existing pedestrian routes are blocked or detoured, information should be provided about alternative routes that are usable by pedestrians with disabilities, particularly those who have visual disabilities.

Provisions may be incorporated into the project bid documents that enable contractors to develop an alternate TTC plan.

Modifications of TTC plans may be necessary because of changed conditions or a determination of better methods of safely and efficiently handling road users. This alternate or modified plan should have the approval of the responsible highway agency prior to implementation.

TEMPORARY TRAFFIC CONTROL

Reduced speed limits should be used only in the specific portion of the TTC zone where conditions or restrictive features are present. However, frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can travel through the TTC zone with a speed limit reduction of no more than 10 mph.

A reduction of more than 10 mph in the speed limit should be used only when required by restrictive features in the TTC zone. Where restrictive features justify a speed reduction of more than 10 mph, additional driver notification should be provided. The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC warning devices should be used.

Reduced speed zoning (lowering the regulatory speed limit) should be avoided as much as practical because drivers will reduce their speeds only if they clearly perceive a need to do so.

Research has demonstrated that large reductions in the speed limit, such as a 30 mph reduction, increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to 10 mph cause smaller changes in speed variance and lessen the potential for increased crashes. A reduction in the regulatory speed limit of only up to 10 mph from the normal speed limit has been shown to be more effective.

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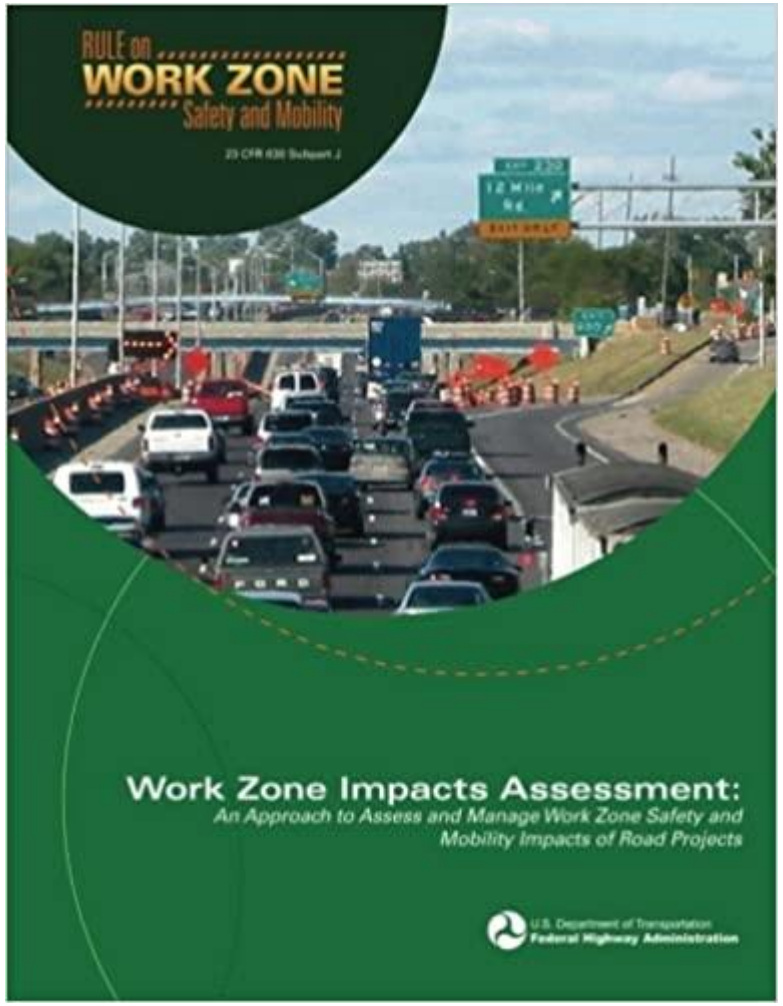
LESSON 3

TEMPORARY TRAFFIC CONTROL



Impact Study for Temporary Traffic Control

An impact study for temporary traffic control assesses the potential effects and consequences of implementing temporary traffic control measures in a specific area or during a particular event. It aims to evaluate the impact on traffic flow, safety, and the surrounding environment. The study typically involves gathering data, analyzing existing conditions, and making predictions based on various scenarios.

TEMPORARY TRAFFIC CONTROL

Here are the key components typically included in an impact study for temporary traffic control:

Traffic Flow Analysis: This involves assessing the existing traffic patterns, volume, and congestion levels in the area under consideration. It includes collecting data on peak hours, traffic counts, and travel speeds. This analysis helps determine how temporary traffic control measures may affect the overall traffic flow and identify potential bottlenecks.

Safety Assessment: Evaluating the impact on safety is crucial. The study considers potential risks to motorists, pedestrians, and workers during the implementation of temporary traffic control measures. It may involve analyzing accident data, identifying high-risk areas, and proposing safety improvements or alternative traffic routes.

Environmental Impact Evaluation: Temporary traffic control measures can have environmental effects, such as increased emissions and noise pollution. The study assesses the potential impact on air quality, noise levels, and other environmental factors in the vicinity. It may also propose mitigation measures to minimize adverse effects.

Stakeholder Engagement: Engaging with relevant stakeholders, such as local authorities, transportation agencies, and community members, is essential. The study may include public consultations, surveys, and interviews to gather feedback and incorporate community concerns into the impact assessment.

TEMPORARY TRAFFIC CONTROL

Simulation and Modeling: Using traffic simulation software or models can help predict the impact of temporary traffic control measures. By inputting data on proposed changes, such as lane closures or detours, the models can estimate the effects on traffic flow, travel times, and congestion levels.

Cost Analysis: Assessing the financial implications of temporary traffic control measures is crucial for decision-making. The study should consider the costs associated with implementing and maintaining the measures, as well as potential economic impacts resulting from disruptions to businesses or local commerce.

Mitigation and Recommendations: Based on the findings of the impact study, recommendations should be provided to mitigate the potential negative effects of temporary traffic control measures. This may involve suggesting alternative traffic routes, optimizing timing and sequencing of work, or proposing additional signage and safety measures.

Overall, an impact study for temporary traffic control aims to provide a comprehensive assessment of the effects of implementing traffic control measures and guide decision-making processes to minimize disruptions and maximize safety for all stakeholders involved.

Obtaining Permits and Authorizations

Obtaining permits and authorizations for temporary traffic control can vary depending on your location and the specific requirements of the project. However obtaining a permit is typically required during the planning stage. Here are some general steps you can follow:

- **Determine the scope of your project:** Understand the nature of the work you plan to undertake that requires temporary traffic control. This could include road construction, maintenance, special events, or any other activity that affects traffic flow.
- **Identify the responsible authority:** Determine which governmental or regulatory body is responsible for issuing permits and authorizations for temporary traffic control in your area. This could be a local transportation department, public works agency, or a specific permit office.

TEMPORARY TRAFFIC CONTROL

Research requirements: Contact the responsible authority to gather information about the specific requirements for obtaining permits and authorizations. They will provide you with guidelines, forms, and any supporting documentation you need to submit.

Submit your application: Submit your completed application along with the required documentation to the appropriate office or department. Be sure to follow the specified submission process, which may include in-person submission, online application portals, or mailing the documents.

Pay applicable fees: Some permits and authorizations may involve fees. Check the guidelines provided by the responsible authority to determine the cost and payment process. Ensure that you include the required fees with your application, if applicable.

Review and approval: Once your application is submitted, it will undergo a review process by the responsible authority. They will assess your project plans, traffic control measures, and any other relevant factors to ensure compliance with safety and traffic regulations.

Obtain the permit: If your application is approved, you will receive the permit or authorization for temporary traffic control. This document will outline the specific conditions, dates, and requirements for implementing traffic control measures.

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LESSON 3

TEMPORARY TRAFFIC CONTROL

Implement traffic control measures: With the approved permit in hand, you can proceed with implementing the necessary traffic control measures as specified in the permit. This may involve signage, barricades, detours, or other measures to ensure the safety of workers and the public.

Compliance and inspections: During the project, the responsible authority may conduct inspections to ensure that you are complying with the conditions outlined in the permit. Cooperate with any inspections and address any issues or concerns raised by the authorities.

Remember that these steps are general guidelines, and the specific process for obtaining permits and authorizations may vary depending on your location and the nature of the project. It's crucial to contact the responsible authority early in your planning process to understand their requirements and ensure compliance with local regulations.

ARDOT ARKANSAS DEPARTMENT OF TRANSPORTATION

DOTD LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

ODOT Oklahoma Department of Transportation

Texas Department of Transportation

Determine Public Relation Needs

Determining public relations needs for temporary traffic control involves understanding the specific goals, challenges, and stakeholders involved in the project. Here are some steps to help you determine the public relations needs for temporary traffic control:

- **Identify project goals:** Start by clarifying the objectives of the temporary traffic control project. Are you aiming to minimize disruptions, enhance public safety, or improve public perception of the project? Understanding the goals will help you shape the public relations strategy accordingly.
- **Define target audience:** Determine the key stakeholders and audiences affected by the temporary traffic control. This may include local residents, commuters, business owners, emergency services, public transportation users, and community organizations. Each group may have different concerns and information needs.

- **Conduct stakeholder analysis:** Analyze the concerns, expectations, and interests of the identified stakeholders. Identify any potential conflicts or points of contention. This analysis will help you tailor your public relations messages and initiatives to address these specific concerns.
- **Assess communication channels:** Determine the most effective communication channels to reach your target audience. Consider using a mix of traditional media (newspapers, radio, TV), digital media (websites, social media platforms), community meetings, signage, and direct mailings. Adapt your communication channels based on the preferences and accessibility of your target audience.
- **Develop key messages:** Craft key messages that align with the project goals and address the concerns of your target audience. These messages should be clear, concise, and easy to understand. Emphasize the benefits of the temporary traffic control measures and how they contribute to public safety or improved infrastructure.
- **Establish a communication plan:** Create a comprehensive plan outlining the timeline, objectives, and tactics for your public relations efforts. Include details on how you will disseminate information, handle inquiries and complaints, and address any unexpected challenges. Assign responsibilities to team members and establish a mechanism for monitoring and evaluating the effectiveness of your communication efforts.
- **Engage with stakeholders:** Actively engage with your target audience and stakeholders throughout the project. Seek feedback, listen to their concerns, and respond promptly and transparently. Use various engagement methods such as public meetings, online surveys, or community outreach events to foster dialogue and build trust.

TEMPORARY TRAFFIC CONTROL

- **Monitor and evaluate:** Continuously monitor the effectiveness of your public relations efforts. Measure the reach and impact of your messages through metrics like media coverage, website traffic, social media engagement, or feedback received. Use this data to refine your approach and make adjustments as needed.

Remember, effective public relations for temporary traffic control requires proactive communication, transparency, and a focus on addressing the needs and concerns of the affected stakeholders.

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REVIEW

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Knowledge Check: Multiple Choice

Warning signs in work zones should have what color scheme?

A. Black legend and border on orange background

B. Black legend and border on yellow background

C. White legend and border on blue background

D. Red legend and border on white background

Knowledge Check: True / False

When standard orange flags or flashing warning lights are used in conjunction with signs, they shall not block the sign face

A. TRUE

B. FALSE

Knowledge Check: Multiple Choice

The taper of the work zone

a. Is not to be modified

b. Is determined by a set of criteria found in the MUTCD

c. Can be reduced by the senior technician

d. Should be set up by the senior technician

Knowledge Check: Multiple Choice

In a work zone, the transition area is?

a. Not required for speed below 55 MPH

b. Used to channel traffic from the normal path to a new path of traffic

c. Used to advise motorists of actions that are required ahead

d. The area after the work zone where traffic moves back to the normal path of traffic

Knowledge Check: Multiple Choice

According to the MUTCD Section 6B.01.07 good public relations should be maintained by applying which of the following principles?

a. The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.

b. The needs of all road users should be assessed such that estimated advance notice is given and clearly defined alternative paths are provided.

c. The needs of all road users should be assessed such that precise advance notice is given and clearly defined alternative paths are provided.

d. The needs of all road users should be assessed such that some advance notice is given and clearly defined alternative paths are provided.

Knowledge Check: Multiple Choice

Which statement about a detour is **CORRECT**?

a. A detour diverts traffic through the existing roadway by shifting traffic flow

b. A detour redirects traffic to another roadway to bypass the work zone

c. A detour must be paid for under a separate pay item

d. A detour must be approved by the Police Department

Knowledge Check: Multiple Choice

When planning a work zone, communication to the public

a. Should be as generic as possible with very little detail

b. Is transmitted via the 811 system

c. Is not required

d. Should be clear, informative, and presented in a positive manner

Knowledge Check: Multiple Choice

In what order should the traffic control devices be placed when installing a work zone on a one-lane closure of a two-lane two-way street?

a. Advance warning, transition, closure, termination

b. Closure, transition, termination, advance warning

c. Termination, closure, transition, advance warning

d. Transition, closure, termination, advance warning

Knowledge Check: Multiple Choice

In what order should the traffic control equipment be removed in a single lane freeway closure?

a. Advance warning, active, transition, termination

b. Advance warning, transition, active, termination

c. Termination, active, transition, advance warning

d. Termination, transition, active, advance warning

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

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Gathering Required Equipment

When setting up a temporary traffic control zone, it's important to have the necessary equipment to ensure the safety of both workers and road users. Here's a list of commonly required equipment for a temporary traffic control zone:

- **Traffic cones:** These are essential for marking the boundaries of the work area, lane closures, or detours. Use cones with reflective strips for increased visibility, especially during low-light conditions.
- **Traffic signs:** Include signs such as "Road Work Ahead," "Detour," "Lane Closed," and "Merge" signs as necessary. These signs help provide clear directions to drivers and communicate changes in traffic patterns.
- **Barricades:** Use barricades to close off entire sections of road or to create a physical barrier between the work area and traffic. Reflective barricades are highly recommended for nighttime operations.

Traffic delineators: These devices help guide drivers along the desired path by separating traffic lanes or indicating lane shifts. Delineators are particularly useful during nighttime operations.

Traffic barrels: Large barrels can be filled with sand or water and used as temporary barriers to direct traffic or block access to certain areas.

Temporary rumble strips: Use these strips to alert drivers to slow down and pay attention to changing road conditions. Rumble strips create noise and vibrations, helping to enhance driver awareness.

Traffic lights or signals: If the temporary traffic control zone requires complex traffic management, you may need portable traffic lights or signals to control the flow of vehicles and pedestrians.

Flagging equipment: Provide high-visibility vests, hard hats, and flags for traffic controllers or flaggers who are responsible for directing traffic safely through the work zone.

Message boards: Electronic message boards can be used to display real-time information about lane closures, detours, or upcoming traffic delays. These boards improve communication with drivers and help manage traffic flow.

Message boards: Electronic message boards can be used to display real-time information about lane closures, detours, or upcoming traffic delays. These boards improve communication with drivers and help manage traffic flow.

Pavement marking tape: If you need to temporarily mark the road, consider using removable pavement marking tape that can be easily applied and removed after the work is completed.

Remember, the specific equipment required may vary depending on the nature and scale of the work being performed, local regulations, and the level of traffic control needed. Always consult local authorities and traffic control experts to ensure compliance with safety standards and regulations for your specific location.

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LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

Pre-Activity Meeting

Pre-activity meetings for temporary traffic control are essential to ensure the safety and efficiency of road work or construction projects. This is for anyone involved with the work. Law enforcement should be there to know their responsibilities. Anyone for that day's assignment needs to there. These meetings are generally done right before work assignment.

Here's a step-by-step guide to conducting a pre-activity meeting for temporary traffic control:

Introduction: Begin the meeting by introducing yourself and welcoming the participants. State the purpose of the meeting, which is to discuss temporary traffic control plans and safety measures.

Attendees: Confirm the presence of all necessary personnel, including project managers, supervisors, traffic control coordinators, and relevant workers.

Review Project Details: Provide a brief overview of the project, including its location, scope, and duration. Discuss any specific challenges or considerations related to the project that may impact traffic control measures.

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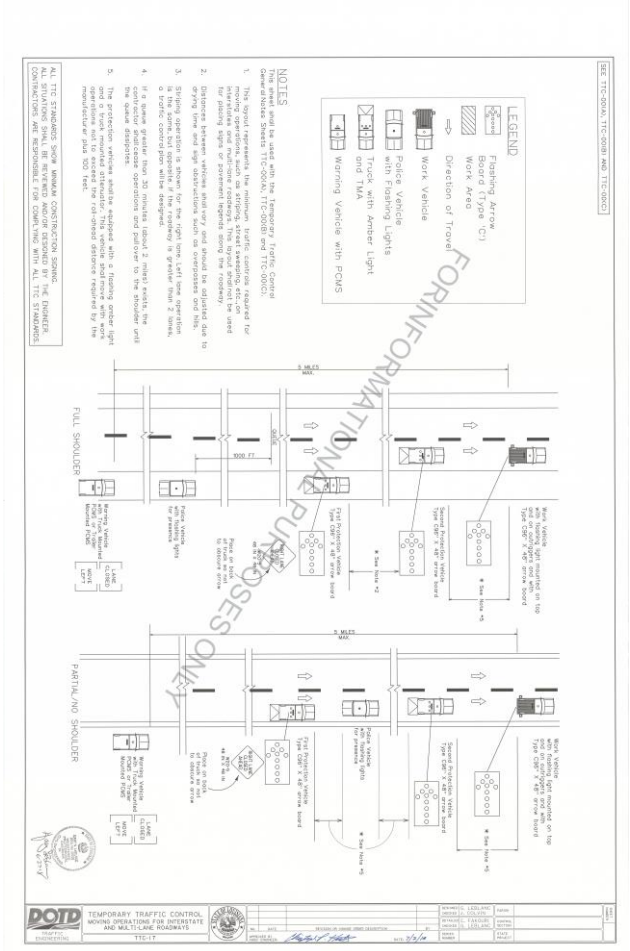
LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)



Temporary Traffic Control Plans: Present the temporary traffic control plans for the project. Display diagrams, maps, or drawings to help illustrate the traffic control measures. Explain the purpose of each control measure, such as signage, flaggers, lane closures, detours, or speed reductions.

Roles and Responsibilities: Clarify the roles and responsibilities of each team member involved in traffic control. Assign specific tasks to individuals or groups and ensure they understand their duties. Emphasize the importance of communication and coordination among team members.

Safety Procedures: Discuss safety procedures and guidelines that must be followed at all times. Address personal protective equipment (PPE) requirements, such as high-visibility vests, hard hats, and safety footwear. Highlight potential hazards, such as moving vehicles, heavy machinery, or hazardous materials, and discuss mitigation strategies.

Communication: Review communication protocols and channels to be used during the project. Discuss radio procedures, hand signals, and other means of communication between workers, flaggers, and supervisors. Provide contact information for key personnel in case of emergencies or issues.

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LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

Traffic Management: Explain how traffic will be managed during the project, considering factors like peak hours, nearby intersections, and pedestrian safety. Discuss the sequence of traffic control measures and any phasing required. Address any concerns or questions from the team regarding traffic management.

Emergency Response: Outline emergency response procedures in case of accidents, injuries, or other incidents. Provide information on the location of first aid kits, fire extinguishers, and emergency exits. Encourage workers to report any incidents or near-misses promptly.

Q&A and Closing: Allow time for questions, clarifications, or suggestions from the team members. Address any outstanding concerns or issues raised during the meeting.
Summarize the key points discussed and thank everyone for their participation. Remind the team of the importance of adhering to the temporary traffic control plans and safety protocols.

Remember to document the meeting minutes and distribute them to all attendees for future reference. Regularly review and update the temporary traffic control plans as needed throughout the project.

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LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

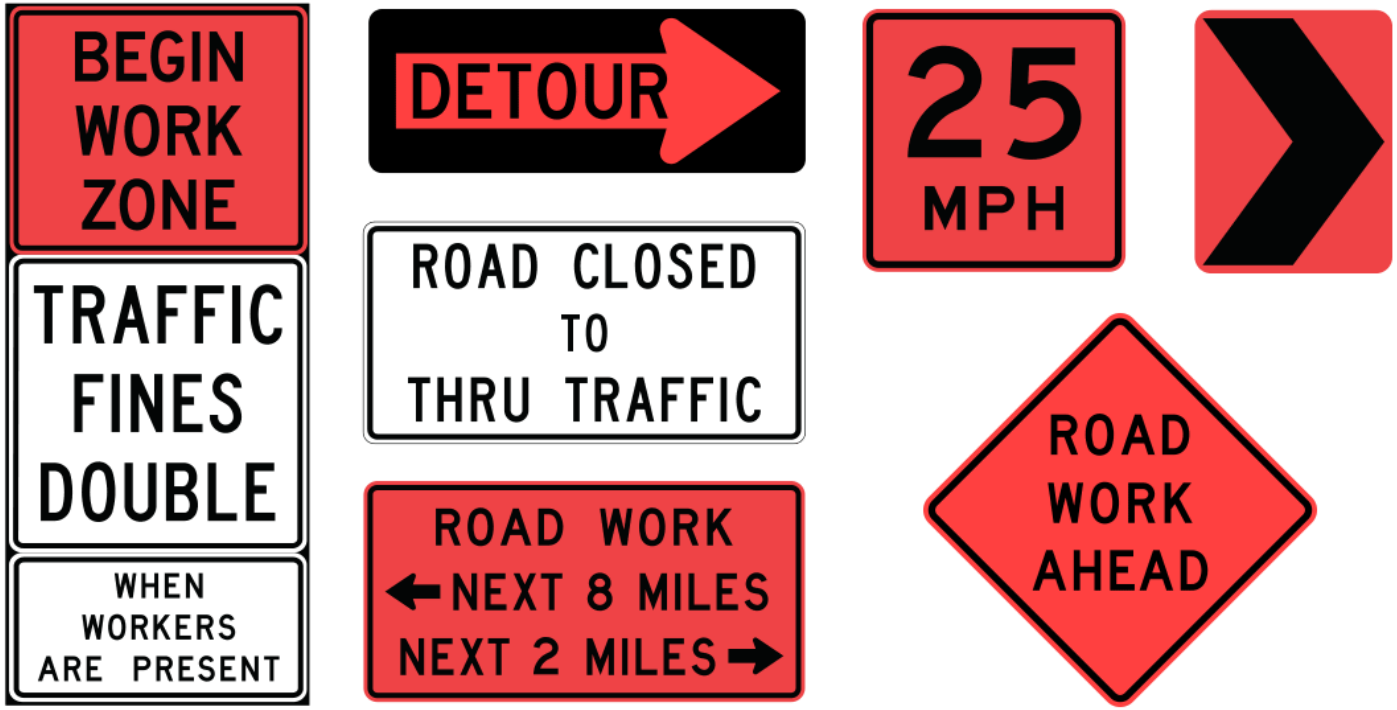
When setting up temporary traffic control zones, it's important to follow the guidelines and regulations provided by the relevant transportation authority or agency in your region. The specific requirements may vary depending on your location. Each TTC zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. The goal of TTC in work zones is safety with minimum disruption to road users. The key factor in promoting TTC zone safety is proper judgment.

LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

Set Up Advance Warning Area

Install advance warning signs in advance of the work zone to alert drivers of upcoming changes in traffic patterns or conditions.



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LESSON 4

TEMPORARY TRAFFIC CONTROL

Set Up Advance Warning Area

Place temporary traffic control devices, such as barrels, cones, or barricades, to guide traffic and delineate the work area.

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LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

Set Up Advance Warning Area

Consider using flashing lights or temporary rumble strips to enhance visibility and provide additional warning to drivers.

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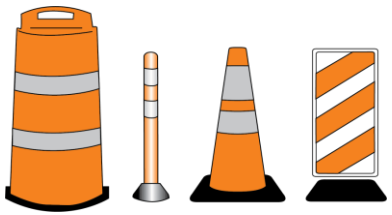
LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

Establish Transition Area

- Use signs and pavement markings to guide drivers through the transition area between the normal roadway and the work zone.
- Set up channelizing devices like cones, tubular markers, or delineators to create a clear path for vehicles.
- Consider using temporary traffic signals or flaggers to direct traffic if necessary.



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LESSON 4

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

Set Up Activity Area

a. Place signs indicating specific instructions or warnings related to the work being performed, such as "Road Work Ahead" or "Lane Closed Ahead."

b. Use barricades or other barriers to separate the work area from the traffic flow.

c. Ensure that equipment and personnel are positioned safely within the activity area.

Maintain Traffic Flow

a. Regularly monitor and adjust the traffic control measures to ensure their effectiveness and address changing conditions.

b. Provide adequate lighting during nighttime operations to enhance visibility.

c. Follow any additional guidelines or requirements specific to your project or jurisdiction.

Gathering Equipment, Pre-Activity Meeting, Placing Equipment & Signs, and Notifying Authority Having Jurisdiction (AHJ)

TTC plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users. There shall be adequate statutory authority for the implementation and enforcement of needed road user regulations, parking controls, speed zoning, and the management of traffic incidents. Such statutes shall provide sufficient flexibility in the application of TTC to meet the needs of changing conditions in the TTC zone.

REVIEW

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Knowledge Check: Multiple Choice

In evaluating a pre-work zone condition what should be considered **FIRST**?

a. The type of funding source

b. The type of equipment that will be used to perform the work

c. The type of personnel that will be used to perform the work

d. The type of work that will be performed

Knowledge Check: Multiple Choice

What is the **MINIMUM** standard that shall be used when developing or implementing a temporary traffic control plan?

a. NEC

b. MUTCD

c. NFPA

d. OSHA

Knowledge Check: Multiple Choice

When discussing the work zone during a pre-activity meeting, which of the following is reviewed for need and location?

a. Refueling safety zones

b. Hydration replenishment stations

c. Inspection review points

d. Traffic control devices

Knowledge Check: Multiple Choice

Road work is planned on a two-way, two-lane street. Which of the following is typically required during the planning stage?

a. A Davis-Bacon Act authorization permit

b. Type II and Type III barricades

c. Approval from adjacent property owners

d. A permit from the jurisdiction having authority

Knowledge Check: Multiple Choice

Which of the following is the best resource to use when setting up a work zone?

a. Police Departments

b. Aerial photographs

c. GIS mapping

d. AADT (Annual Average Daily Traffic) counts

Knowledge Check: Multiple Choice

During the Pre-Activity, personnel are assigned tasks based on

a. Need and qualifications

b. Presence and quantity

c. Seniority and availability

d. Size and appearance

Knowledge Check: Multiple Choice

Which of the following is considered an Authority Having Jurisdiction that may need to be contacted about an upcoming work zone on a local road?

a. County Tax Office

b. Local Public Agency

c. OSHA

d. State Construction Board

Flagger Control

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LESSON 5

Flagger Control

Because flaggers are responsible for public safety and make the greatest number of contacts with the public of all highway workers, they should be trained in safe traffic control practices and public contact techniques. Flaggers should be able to satisfactorily demonstrate the following abilities:

A. Ability to receive and communicate specific instructions clearly, firmly, and courteously;

B. Ability to move and maneuver quickly in order to avoid danger from errant vehicles;

C. Ability to control signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers approaching a TTC zone in frequently changing situations;

D. Ability to understand and apply safe traffic control practices, sometimes in stressful or emergency situations; and

E. Ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

Flagger Control

High-Visibility Safety Apparel

For daytime and nighttime activity, flaggers shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled "American National Standard for High-Visibility Apparel and Headwear" (see Section 1A.11) and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. The apparel background (outer) material color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 feet. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

Flagger Control

Hand-Signaling Devices

The STOP/SLOW paddle should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags should 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. The STOP (R1-1) face shall have white letters and a white border on a red background. The SLOW (W20-8) face shall have black letters and a black border on an orange background. When used at night, the STOP/SLOW paddle shall be retro reflectorized.

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LESSON 5

Flagger Control

- If flashing lights are used on the STOP face of the paddle, their colors shall be all white or all red.
- If flashing lights are used on the SLOW face of the paddle, their colors shall be all white or all yellow.
- If more than eight flashing lights are used, the lights shall be arranged such that they clearly convey the octagonal shape of the STOP face of the paddle and/or the diamond shape of the SLOW face of the paddle.
- If flashing lights are used on the STOP/SLOW paddle, the flash rate shall be at least 50, but not more than 60, flashes per minute.

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LESSON 5

Flagger Control

Flags, when used, shall be red or fluorescent orange/red in color, shall be a minimum of 24 inches square, and shall be securely fastened to a staff that is approximately 36 inches in length. When used at nighttime, flags shall be retro reflectorized red.

STOP/SLOW Automated Flagger Assistance Devices

A STOP/SLOW Automated Flagger Assistance Device (AFAD) (see Section 6E.04) shall include a STOP/SLOW sign that alternately displays the STOP (R1-1) face and the SLOW (W20-8) face of a STOP/SLOW paddle (see Figure 6E-1). The AFAD's STOP/SLOW sign shall have an octagonal shape, shall be fabricated of rigid material, and shall be mounted with the bottom of the sign a minimum of 6 feet above the pavement on an appropriate support.

The size of the STOP/SLOW sign shall be at least 24 x 24 inches with letters at least 8 inches high. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be diamond shaped and orange with black letters and border. Both faces of the STOP/SLOW sign shall be retro reflectorized.

The AFAD's STOP/SLOW sign shall have a means to positively lock, engage, or otherwise maintain the sign assembly in a stable condition when set in the STOP or SLOW position.

Automated Flagger Assistance Devices

Automated Flagger Assistance Devices (AFADs) enable a flagger(s) to be positioned out of the lane of traffic and are used to control road users through temporary traffic control zones. These devices are designed to be remotely operated either by a single flagger at one end of the TTC zone or at a central location, or by separate flaggers near each device's location.

Flagger Control

Automated Flagger Assistance Devices

There are two types of AFADs:

A. An AFAD (see Section 6E.05) that uses a remotely controlled STOP/SLOW sign on either a trailer or a movable cart system to alternately control right-of-way.

B. An AFAD (see Section 6E.06) that uses remotely controlled red and yellow lenses and a gate arm to alternately control right-of-way.

STOP/SLOW Automated Flagger Assistance Devices

The AFAD's STOP/SLOW sign shall be supplemented with active conspicuity devices by incorporating either:

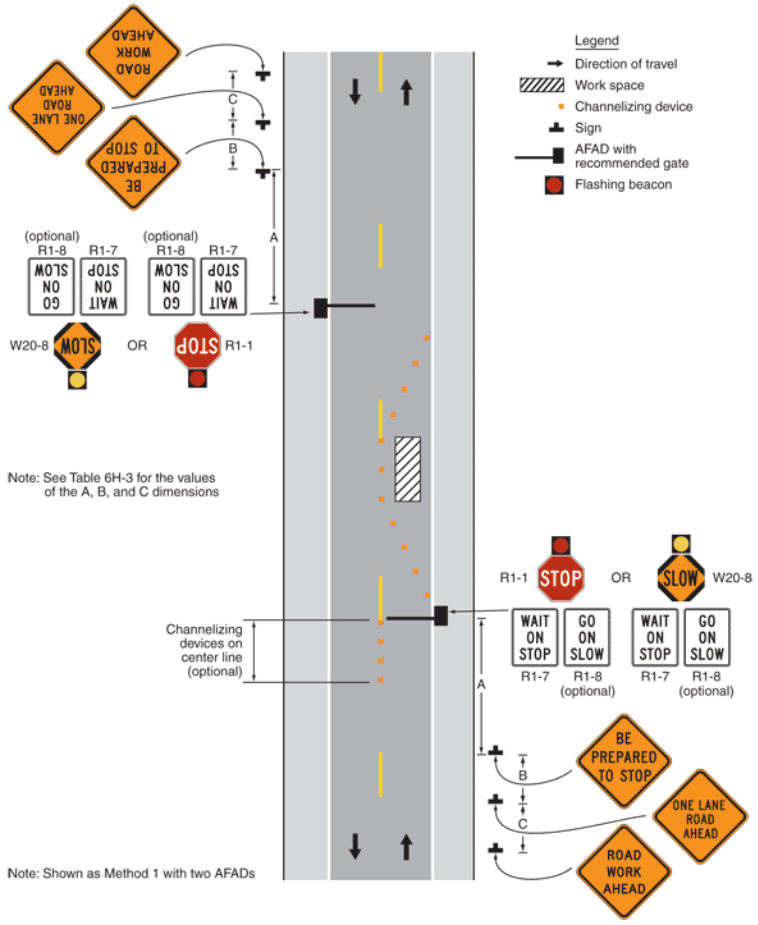
A. White or red flashing lights within the STOP face and white or yellow flashing lights within the SLOW face meeting the provisions contained in Section 6E.03; or

B. A Stop Beacon (see Section 4L.05) mounted a maximum of 24 inches above the STOP face and a Warning Beacon (see Section 4L.03) mounted a maximum of 24 inches above, below, or to the side of the SLOW face. The Stop Beacon shall not be flashed or illuminated when the SLOW face is displayed, and the Warning Beacon shall not be flashed or illuminated when the STOP face is displayed. Except for the mounting locations, the beacons shall comply with the provisions of Chapter 4L.

Flagger Control

STOP/SLOW Automated Flagger Assistance Devices

Figure 6E-1. Example of the Use of a STOP/SLOW Automated Flagger Assistance Device (AFAD)



Red/Yellow Lens Automated Flagger Assistance Devices

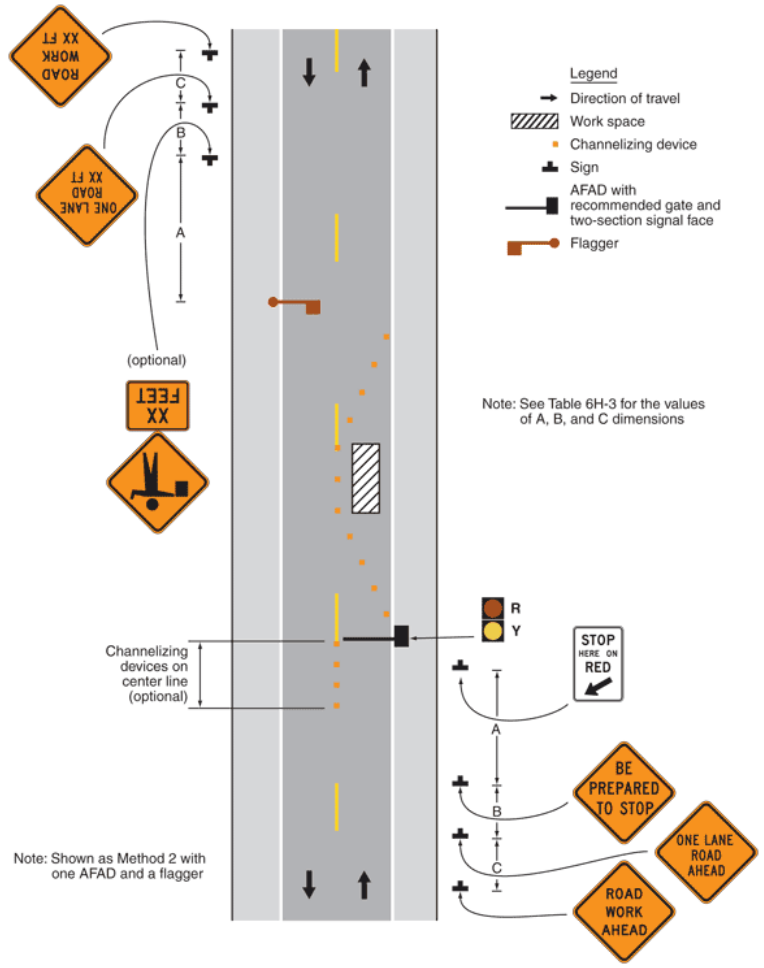
A Red/Yellow Lens Automated Flagger Assistance Device (AFAD) (see Section 6E.04) shall alternately display a steadily illuminated CIRCULAR RED lens and a flashing CIRCULAR YELLOW lens to control traffic without the need for a flagger in the immediate vicinity of the AFAD or on the roadway (see Figure 6E-2).

Red/Yellow Lens AFADs shall have at least one set of CIRCULAR RED and CIRCULAR YELLOW lenses that are 12 inches in diameter. Unless otherwise provided in this Section, the lenses and their arrangement, CIRCULAR RED on top and CIRCULAR YELLOW below, shall comply with the applicable provisions for traffic signal indications in Part 4. If the set of lenses is post-mounted, the bottom of the housing (including brackets) shall be at least 7 feet above the pavement. If the set of lenses is located over any portion of the highway that can be used by motor vehicles, the bottom of the housing (including brackets) shall be at least 15 feet above the pavement.

Flagger Control

STOP/SLOW Automated Flagger Assistance Devices

Figure 6E-2. Example of the Use of a Red/Yellow Lens Automated Flagger Assistance Device (AFAD)



Flagger Procedures

Flaggers shall use a STOP/SLOW paddle, a flag, or an Automated Flagger Assistance Device (AFAD) to control road users approaching a TTC zone. The use of hand movements alone without a paddle, flag, or AFAD to control road users shall be prohibited except for law enforcement personnel or emergency responders at incident scenes as described in Section 6I.01.

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 away from the body.

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LESSON 5

Flagger Control

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

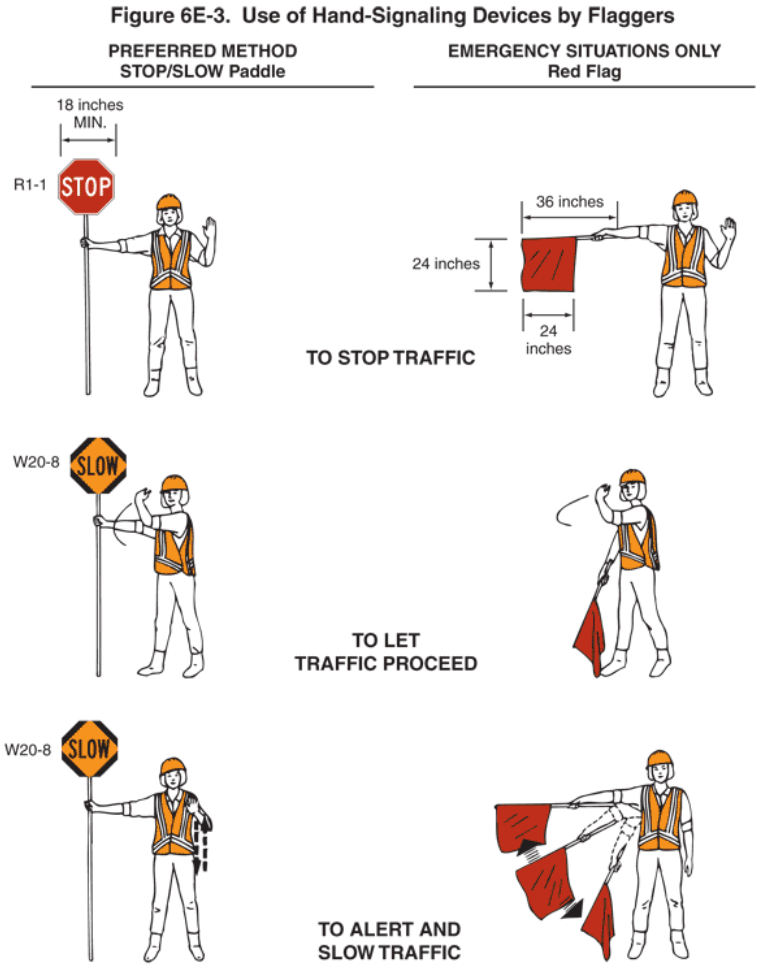
A. To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users' lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.

B. To direct stopped road users to proceed, the flagger shall face road users with the flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

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.

Flagger Control

Flagger Procedures



Review

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Knowledge Check: Multiple Choice

Automated Flagger Assistance Devices shall **NOT** be used

a. As a replacement for a temporary traffic control signal

b. During short term work

c. For a bridge maintenance work zone

d. For a pavement patching work zone

Knowledge Check: Multiple Choice

One reason to assign the duty of flagger to well rested individuals is for their ability to

a. Keep moral up during a long working day

b. Locate the car of a platoon and communicate that to fellow workers

c. Recognize dangerous traffic situations and warn other workers

d. Understand time management during the project

Knowledge Check: Multiple Choice

Flaggers are responsible for the following **EXCEPT** for;

a. Performing inspection of advance warning signs

b. Protecting and warning project personnel of errant vehicles

c. Protecting self by evaluating escape routes

d. Providing safe, courteous and authoritative directions to motorists

Pedestrian and Worker Safety Considerations

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Pedestrian Considerations

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

- The various TTC provisions for pedestrian and worker safety set forth in Part 6 of the MUTCD shall be applied by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.
- Advance notification of sidewalk closures shall be provided by the maintaining agency.
- If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.
- It must be recognized that pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance or out-of-the-way travel to a destination.

Pedestrian Considerations

The following three items should be considered when planning for pedestrians in TTC zones:

- ✓ *Pedestrians should not be led into conflicts with vehicles, equipment, and operations.*
- ✓ *Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.*
- ✓ *Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).*

Pedestrian Considerations

A pedestrian route should not be severed and/or moved for non-construction activities such as parking for vehicles and equipment.

Consideration should be made to separate pedestrian movements from both worksite activity and vehicular traffic. Unless an acceptable route that does not involve crossing the roadway can be provided, pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway. In urban and suburban areas with high vehicular traffic volumes, these signs should be placed at intersections (rather than midblock locations) so that pedestrians are not confronted with midblock worksites that will induce them to attempt skirting the worksite or making a midblock crossing.

Pedestrian Considerations

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

- Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC plan.
- Access to transit stops should be maintained.
- A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)".
- The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.

Pedestrian Considerations

- Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision. Where pedestrian traffic is detoured to a TTC signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals should be considered for crossings along an alternate route.
- When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it. These detectable edgings should comply with the provisions of Section 6F.74 of the MUTCD.
- Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.

Worker Safety Considerations

The following are the key elements of worker safety and TTC management that should be considered to improve worker safety:

- ❑ 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 TTC responsibilities should be trained in TTC techniques, device usage, and placement.
- ❑ Temporary Traffic Barriers—temporary traffic barriers should be placed along the work space depending on factors such as lateral clearance of workers from adjacent traffic, speed of traffic, duration and type of operations, time of day, and volume of traffic.
- ❑ Speed Reduction—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, or the use of uniformed law enforcement officers or flaggers, should be considered.
- ❑ Activity Area—planning the internal work activity area to minimize backing-up maneuvers of construction vehicles should be considered to minimize the exposure to risk.
- ❑ Worker Safety Planning—a trained person designated by the employer should conduct a basic hazard assessment for the worksite and job classifications required in the activity area. This safety professional should determine whether engineering, administrative, or personal protection measures should be implemented. This plan should be in accordance with the Occupational Safety and Health Act of 1970, as amended, "General Duty Clause" Section 5(a)(1) - Public Law 91-596, 84 Stat. 1590, December 29, 1970, as amended, and with the requirement to assess worker risk exposures for each job site and job classification, as per 29 CFR 1926.20 (b)(2) of "Occupational Safety and Health Administration Regulations, General Safety and Health Provisions".

Worker Safety Considerations

All workers, including emergency responders, within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure, except as provided in Paragraph 5. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.

Review

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Knowledge Check: Multiple Choice

When shall pedestrians be provided with access and safe passage through the work zone?

a. When two or more lanes are closed

b. When multiple turn lanes are closed

c. When the work is being done on expressways

d. When an existing pedestrian way exists within the work zone

Knowledge Check: Multiple Choice

Road work is to be performed on an urban arterial with heavy traffic during morning and afternoon peak hours, which of the following is the **BEST** time period to schedule the work?

a. Between 5:00 PM and 1:00 AM

b. Between 5:00 AM and 1:00 PM

c. Between 9:00 AM and 4:00 PM

d. Between 12:00 PM and 8:00 PM

Knowledge Check: Multiple Choice

What Speed Limit type should be used to determine taper lengths?

a. Advisory

b. Posted

c. Design

d. Advisory – 15%

Knowledge Check: Multiple Choice

Crosswalks having an uneven surface greater ¼ inch should

a. Be closed to pedestrian traffic

b. Require a mid-block crossing

c. Not require any modifications

d. Have temporary apron constructed

Knowledge Check: Multiple Choice

When planning a work zone, communication to the public

a. Should be as generic as possible with very little detail

b. Is transmitted via the 811 system

c. Is not required

d. Should be clear, informative, and presented in a positive manner

Conducting final Inspection and Post activity review

Advancing the Future of Public Safety

Final Inspection and Post-Activity Review

Conducting Final Inspection

When conducting a final inspection upon removing work zones, there are several key steps you should follow to ensure that everything has been properly completed and the area is safe for public use.

Here's a general guideline for conducting a final inspection:

- ❑ Review the work order: Familiarize yourself with the scope of the project and the specific tasks that were planned for the work zone. This will help you ensure that all the necessary work has been completed.
- ❑ Safety check: Begin by conducting a thorough safety check of the entire work zone. Look for any remaining hazards such as loose debris, exposed wires, or uneven surfaces. Make sure that all safety barriers, signage, and markings have been removed or properly relocated.
- ❑ Cleanliness assessment: Check the cleanliness of the area. Remove any remaining construction materials, tools, or equipment. Sweep or clean the surfaces to ensure that they are free from dust, dirt, or debris. If necessary, arrange for waste removal services to clear any leftover debris.
- ❑ Structural integrity evaluation: Inspect any structures that were part of the work zone, such as roads, sidewalks, or barriers. Ensure that they are in good condition and have been restored to their original state. Look for signs of damage or deterioration that may require further attention.

Final Inspection and Post-Activity Review

Conducting Final Inspection

- ❑ Utilities and services: Verify that all utilities and services affected by the work zone, such as water lines, gas lines, or electrical cables, have been properly restored and are functioning correctly. Ensure that any temporary connections or modifications have been removed.
- ❑ Compliance with regulations: Check that the work zone removal has been carried out in compliance with relevant regulations, permits, and codes. Ensure that any necessary inspections or approvals have been obtained.
- ❑ Documentation and records: Maintain comprehensive records of the final inspection. Take photographs or video footage of the work zone before and after the removal process. Keep a log of any findings, issues, or observations made during the inspection.
- ❑ Final sign-off: Once you are satisfied that all necessary steps have been completed and the work zone is safe for public use, sign off on the final inspection report. This document should outline the inspection details, any outstanding issues, and the actions taken to address them.

Remember that the specific requirements for a final inspection may vary depending on the nature of the work zone and local regulations. Always consult relevant guidelines and regulations to ensure compliance with specific requirements in your area.

Final Inspection and Post-Activity Review

Post-Activity Review

A post-activity review for work zones is an important step in evaluating the effectiveness and safety of work zone operations. It helps identify strengths and areas for improvement, ultimately leading to enhanced future work zone planning and execution.

Here are some key steps and considerations to conduct a post-activity review for work zones:

- ✓ Define the Objectives: Clearly outline the objectives of the review. This may include assessing the effectiveness of traffic management strategies, evaluating worker safety measures, analyzing project timelines, or examining the impact on traffic flow and user experience.
- ✓ Gather Relevant Data: Collect all pertinent data related to the work zone activity. This may include traffic data, accident reports, project timelines, field observations, feedback from workers, and any other relevant information. The more comprehensive the data, the better the review.
- ✓ Assess Traffic Management Strategies: Evaluate the effectiveness of the traffic management strategies employed during the work zone. Analyze if the implemented measures, such as signage, barriers, and lane closures, were appropriate and successful in guiding motorists safely through the work zone. Consider the impact on traffic flow, congestion, and any reported incidents.

Final Inspection and Post-Activity Review

Post-Activity Review

- ✓ Review Worker Safety Measures: Examine the safety protocols and measures implemented for the workers. Assess if appropriate safety equipment, such as personal protective gear, barriers, and warning signs, were utilized effectively. Analyze any incidents or near misses that occurred and identify potential improvements to enhance worker safety.
- ✓ Analyze Project Timelines: Review the timeline of the work zone project, including the planned schedule and the actual duration. Identify any delays or issues that may have affected the completion of the project within the set timeframe. Consider factors such as weather conditions, resource availability, and any unforeseen challenges.
- ✓ Evaluate Communication and Public Outreach: Assess the effectiveness of communication and public outreach efforts during the work zone activity. Review if the public was adequately informed about the work zone, including its purpose, duration, and potential impacts on traffic. Analyze feedback received from the public and identify any areas for improvement in communication strategies.
- ✓ Identify Lessons Learned: Identify key lessons learned from the work zone activity. Consider both positive aspects and areas that need improvement. These lessons can be used to develop best practices for future work zones and to enhance overall project management.

Final Inspection and Post-Activity Review

Post-Activity Review

- ✓ Develop Recommendations: Based on the findings of the review, develop actionable recommendations for improving work zone operations. These recommendations may include adjustments to traffic management strategies, enhanced safety measures, improved communication plans, or modifications to project scheduling.
- ✓ Implement Improvements: Ensure that the recommendations are communicated to relevant stakeholders and implemented in future work zone activities. Track the progress of these improvements and conduct periodic reviews to assess their effectiveness.
- ✓ Document the Review: Compile a comprehensive report summarizing the post-activity review findings, recommendations, and action plans. This document will serve as a valuable reference for future work zone projects and as a record of lessons learned.

Remember, a post-activity review for work zones should be conducted in a collaborative manner involving key stakeholders, including project managers, traffic engineers, safety personnel, and workers involved in the work zone activity. Their insights and perspectives will contribute to a more comprehensive and effective review process.

Conducting final Inspection and Post activity review

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Knowledge Check: Multiple Choice

What four items should be checked for during final inspection?

a. Railroad hazards, permanent signs restored, pavement markings restored, and remaining traffic control equipment

b. Road hazards, permanent signs restored, pavement markings removed, and remaining traffic control equipment

c. Road hazards, permanent signs restored, pavement markings restored, and remaining traffic control equipment

d. Road hazards, temporary signs restored, pavement markings restored, and remaining traffic control equipment

Knowledge Check: Multiple Choice

When performing the final inspection, which of the following is **MOST IMPORTANT** to have knowledge of?

a. The temporary traffic control plan and state and local standards

b. The type of pavement that the inspection is being conducted on

c. The type of permanent signs that are being installed

d. The type of road that the inspection is being conducted on

Knowledge Check: Multiple Choice

When work is complete and the temporary traffic control is removed, the area should be inspected for

a. Litter abatement

b. Road hazards and construction debris

c. Speed enforcement

d. Traffic congestion

Knowledge Check: Multiple Choice

When the work zone is completed, the temporary traffic control devices should be

a. Sent to recycling

b. Left in the right of way for the maintaining agency

c. Reused regardless of condition since they are considered temporary devices

d. Inspected, cleaned, repaired, or replaced

Knowledge Check: Multiple Choice

When closing down and/or removing a work zone area, the permanent signs

a. Are of no concern since the project has been accepted

b. Can be left as is, the maintaining agency will repair or replace them

c. Will need to be uncovered or placed back into pre-work zone condition

d. Need not apply to MUTCD standards

Knowledge Check: Multiple Choice

What activity should always be done prior to leaving a work zone?

a. Say goodbye to the citizens

b. Organize work truck

c. Pick up all trash and debris

d. Clean tools, if dirty

End

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