Idaho State Traffic Control Supervisor Certification Course

2-Day Agenda

Day 1:

- Introduction to Temporary Traffic Control (TTC)
- TTC Regulations and Resources
- Fundamental Principles
- Traffic Control Supervisor (TCS) Responsibilities
- Temporary Traffic Control Devices
- Elements of TTC Plans

→ Exercise: Plan Element Identification

- Reading Contract Provisions and Plans

Day 2:

→ Exercise: Reading TTC Plans

- Traffic Control Labor
- Flagging

→ Exercise: Flagging Operations

- Installing and Removing TTC Devices

→ Exercise: TTC Device Inventory/Storage

- Temporary Traffic Control Plan Management and Evaluation

→ Exercise: Preparing Daily TTC Diary

→ Exercise: TTC Plan Problem Identification and Correction

→ Exercise: TTC Plan Modification

- Summary
- **Pass/Fail Exam**

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IDAHO TRAFFIC CONTROL SUPERVISOR

Forward

The objective of this course is to train Traffic Control Supervisors: the personnel who supervise the installation, maintenance, modification, and removal of Temporary Traffic Control zones. This course teaches the skills and knowledge needed to properly oversee TTC setup, with the end goal of helping to ensure the safety of workers, motorists, and pedestrians during street, highway, and freeway construction and maintenance activities.

The foundation of the Idaho Transportation Department's two-day certification course comes primarily from the following sources:

1. Federal Highway Administration, National Highway Institute training materials.
2. Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD), particularly Part 6.
3. The Idaho Transportation Department's policies, standards and guidelines in reference to worker and public safety during highway construction and maintenance operations.

These training materials and the certification training program for Traffic Control Supervisor are for public and private sector engineers, inspectors, supervisors, and field crew personnel.

Candidates for certification receive this manual as a training and reference guide, plus other materials, including a copy of the MUTCD, Part 6. You are allowed to reference the MUTCD and training materials provided in this notebook when taking the certification examination. By achieving a score of 80% or better on the exam, you will be issued a State of Idaho Transportation Department Traffic Control Supervisor certification card, good for four years from the date of your examination.

CHAPTER 1
INTRODUCTION

1.1 SUMMARY

This chapter introduces participants to the national regulatory requirements for traffic safety in highway work zones, and describes the purpose, scope, objectives, and structure of the Idaho Traffic Control Supervisor training course.

1.2 NATIONAL REGULATORY REQUIREMENTS FOR TEMPORARY TRAFFIC CONTROL

Work zones directly impact the safety and mobility of road users and highway workers. Federal regulations apply on Federal-aid highway projects and are found in 23 CFR 630, Subparts J and K—titled "Work Zone Safety and Mobility" and "Temporary Traffic Control Devices."

The Federal Highway Administration (FHWA) requires states to implement the standards found in the Manual on Uniform Traffic Control Devices (MUTCD). This manual is issued by the FHWA in accordance with Title 23, U.S. Code, Section 109(b),109(d),114(a), 217, 315 and 402(a), 23 CFR 655.603 and 49 CFR 1.48(b)(8), 1.48(b)(33), and 1.48(c)(2). The MUTCD is adopted in Idaho through IDAPA 39.03.41 – Rules Governing Traffic Control Devices. Part 6 of the MUTCD sets forth basic principles and prescribes standards for the design, application, installation, and maintenance of Temporary Traffic Control devices for highway and street construction, maintenance operation, and utility work. Additional information is provided in the ITD Traffic Manual.

In addition to the provisions in the MUTCD, federal regulations describe other actions that can be taken to further help mitigate the safety and mobility impacts of work zones. Some examples of these actions include:

- A Temporary Traffic Control (TTC) Plan for each project or activity.
- Assignment of a qualified responsible person in charge of Temporary Traffic Control.
- Pay items for Temporary Traffic Control, if necessary.
- Training of Temporary Traffic Control personnel.
- A process for review and evaluation of the adequacy of Temporary Traffic Control on randomly selected projects.

- Analysis of construction zone accidents to continually correct deficiencies and improve the content of future Traffic Control Plans (TCPs).

Many states have adopted the same or similar procedures for all highway work being performed or administered by the state (regardless of funding source). They have found these procedures to benefit their own operations and to protect them from potential liability suits arising from accidents in Temporary Traffic Control zones.

1.3 COURSE SCOPE

The course discusses the process for interpreting, installing, maintaining, and evaluating proper Temporary Traffic Controls for work zones. While the implementation of Temporary Traffic Control is covered in detail, issues concerning the safety and operations of motorists, pedestrians, and highway workers are addressed when appropriate. Emphasis is placed on the duties and responsibilities of the Temporary Traffic Control Supervisor.

The principles presented in the course apply to the following:

- All roads open to public travel, including streets, roads, highways, and limited access facilities, regardless of jurisdiction.
- Temporary Traffic Control zones in urban and rural areas.
- Work activities of various duration and complexity.
- Construction, maintenance, and utility work, and operations associated with emergency and incident management.
- Activities which are performed during daylight hours or at night.

The procedures and devices covered are generally taken from Part 6 of the MUTCD and represent national standards and guidelines. Where nationally recognized standards and guidelines are not available, recommendations based on successful procedures developed by the Idaho Transportation Department and several other highway agencies are used, and are presented as acceptable current practice.

1.4 COURSE OBJECTIVES

This course is designed to train personnel in principles and practices of temporary traffic management which will enable them to provide the safest and most efficient operation of Temporary Traffic Control in work zones. Of critical importance is the need to employ uniform controls recognized by motorists throughout the country, to adhere to national

and local standards, and to meet legal requirements. The course stresses procedures which have been proven effective, and discourages the use of poor practices often encountered in work zones.

Specific objectives sought in various parts of the course include:

- Gain an understanding of each step involved in providing Temporary Traffic Control.
- Identify and apply workable concepts and techniques during the installation, maintenance, and evaluation of controls for construction, maintenance, utility, and incident management situations.
- Apply Temporary Traffic Control Plans which are appropriate to site conditions, monitor implementation of the plan, and make changes initiated by crashes, incidents, and operational difficulties.
- Discuss techniques and procedures used by ITD.
- Assess the legal consequences of actions or inaction relative to Temporary Traffic Control, and identify risk management procedures.

1.5 COURSE STRUCTURE

The course is divided into the following topical areas:

1. Introduction
2. Temporary Traffic Control (TTC) Regulations and Resources
3. Fundamental Principles of TTC
4. The TTC Team
5. TTC Devices
6. Elements of TTC Plans
7. Reading and Modifying TTC Plans
8. Flagging
9. Installing and Removing TTC Devices
10. TCP Management and Evaluation

CHAPTER 2
Temporary Traffic Control Regulations and Resources

2.1 SUMMARY

This chapter covers State and Federal requirements and Idaho Transportation Department (ITD) standards that apply to all aspects of safety and operations in Temporary Traffic Control zones. Participants will become familiar with the ITD Standard Specifications' hierarchy, definitions, and abbreviations, as well as websites and phone numbers that are commonly used by the Temporary Traffic Control industry in Idaho.

2.2 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

The MUTCD is approved by the Federal Highway Administration as the national standard for all highways open to public travel and is adopted for use in Idaho through IDAPA 39.03.41 – Rules Governing Traffic Control Devices.

States may adopt the MUTCD as their state standard, or they may publish their own manuals and develop supplements to the MUTCD as long as they correlate with and are in substantial conformance with the most recent edition of the national MUTCD. State manuals on traffic control devices must be approved by the Federal Highway Administration. The MUTCD is considered minimum requirements; you can never go below these minimum requirements.

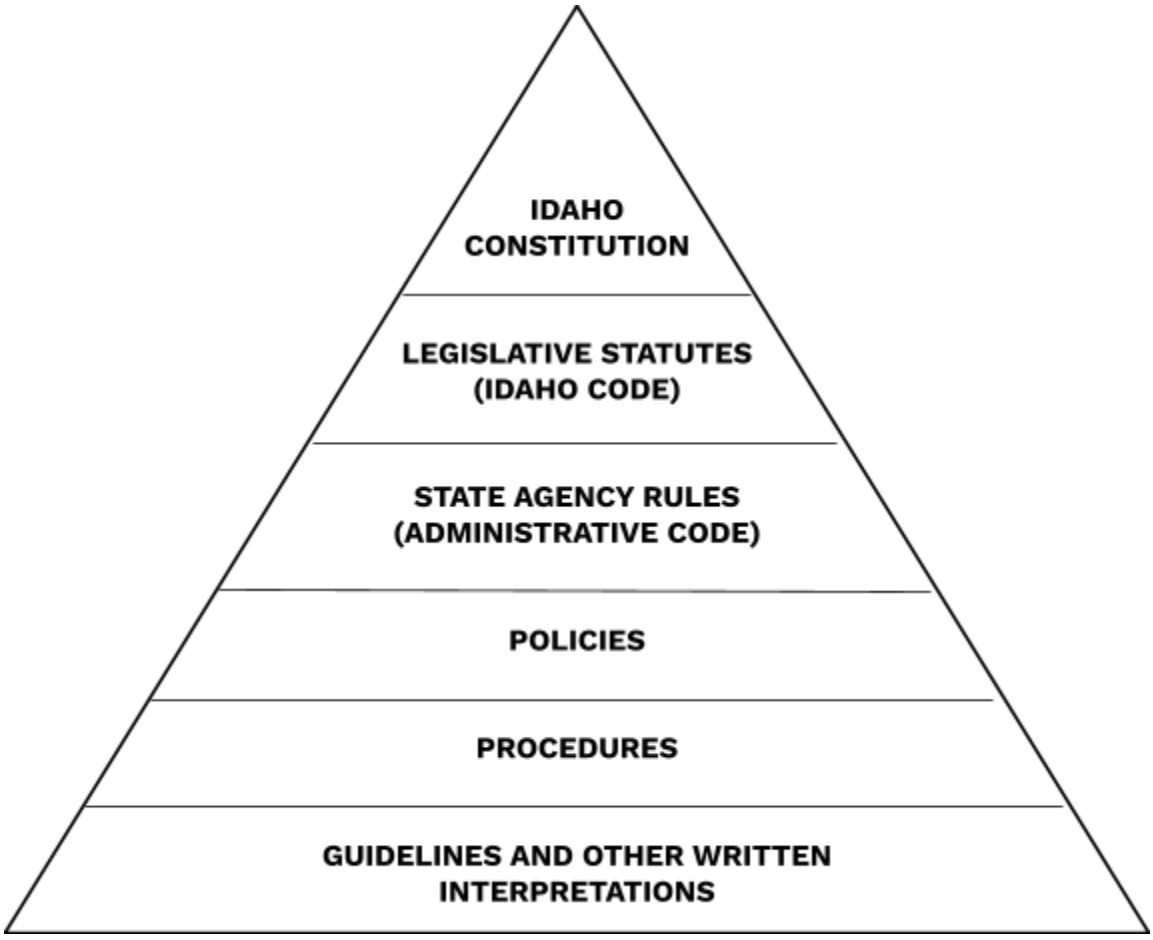
Traffic control devices covered by the standards described in the MUTCD consist of signs, signals, markings, and devices placed on, over or adjacent to a street or highway by authority of a public body or official having jurisdiction to regulate, warn, or guide traffic.

2.3 PART 6 OF THE MUTCD – Temporary Traffic Control

The MUTCD contains nine parts. Part 1 contains general provisions, Parts 2 through 4 cover signs, markings, and traffic control signals. Parts 5 through 9 address applications. This course is based primarily on Part 6, but other sections of the MUTCD may need to be consulted whenever situations are encountered which are not fully discussed in Part 6.

2.4 ITD TRAFFIC MANUAL

The ITD Traffic Manual provides supplemental information to the MUTCD as well as information on practices common in Idaho. Figure 1A-1 shows the levels of precedent for state government documents. The highest levels of the pyramid in the figure have a broad scope but limited amount of guidance, whereas the bottom levels have a narrow scope but detailed guidance. Legislative statutes create the Idaho Transportation Board and the Idaho Transportation Department and direct the Transportation Board to "adopt a manual and specifications for a uniform system of traffic-control devices (see Idaho Statute 49-201(3))." Through state agency rules, FHWA's "Manual on Uniform Traffic Control Devices" (MUTCD) is adopted for use in Idaho with some changes (*see IDAPA 39.03.41 – Rules Governing Traffic Control Devices)*.



Through legislative statutes and state agency rules, the MUTCD and the adopted changes have the force and effect of law.

The Traffic Manual, at the guidelines level, does not have the force and effect of law and does not replace or supersede the MUTCD. Legislative statutes, state agency rules (IDAPA), and ITD policies are referenced in the Traffic Manual when applicable.

The Traffic Manual is organized like the MUTCD for cross-referencing purposes. Standards, Guidance, Options, and Support stated in the MUTCD are not repeated in the Traffic Manual. The Traffic Manual is not separated into Standards, Guidance, Options, and Support, but instead gives information about common ITD practices and is intended to allow the reader to use engineering judgment. When no supplementary guidance is added for a section of the MUTCD, the section heading is included in this Manual with supporting text stating, "no supplementary information."

2.5 ITD STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

Sections: 105.04, 105.14, 107.06, 626

These specifications are produced by the ITD. They outline contractor obligations related to highway construction.

- Section 105.04 covers the Coordination of Contract Documents.
- Section 105.14 covers Maintenance During Construction.
- Section 107.06 covers Traffic Control Devices.
- Section 626 covers Temporary Traffic Control.

2.6 QUALITY GUIDELINES FOR WORK ZONE TRAFFIC CONTROL DEVICES

These guidelines are produced by the American Traffic Safety Services Association (ATSSA), and are referenced in Section 626 of the Standard Specifications for Highway Construction. Application of these guidelines ensures that all Temporary Traffic Control devices are in acceptable condition. The MUTCD provides guidance on the maintenance of traffic control devices. *(MUTCD 1A.05)*

- Functional maintenance of traffic control devices should be used to determine if certain devices need to be changed to meet current traffic conditions.
- Physical maintenance of traffic control devices should be performed to retain the legibility and visibility of the devices, and to retain the proper functioning of the device.

2.7 DEFINITIONS

Some of the more important terms used in this course are defined here to clarify the meaning intended.

The following terms are used to identify the level of compliance *(MUTCD 1A.13)*:

Standard: "shall" conditions - always means a mandatory requirement
Guidance: "should" conditions - used to denote a desirable or expected application
Option: "may" conditions - indicates a permissive condition
Support: descriptive and/or general information

Board: Idaho Transportation Board.

Clear Zone: "The unobstructed, traversable area provided beyond the edge of the through traveled way for the recovery of errant vehicles. The clear zone includes shoulders, bike lanes, and auxiliary lanes, except those auxiliary lanes that function like through lanes." – AASHTO Roadside Design Guide

Delineators: Retroreflective devices mounted on the highway surface or at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.

Duration of work: The five categories of work duration. According to the MUTCD:

1. **Long-term stationary** is work that occupies a location more than 3 days.
2. **Intermediate-term stationary** is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
3. **Short-term stationary** is daytime work that occupies a location for more than 1 hour within a single daylight period.
4. **Short duration** is work that occupies a location up to 1 hour.
5. **Mobile** is work that moves intermittently or continuously.

Engineer: Whenever reference is made to "Engineer," it shall mean the administrator acting either directly or through an authorized representative within the limits of the authority granted by the administrator.

Flagger: A person who actively controls the flow of vehicular traffic into and/or through a Temporary Traffic Control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).

Freeway: A divided highway with full control of access.

Hierarchy: Specifications in authority organized into agreement, each subordinate to the one above. *For example: Plans will govern over standard specifications, supplemental specifications, and standard drawings; supplemental specifications will govern over standard specifications, supplemental specifications, and plans.*

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

Inspector: The Engineer's authorized representative assigned to inspect work and materials.

Major Street: A street normally carrying a higher volume of vehicular traffic.

Median: The area between two roadways of a divided highway measured from the edge of one traveled way to the edge of the other traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges, and at opposite approaches of the same intersection.

Minor Street: A street normally carrying a lower volume of vehicular traffic.

Queue: A waiting line of persons or vehicles.

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

Roadbed: That portion of the graded roadway upon which the sub-base, base, surfacing, pavement, shoulders, curb, sidewalks, median, or other incidental facilities are constructed.

Roadside: The area adjoining the outer edge of the roadway within the right-of-way. Areas between the roadways of a divided highway shall also be considered roadside.

Roadway: That portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles. In the event a highway includes two or more separate roadways, the term roadway as used in this Manual shall refer to any such roadway separately, but not to all such roadways collectively.

Rural Highway: A type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.

Tangent: The straightaway area between the work area and the lane of traffic that runs from the transition taper to the downstream taper.

Temporary Traffic Control (TTC) Zone: An area of a roadway where road user conditions are changed because of a work zone or incident by the use of Temporary Traffic Control devices, flaggers, uniformed law enforcement officers, or other authorized personnel.

Most TTC Zones are divided into four areas:

1. Advanced Work Area
2. Transition Area
3. Activity Area
4. Termination Area

Temporary Traffic Control (TTC) Plan: A TTC Plan is a scheme for handling vehicle and pedestrian traffic through a specific roadway or street work zone or project. These plans may range in scope from a very detailed TTC Plan designed solely for a specific project, to a reference to a Typical Application in the MUTCD or a standard drawing approved by a roadway agency. The degree of detail in a TTC Plan will depend on the project complexity and the anticipated interference of work activities with traffic movement.

Traffic Management Plan (TMP): A TMP is prepared by the district and provided to the Temporary Traffic Control COmpany at the pre-con.

Typical Application (TA): Typical Applications of Temporary Traffic Control zones have been established to assist in developing TTC Plans. Selecting the appropriate Typical Application requires knowledge and understanding of where the zone is going to be. Typical Applications often need to be modified based on specific site and traffic conditions. Typical Applications have been categorized based on the following three factors:

1. Duration of work
2. Location of work
3. Roadway type

2.8 ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACPA	American Concrete Pipe Association
ADT	Average Daily Traffic
ATSSA	American Traffic Safety Services Association
CMS	Changeable Message Sign
DOT	Department of Transportation

ESC	Evergreen Safety Council
FHWA	Federal Highway Administration
HOV	High Occupancy Vehicle
ITD	Idaho Transportation Department
ITE	Institute of Transportation Engineers
ISP	Idaho State Police
MUTCD	Manual on Uniform Traffic Control Devices
NHI	National Highway Institute
NPCA	National Pre-Cast Concrete Association
PCB	Precast Concrete Barrier
PCMS	Portable Changeable Message Sign
TCOC	Traffic Control Certification Oversight Committee
TTCD	Temporary Traffic Control Device
TTCP	Temporary Traffic Control Plan
TCS	Traffic Control Supervisor
TCT	Traffic Control Technician
TLTWO	Two-lane, Two-way Operation
TMA	Truck Mounted Attenuator
TTC	Temporary Traffic Control

2.9 WEBSITES

AASHTO *(American Association of State Highway & Transportation Officials)* http://www.aashto.org

ANSI *(American National Standards Institute)* http://web.ansi.org/

ATSSA *(American Traffic Safety Services Association)* http://www.atssa.com

ESC *(Evergreen Safety Council)* http://www.esc.org/

FHWA *(Federal Highway Administration)* http://www.fhwa.dot.gov/

ITE *(Institute of Transportation Engineers)* http://www.ite.org

MUTCD http://mutcd.fhwa.dot.gov

NHTSA *(National Highway Traffic Safety Administration)* http://www.nhtsa.dot.gov/

OSHA *(Occupational Safety & Health Administration)* http://www.osha.gov

STATE OF IDAHO http://www.idaho.gov/

ITD *(Idaho Transportation Department)* HOME PAGE http://www.itd.idaho.gov

CHAPTER 3
Fundamental Principles of Temporary Traffic Control

3.1 SUMMARY

This chapter covers the fundamental principles that will guide participants in the completion of their responsibilities as Traffic Control Supervisors.

The primary function of Temporary Traffic Control (TTC) is to provide for the reasonably safe and effective movement of road users through or around TTC zones while reasonably protecting road users, workers, responders to traffic incidents, and equipment.

To accomplish this purpose, Temporary Traffic Control must:

- Warn motorists and pedestrians of hazards,
- Direct roadway users to the proper travel path through the area,
- Delineate the path traffic should follow, and
- Separate and protect motorists, pedestrians, bicyclists and workers.

3.2 THE FUNDAMENTALS

Because it is not possible to define every work site and condition, the fundamental principles provide a guiding philosophy for providing good Temporary Traffic Control.

1. General plans or guidelines should be developed to provide safety.
2. Road user movement should be inhibited as little as is practical.
3. Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner appropriate to the type of work being performed.
    - Flagging procedures, when used, should provide positive guidance to road users.
4. Provide acceptable levels of operations.
5. Perform routine inspections of traffic control elements.
6. Attention should be given to the maintenance of roadside safety during the life of the TTC zone.

7. 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.

8. Maintain good public relations.

The goal of Temporary Traffic Control is safety with minimum disruption to road users.

The key elements of Temporary Traffic Control are:

- Give adequate warning and guidance
- Keep the Temporary Traffic Controls simple
- Follow recognized standards

3.3 HUMAN FACTORS

Expectancy

Based on their experience with similar situations in the past, people expect certain things to appear and to operate in a certain way. A common example is the location of the on-off light switch near the entrance to a dark room. Over a period of time, these expectancies develop into a workable set of expectations, which allow people to anticipate and plan a course of action.

Examples of Temporary Traffic Control zone situations which violate driver expectancy include road and lane closures, median crossovers, conflicting pavement markings, reduced speed limits, slow moving traffic, and workers and equipment in or near the travel lanes.

Expectancies affect the perception of and reaction to information so that:

- When expectancies are met and reinforced, performance tends to be error free.

- When expectancies are violated (such as in a TTC zone), motorists need more time to respond, their performance may be poorer, and they may commit errors or even fail to respond.

To help improve driver expectancy, a rule of thumb for effective Temporary Traffic Control is:

- In *similar situations*,
- use *similar treatments*
- to get a *similar response*.

Positive guidance

Fundamental to positive guidance is providing information to the driver at a point where they have sufficient time to react.

Once a driver has perceived a hazard, they must decide on a course of action and respond accordingly. Motorists need more time to decide on the appropriate action when:

- The situation is unfamiliar,
- Several responses are possible,
- The maneuver required is complex, or
- The driver is impaired in some manner, such as fatigue, drowsiness, being on medication, or being under the influence of alcohol or illegal drugs.

For TTC zones to operate safely, the Temporary Traffic Control Plan must be designed to provide adequate decision sight distance for drivers traveling through the TTC zone.

Decision sight distance (DSD) has been defined as the distance needed for drivers to recognize a potential problem or hazard and complete a maneuver safely and efficiently by selecting an appropriate speed and/or path.

Additionally, drivers must be given clear guidance on what choice to make. When a situation is very complex, the driver may not be able to determine alternatives, causing them to temporarily freeze or act erratically. Studies of drivers approaching arrow displays operating in the double arrow mode have shown that many motorists change lanes at the last moment because of the difficulty in selecting between the two alternatives presented to them by the double arrow.

All persons responsible for Temporary Traffic Control must minimize the difficulty of driving through a TTC zone by:

- Reducing the number of features which can cause driver error.
- Ensuring that motorists are adequately warned of features that cannot be eliminated.
- Protecting drivers from hazards.

Credibility

Credibility means the message conveyed by the TTC device must be accurate and relevant to the situation.

To increase the credibility of information, adhere to the following:

- Cover or remove signs that are not applicable.
- Don't post unnecessarily restrictive speed limits.
- Limit warning messages to ones that are relevant to hazards that are present.
- Avoid or warn roadway users of unexpected situations (surprised drivers may react in unexpected ways).
- Assume roadway users are approaching the Temporary Traffic Control zone for the first time.
- Avoid use of vague messages

3.4 PEDESTRIAN SAFETY AND ACCESSIBILITY 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. Considerations for pedestrians with disabilities are addressed in Section 6D.02 of the MUTCD.

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 is practical, the most desirable characteristics of the existing sidewalk(s) or footpath(s).

3.5 WORK ZONE CRASHES

When the pavement or adjacent area is occupied for a work activity, conflict arises between the requirements of the work force and the needs and desires of the traveling public. Worksites create potential hazards because they:

- Present motorists with unexpected and sometimes confusing situations,
- Create obstructions with which motorists can collide,
- Divert motorists' attention from the driving task, and
- Expose workers to traffic.

3.6 FEEDBACK FROM ROAD USERS

It is important to recognize and act upon feedback from motorists and circumstances occurring in the roadway itself. This lets us know that the roadway user is uncomfortable with the setup of the Temporary Traffic Control zone and conditions that exist could lead to crashes. This feedback comes in many forms, including:

- Brake applications indicating traffic conflicts.
- Tire marks on the pavement and on temporary barriers.
- Frequently displaced channelizing devices.
- Letters or phone calls to the roadway agency from road users.
- Horn blowing that may be accompanied by gestures.
- Verbal abuse of workers by upset roadway users.

3.7 DEALING WITH ANGRY ROADWAY USERS

Some road users of varying ages and demographics may become angry enough to lose control and express hostility toward workers. The road user may not be angry with the workers, but with the interruption and inconvenience.

Do not add fuel to the motorists' agitation. Workers must be in control of the situation and not elevate the level of conflict. As a representative of the contractor or department, the worker must exercise restraint and work to defuse the situation. The following are some tips to help reduce the motorists' anxiety and win their support:

- Ensure TTC workers are aware of all expected delays, when they will occur, and how long they will last. You can pass this information on to roadway users and possibly prevent escalation.

- Smile and be pleasant. It is harder for roadway users to be upset with a worker who is polite and appears to be glad to see them.

- Apologize to roadway users for the inconvenience. It can have a calming effect on an angry motorist if someone cares about the reason for their frustration.

- Regardless of how irrational an irate roadway user's statements are, do not challenge them.

- Avoid extended eye contact with a hostile roadway user, but do keep them under surveillance and watch for any sudden hostile movement.

CHAPTER 4
The Temporary Traffic Control Team

4.1 SUMMARY

This chapter will familiarize the participants with the duties and responsibilities of each member of the Temporary Traffic Control management team. It will cover the selection, training, certification and job assignment of traffic control labor. It will also discuss the required clothing and equipment used by all workers engaged in traffic control.

4.2 THE TRAFFIC CONTROL SUPERVISOR

Temporary Traffic Control work is commonly a contract item. Just like all other contract items, it must be inspected for adequacy and conformance with the contract.

A TCS must be identified for construction projects and maintenance operations that will use Temporary Traffic Control. The TCS is an individual who has met minimum requirements and has completed approved TCS training and received certification.

TCS contact information must be made available to the project manager, inspectors, and other contractors. The TCS must also provide contact information for other personnel if the TTC operations carry into the night, last for more than a day, or both. In these cases, the TCS or a designee will be available to be contacted and to respond 24 hours a day during the duration of the TTC operations.

Per the ITD Standard Specifications (626.03)

- Identify a project Traffic Control Supervisor (TCS) certified by ATSSA or Evergreen Safety Council to direct the installation, modification, and maintenance of Temporary Traffic Control devices.
- Provide contact information for the TCS.
- Provide a schedule and contact information for personnel working under the direction of the TCS who can be contacted and who will respond 24 hours a day for the duration of Temporary Traffic Control operations to provide Temporary Traffic Control maintenance.

Additional TCS responsibilities include:

1. Have a current copy of the approved Temporary Traffic Control (TTC) plan, applicable contract plans and specifications, the MUTCD as adopted in Idaho, Standard Specifications, and the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features. The ITD Traffic Manual can be another helpful reference.

2. Ensure Temporary Traffic Control devices and equipment are available and in acceptable condition prior to use. (*Spec. 626.02)*

3. Oversee installation, modification, and removal of Temporary Traffic Control devices.

4. Inspect Temporary Traffic Control devices and nighttime lighting for proper location, installation, message, cleanliness, and effectiveness. Correct, or arrange to correct, deficiencies noted during these inspections.

5. Make minor revisions to the TTC plan to accommodate site conditions, provided that the original intent of the TTC plan is maintained.

6. At least once per week, ensure that Temporary Traffic Control devices function well during non-daylight hours. *(Spec. 626.03)*

7. Monitor and maintain the Temporary Traffic Control Plan and devices for the duration of the Temporary Traffic Control operations. *(Spec. 626.03B)*

8. Perform administrative tasks, such as keeping a daily diary of TTC operations, keeping a daily record of TTC maintenance, tracking contract items measured by hours or days, and keeping a record of TTC inspections carried out by the TCS.

Qualifications of a Traffic Control Supervisor

To be certified as a Traffic Control Supervisor in Idaho, you must attend an ITD approved training course and meet the following requirements:

- Have a currently approved flagger card from one of the following states: Idaho, Montana, Oregon, Utah or Washington. *(Possession of a TCS Certification **DOES NOT** qualify you as a flagger.)*

- Provide verification of 2000 hours of work zone experience in the form of 2 signed letters (or 1 letter with 2 signatures)
- Pass the TCS exam with a score of 80% or better.

Certification is valid for 4 years.

While on the job, Traffic Control Supervisors must wear class 2 or 3 high-visibility safety apparel that is in acceptable condition *(MUTCD 6D.03)*. A TCS may be required to wear a hard hat depending on the situation.

4.3 TEMPORARY TRAFFIC CONTROL LABOR

Each person whose actions affect TTC zone safety, from upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make *(MUTCD 6B.01)*.

When the work zone requires a flagger to direct traffic, ITD requires that you use a certified flagger. Certified flaggers have completed a flagger training course from an ITD approved source and carry a current certificate of training. Certifications issued by other state Departments of Transportation that have a reciprocity agreement with the Department are acceptable. *(Spec. 626.03N)* These include Washington, Utah, Oregon, and Montana.

According to the MUTCD, flaggers should be able to:

- Receive and communicate specific instructions clearly, firmly, and courteously;
- Move and maneuver quickly in order to avoid danger from errant vehicles;
- 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;
- Understand and apply safe traffic control practices, sometimes in stressful or emergency situations; and
- Recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

4.4 WORKER SAFETY

The safety of road users traveling through the TTC zone is just as important as the safety of workers. TTC zones present temporary and constantly changing conditions that are not expected by the road user. This creates an even higher degree of vulnerability for workers on or near the roadway.

It is particularly important to maintain TTC zones where road user flow is inhibited as little as possible, and to use TTC devices that get the road user's attention and provide positive direction. Likewise, equipment and vehicles moving within the activity area pose a risk to workers on foot. When possible, the separation of moving equipment and construction vehicles from workers on foot provides the operator of these vehicles with a greater separation clearance and improved sight lines to minimize exposure to the hazards of moving vehicles and equipment.

The following are the key elements of TTC management that can help improve worker safety:

Worker 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. (MUTCD 6D.03)

Provide a TCS — Provide a project Traffic Control Supervisor, certified by the American Traffic Safety Services Association, Evergreen Safety Council or an approved equal, to direct the required installation, modification, and maintenance of traffic control devices.

Vehicle lights — Ensure vehicles used to perform traffic control activities (e.g., traffic control device installation, removal, maintenance, or monitoring) are equipped with a working high-intensity rotating, flashing, oscillating, or strobe light meeting the Manual on Uniform Traffic Control Devices (MUTCD) requirements.

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

Safety apparel is defined as fluorescent yellow-green/orange, shirt, vest, coat, or coverall meeting ANSI Class 3 requirements for visibility, and refers to the outermost layer excluding the hard hat.

For daytime and nighttime activity, flaggers shall wear apparel meeting the requirements of ISEA “American National Standard for High-Visibility Apparel” and

labeled as meeting the ANSI 107-2004 standard performance for class 2 risk exposure.

If workers will be operating during nighttime hours or low-visibility conditions, they should consider wearing apparel that meets Class 3 specifications.

(MUTCD 6E.02 High-Visibility Safety Apparel)

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 competent person designated by the employer should conduct a basic hazard assessment for the work site 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.'"

4.5 MANAGING THE TRAFFIC CONTROL TEAM

As a Traffic Control Supervisor, it is your job to help organize, motivate, support, and communicate effectively with everyone on the work site. You'll also need problem-solving skills for difficult situations. This section covers a few strategies that are helpful to consider as you manage your team.

Organization

Most roadway projects are complex and, as we have discussed above, they involve many hazards for both workers and the public. It is essential that you stay organized so that you can stay on top of the work being done as well as any issues that arise along the way.

Here are a few things to keep in mind about organization:

- Establish a reliable way to keep track of schedules – both your own and any others that pertain to your project.
- Create recordkeeping and file management practices that help you keep important information in a central, easily accessible place.
- Make sure you are always planning ahead, and taking steps to avoid any potential issues.
- Establish clear priorities for yourself and your team. The first priority should always be safety. Keep in mind that priorities can (and should) shift significantly over time, depending on how work is going.
- Delegate tasks. As the supervisor, you can't do it all, even if you want to. Even if it initially takes more time to show someone else how to do something, in the end, you must allow others to do a share of the work so that you can stay on top of keeping the team organized, on schedule, and safe.
- Work side by side with your team. Even as you delegate, there will always be opportunities for you to jump in and assist your team on certain tasks. Make sure that you stay involved in their day-to-day activities and be willing to help out when needed.

Communicating with your team

Great leadership is all about clear, effective communication. Here are a few tips.

Before you communicate with your team:

- Get to know your team and their skill levels so that you can tailor your instructions to them. Some team members may be more experienced than others. Newer team members may need more background information in order to do their job properly.
- Think ahead about the instructions or information you want to communicate. What are the main points you need to get across in order for work to proceed safely and efficiently?

As you communicate with your team:

- Be clear about what each member of the team should be doing, and give them precise instructions if needed. In some cases, it may be good to give employees a hands-on demonstration of what you are talking about.
- Give your team reasons to follow your lead. Provide them with clear rationale for why they need to do the job a certain way, and show them how it will benefit them and the rest of the team when they do as you ask.

After you communicate with your team:

- Check that your instructions have been understood, and give them time to ask clarifying questions.
- Be willing to adjust your communication if you see that your instructions are not being followed or understood.
- Listen to your team's feedback and input on how to move forward. They will often have essential information about how work is proceeding or problems that are coming up.

It is also important that you take accountability for your mistakes or miscommunication. By demonstrating that it is okay to make mistakes as long as you own up to them and correct them, you will create a better and safer team environment.

Motivating your team

People respond best to positive reinforcement. Be sure to tell team members when they are doing a good job. If they need to improve or change something, if possible, take them aside and show them what they need to do differently.

Long-term career advancement is also a great motivator. Talking to your team about opportunities in your field, and showing them the path to get there, is a great way to build trust and goodwill.

Employees like to be involved in decisions that affect them. Involving your team on certain decisions, such as how to solve a problem that comes up, will help them work more smoothly. You don't have to do everything they suggest, but making them feel heard is a great way to earn their trust and dedication.

It is also recommended that you check in with each employee individually on a regular basis. This can help you avoid difficult situations that can arise because of conflicts on the team, or personal problems that the employee is facing.

Problem-solving skills for difficult situations

Part of the supervisor's job is dealing with difficult situations, such as conflicts between employees, misbehavior, absenteeism, or other issues.

It is highly recommended that you (or your employer) plan ahead for these situations and establish a set of clear expectations that you communicate to your employees. Potential topics include:

- Processes for mediating between employees when conflict arises.
- Expectations for behavior on the job, including policies on attendance and tardiness, clothing and equipment, use of substances such as alcohol and drugs, and discrimination and harassment.
- Clear consequences for violation of these policies, including performance improvement plans, probation, and termination.

Hiring practices

Some supervisors may be responsible for hiring new employees. In the event that this becomes your responsibility, there are several points of law that a supervisor must be aware of. Discrimination on the basis of race, color, religion, national origin, sex, disability or age is illegal. (This pertains to both hiring and termination.)

Termination practices

You (or your company) should have clear-cut guidelines for determining the severity of the infraction and if termination is a justified action to take. Inform employees, in writing, of the rules when they are hired. Document all infractions, conversations, and decisions.

Sexual Harassment

It is illegal in the State of Idaho to harass someone on the basis of their sex. Sexual harassment may include:

- Sexual jokes, comments and innuendoes
- Unwelcome invitations to sexual activity
- Unwelcome touches, pinches and hugs
- Pressure to engage in sexual activity as a condition of employment or promotion
- Sexual assault

Remember what one person views as being harassment may not be viewed as such by another, but this does not mean that the behavior is NOT considered harassment. The employee may still make a sexual harassment claim on the basis of their experience.

As the designated supervisor responsible for your project, it is your responsibility to recognize and help prevent harassment at your work site.

Here are a few recommendations:

- Talk to your employees about sexual harassment, and remind them of the applicable policies.
- Distribute and post a written policy that sexual harassment will not be tolerated.
- Establish procedures for registering, investigating, and dealing with sexual harassment complaints as part of company procedure.

The above recommendations are for your information only. Always check with your Human Resources department or an HR expert to make sure your policies are in line with federal, state, and local rules.

CHAPTER 5
Temporary Traffic Control Devices

5.1 SUMMARY

This chapter covers the specification, selection and proper application of Temporary Traffic Control devices.

5.2 PURPOSE OF TEMPORARY TRAFFIC CONTROL DEVICES

The purpose of Temporary Traffic Control devices, as well as the principles for their use, is to promote safety and efficiency by providing for the orderly movement of roadway users *(MUTCD 1A.01).* TTC devices are often the only means to communicate with the road user.

A Temporary Traffic Control device is a sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, private road open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction, or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction. *(MUTCD 1A.13 & 6F.01)*

Other traffic control devices that are not TTC devices, but that are useful in Temporary Traffic Control zones, include floodlights, temporary traffic barriers, crash cushions, and temporary rumble strips.

Other TTC functions involve personnel, such as flagging or pilot car operations.

5.3 PRINCIPLES OF TEMPORARY TRAFFIC CONTROL DEVICES

To be effective, all traffic control devices, including TTC devices, should meet the following five basic requirements *(MUTCD 1A.02)*:

- Fulfill a need
- Command attention
- Convey a clear, simple meaning
- Command respect from road users
- Give adequate time for proper response

5.4 CONFORMANCE TO ESTABLISHED STANDARDS

Establish traffic control devices in accordance with the MUTCD adopted by the Idaho Transportation Board. Obtain the engineer's approval before placing or removing traffic control devices. *(Spec. 107.06).*

5.5 CRASHWORTHINESS OF TTC DEVICES AND APPURTENANCES

TTC devices and appurtenances must be crashworthy as determined through the National Cooperative Highway Research Project (NCHRP) Report 350 or the Manual for Assessing Safety Hardware (MASH). In general, use MASH-tested devices when they are available. Devices manufactured after December 31, 2019, must have been successfully tested according to the 2016 edition of MASH.

However, NCHRP Report 350 or MASH 2009 Edition-tested devices manufactured on or before December 31, 2019 may continue to be used throughout their normal service lives.

TTC devices, appurtenances, and work vehicles that are not crashworthy become obstacles for roadway users. Where crashworthy devices are not available, take action to reduce the severity of an errant vehicle hitting an obstacle within the highway clear zone. The highway clear zone is usually the area within 30 feet from the path used by vehicular highway users.

Options for addressing roadside obstacles include:

1. Removing the obstacle
2. Relocating the obstacle to a point where it is less likely to be struck
3. Shielding the obstacle with a longitudinal traffic barrier designed for redirection, or using a crash cushion
4. Delineating the obstacle, if the previous alternatives are not appropriate

Additional information about clear zones and addressing roadside obstacles can be found in the *AASHTO Roadside Design Guide*.

5.6 CONDITION OF TEMPORARY TRAFFIC CONTROL DEVICES

ITD specifications require Temporary Traffic Control devices to be in acceptable condition as defined in the American Traffic Safety Service Association's (ATSSA) *Quality Guidelines for Temporary Traffic Control Devices and Features*. *(Spec. 626.02)*

Repair or replace devices that are marginal or unacceptable as defined in the ATSSA guidelines. Ensure Temporary Traffic Control devices remain in place and serviceable during the time their use is required. *(Spec. 626.03)*

5.7 SIGNS

Signs used for TTC include regulatory, warning, and guide signs. Words, symbols, and arrows are used to convey the messages. Use standard signs and sign legends that are shown in the MUTCD and ITD Traffic Manual. Remove or cover existing signs with conflicting messages.

As a general rule, signs should be placed on the right-hand side of the roadway, and may be placed on both sides where special emphasis is needed

Regulatory signs are used in TTC zones to inform roadway users of selected traffic laws or regulations and indicate the applicability of legal requirements. Therefore, proper authority is needed before establishing or changing regulatory signs. Regulatory signs can only be placed under the authority of the public agency that has responsibility for the roadway and under the direction of a professionally licensed engineer. Regulatory signs are usually rectangular with white or red backgrounds.

Speed feedback signs are warning signs that display the speed of an approaching vehicle back to the vehicle operator to provide warning to drivers of their speed in relation to a speed limit or horizontal warning advisory speed. Use speed feedback signs with regulatory speed limit signs.

Warning signs call attention to unexpected conditions on a roadway. These signs are particularly effective when a potential hazard is not obvious or cannot be seen by the driver. According to the ITD Traffic Manual, warning signs are typically 48 x 48 inches except when available space does not allow for them.

Place warning signs far enough in advance of the condition to give roadway users adequate time to understand the warning message and to take action. The MUTCD contains recommendations for TTC warning sign spacing.

Warning signs are usually diamond shaped with yellow backgrounds for permanent signs and orange backgrounds for TTC signs.

Guide signs give roadway users information to help them along their way. These signs show highway numbers, destinations, distances, directions, services, and other geographical or cultural information.

Guide signs used in TTC zones include:

- Standard route markings, where temporary route changes are necessary.
- Directional signs and street name signs.
- Special guide signs relating to the condition or work being done.

Guide signs are usually rectangular with green background or are route signs, often shaped as a shield.

Portable Changeable Message Signs (PCMSs) are TTC devices with the flexibility to display a variety of messages. PCMSs can be used to supplement regulatory, warning, or guide signs and pavement markings.

When used each message should convey a single message. They should be placed on the shoulder of the roadway, delineated with temporary TTC devices, removed when not in use and be able to be read twice at the posted speed.

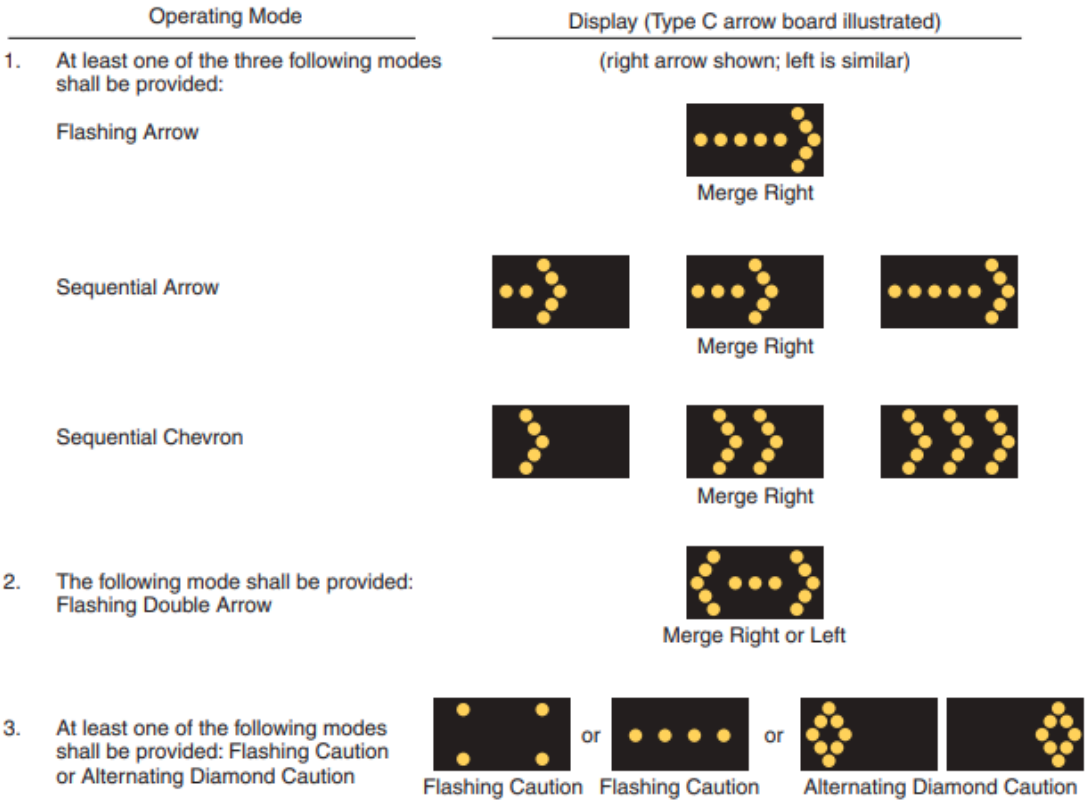
Messages on a portable changeable message sign should consist of no more than two phases, and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read.

Arrow boards are rectangular signs with a matrix of elements capable of flashing or sequential displays used to provide additional warning and directional information to assist in merging and controlling roadway users through or around TTC zones.

Arrow boards in ***arrow or chevron modes*** advise approaching traffic of a ***lane closure on a multi-lane roadway***.

Arrow boards in ***flashing caution or alternating diamond caution modes*** warn of work near a ***shoulder*** or temporary closure of one lane on a two-lane, two-way roadway.

Figure 6F-6. Advance Warning Arrow Board Display Specifications

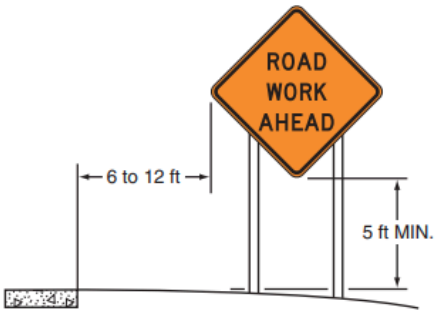


5.8 SIGN PLACEMENT

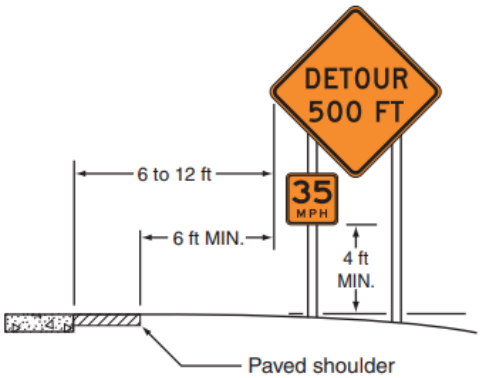
The MUTCD and ITD Standard Specifications contain guidance for sign locations and methods to mount signs.

Signs should be located where they can easily be seen by road users and spaced to allow them with enough time to read and respond. When mounted on barricades or other portable supports, they shall not be less than 1 foot above the traveled way.

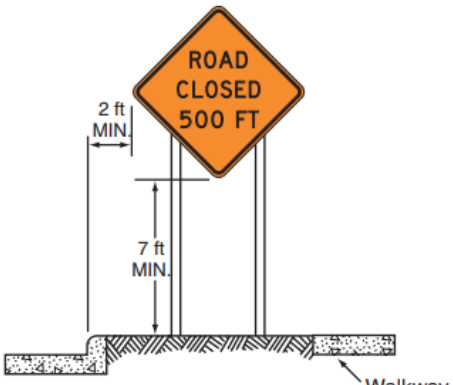
Figure 6F-1. Height and Lateral Location of Signs—Typical Installations



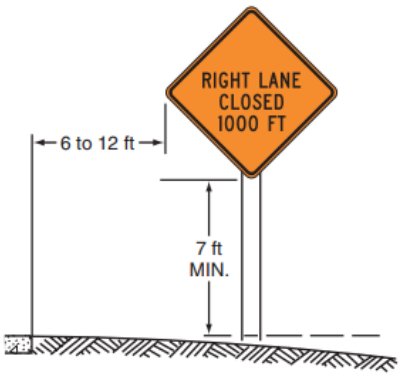
A - RURAL AREA



B - RURAL AREA WITH ADVISORY SPEED PLAQUE

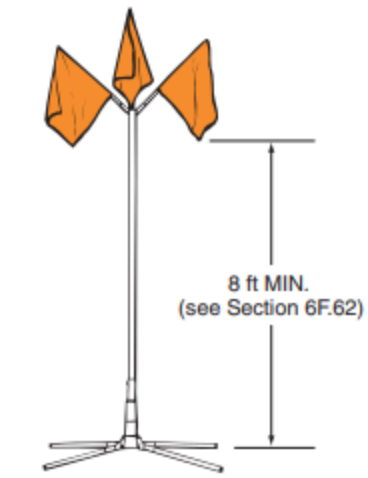


C - BUSINESS, COMMERCIAL, OR RESIDENTIAL AREA

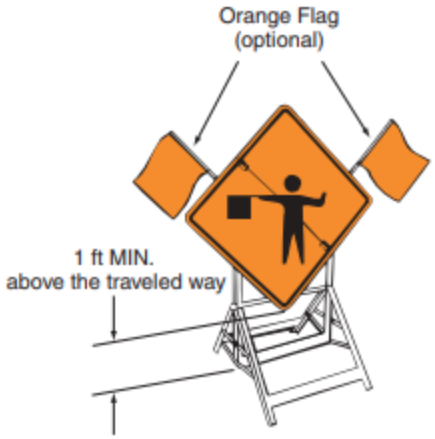


D - BUSINESS, COMMERCIAL, OR RESIDENTIAL AREA (WITHOUT CURB)

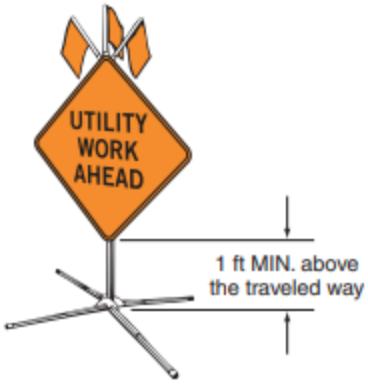
Figure 6F-2. Methods of Mounting Signs Other Than on Posts

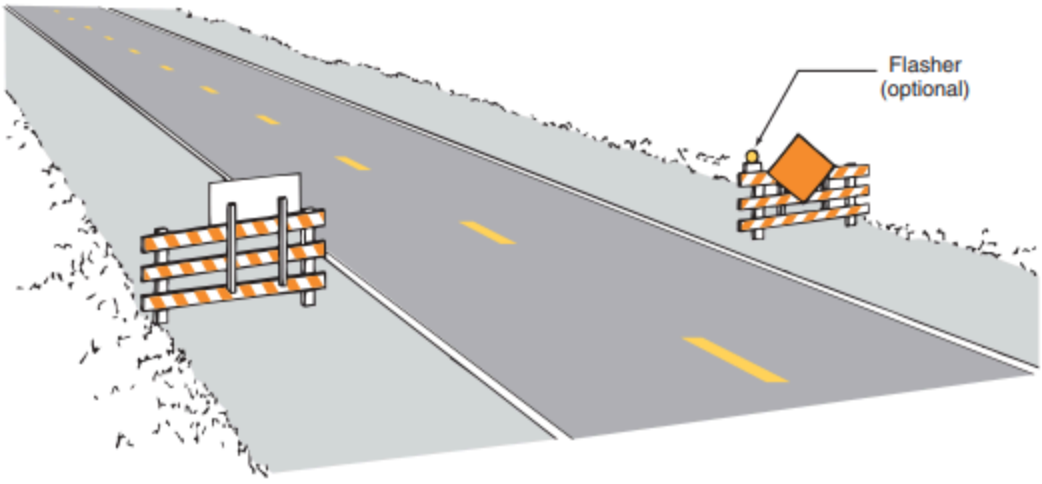


High-Level Warning Device
(Flag Tree)



PORTABLE AND TEMPORARY MOUNTINGS





BARRICADES

5.9 SIGN STORAGE

Store signs to prevent damage. The following are some sign storage recommendations:

Indoor storage (preferred method):

- Store signs on edge.
- If signs become wet, unpack and separate signs to dry.

Outdoor storage:

- Remove packaging materials so nothing is against the sign face.
- Store signs upright on edge on blocks or on 2x4s to keep the signs off the ground.
- Do not lay signs flat. (Water accumulating between signs lying flat can damage the retroreflective sheeting)
- Provide space between signs to allow air circulation and normal moisture evaporation from the face of each sign.
- Avoid sign face contact with treated posts.
- Avoid storing signs where dirt and water may be splashed on the sign face.

5.10 CHANNELIZING DEVICES

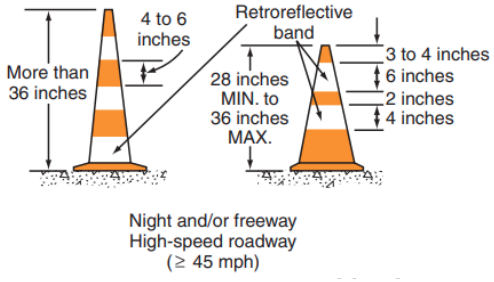
Channelizing devices guide roadway users through the TTC zone and warn users of conditions created by work activities. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices. Descriptions on the design of channelizing devices can be found in the MUTCD.

Channelizing devices placed on or adjacent to the roadway can be used to:

- move traffic from one lane to another
- reduce the width of the traveled way
- delineate and guide roadway users through the TTC zone
- separate traffic from the workspace, pavement drop-offs, pedestrian paths, or opposing directions of traffic
- mark or provide warning of hazards

Cones used as TTC devices have the following design characteristics:

- Constructed of crashworthy orange material,
- 18 inch minimum height for daytime and low-speed roadway operations,
- 28 to 36 inch height for freeways and other high-speed highways, at night, and when more conspicuous guidance is needed, and

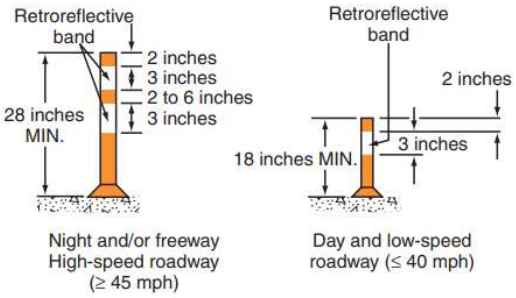


Night and/or freeway
High-speed roadway
(≥ 45 mph)

- Retroreflective or equipped with lighting devices when used at night.

Tubular markers used as TTC devices have the following design characteristics:

- Constructed of crashworthy orange material
- 18 inch minimum height with 2 inch width facing roadway users for daytime and low-speed roadway operations
- 28 inch minimum height for freeways and other high-speed highways, at night, and when more conspicuous guidance is needed
- Retroreflective or equipped with lighting devices when used at night



TUBULAR MARKERS

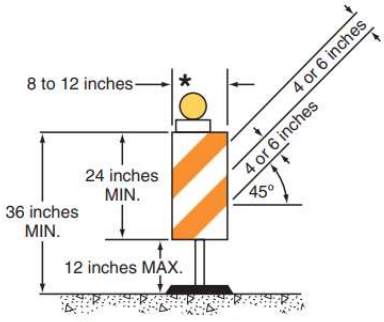
Tubular markers are often used when space limitations do not allow the use of larger channelizing devices, such as to divide opposing lanes of highway users, to divide vehicular traffic lanes moving in the same direction, and to delineate the edge of a pavement drop off.

Per ITD Spec 626.02:

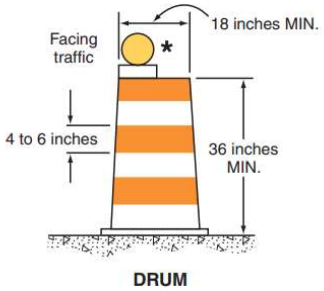
- Provide weighted base or surface-mounted tubular markers that are at least 36 inches high and have at least 3 inches width when facing traffic.
- Attach surface-mounted tubular markers with an adhesive in accordance with the manufacturer's written installation instructions.
- Do not nail or bolt tubular markers to the pavement.

Vertical panels used as TTC devices have the following design characteristics:

- Constructed of crashworthy material,
- 8 to 12 inches in width and at least 24 inches in height, and
- Diagonal orange and white retroreflective stripes sloping downward in the direction vehicular traffic is to pass.



VERTICAL PANEL

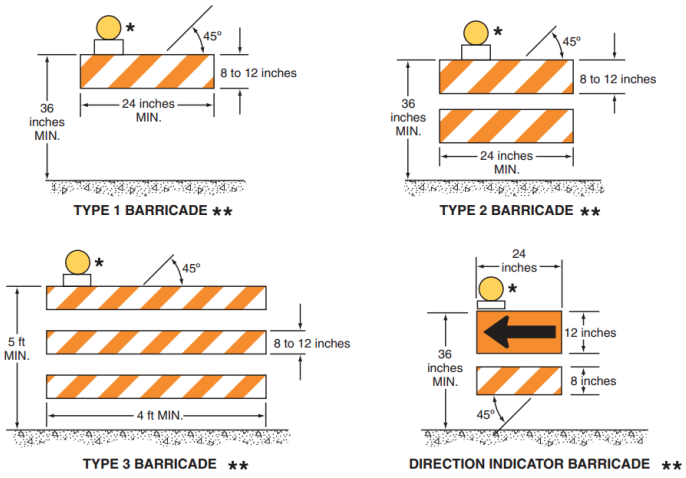


DRUM

- Made of lightweight, deformable, and crashworthy material,
- 36 inch minimum height,
- 18 inch minimum width,
- Alternating orange and white retroreflective stripes, and
- Closed top that will not allow collection of debris.

Drums are often used in taper channelization because they offer a larger retroreflective surface than some other channelizing devices.

Drums are typically used in the transition area of TTC zones (See MUTCD Figure 6C-1) and may be used in tangent sections. *(Traffic Manual 6F.67)*



Barricades are portable or fixed devices having one to three rails with appropriate markings and are used to control road users by closing, restricting, or delineating all or a portion of the right-of-way. Barricades used as TTC devices have the following design characteristics:

- Constructed of crashworthy material,
- Alternating diagonal orange and white retroreflective stripes sloping downward in the direction vehicular traffic is to pass,
- **Type 1** barricades have one rail that is a minimum of 24 inches long,
- **Type 2** barricades have two rails that are a minimum of 24 inches long,
- **Type 3** barricades have three rails that are a minimum of 36 inches long,
- On freeways, expressways, and high-speed roadways, a minimum 270 square inches of retroreflective area facing users.

Note: Traffic Manual Section 6F.68 Type 1, 2, or 3 Barricades - ITD specifies a wider Type 3 barricade that is 7 feet (or 84 inches) in length in the "Standard Specifications for Highway Construction."

5.10 TEMPORARY TRAFFIC BARRIERS

Temporary traffic barriers are not TTC devices, but serve as TTC devices when placed in a line where channelizing devices are normally used and when equipped with channelization features, such as retroreflective elements.

Temporary traffic barriers include portable concrete barriers, ballast filled barriers, steel barriers, portable barriers, and moveable concrete barriers.

Temporary traffic barriers can be used to provide positive protection when placed between the work space and the traffic space.

5.11 VEHICLES

Work vehicles contain the materials, workers, and equipment used to perform work in the TTC zone.

Shadow vehicles equipped with appropriate lights, Truck-Mounted Attenuator and, when appropriate, warning signs can help protect workers from impacts by errant vehicles.

Pilot cars are used to guide a queue of vehicles through the TTC zone or detour. Coordinate pilot car operations with flagging control.

5.12 CRASH CUSHIONS

Crash cushions mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. Crash cushions in TTC zones help protect motorists from the exposed ends of barriers, fixed objects, shadow vehicles, and other obstacles.

Two types of crash cushions used in TTC zones are stationary crash cushions and Truck-Mounted Attenuators (TMAs).

Shadow vehicles with TMAs can be used to provide positive protection when placed between the work space and the traffic space.

5.13 PAVEMENT MARKINGS

Pavement markings define a path for travel through TTC zones day and night, under wet and dry pavement conditions. TTC zones may have pavement markings from pre-TTC activities as well as temporary pavement markings used during TTC activities.

Remove conflicting pavement markings and replace them with temporary pavement markings in long-term stationary TTC zones (TTC zones that occupy a location more than 3 days).

Temporary pavement marking materials include paint, thermoplastic, pavement marking tape, or raised pavement markers.

5.14 PEDESTRIAN FACILITIES

Pedestrians should be separated from the worksite by appropriate devices that maintain accessibility and detectability for pedestrians with disabilities.

Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

(Supplemental Specs. 626.02K)

1. **Pedestrian channelizing devices.** Provide pedestrian channelizing devices that are crashworthy, detectable to long cane users, visible to pedestrians with vision disabilities, and have continuous bottom and top surfaces. Provide a smooth and continuous hand-trailing edge between 32 and 38 inches above the walkway. Provide a continuous detection plate between 2 and 8 inches above the walkway. Ensure the hand-trailing edge and detection plate are in the same vertical plane.

   On the pedestrian side of pedestrian channelizing devices or when not exposed to traffic, provide retroreflective or non-retroreflective sheeting in a contrasting pattern of alternating light and dark colors on the hand-trailing edge, positioned vertically or at a 45 degree angle, and consisting of a minimum of 6 inches of sheeting or other contrasting materials. When exposed to vehicular traffic, provide retroreflective sheeting on the hand-trailing edge and bottom detection plate.

2. **Temporary curb ramps**. Provide temporary curb ramps meeting ADA requirements.

5.15 AUTOMATED FLAGGER ASSISTANCE DEVICES *(MUTCD 6E.04)*

Automated Flagger Assistance Devices (AFADs) enable flaggers to be positioned out of the lane of traffic. 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. *(MUTCD 6E.04)*

- AFADs shall only be used in situations where there is only one lane of approaching traffic in the direction to be controlled.
- When used at night, the AFAD location shall be illuminated.
- Because AFADs are not traffic control signals, they shall not be used as a substitute for or a replacement for a continuously operating Temporary Traffic Control signal.
- AFADs shall meet the crashworthy performance criteria.
- When an AFAD is used, the advance warning signs should include a ROAD WORK AHEAD sign, a ONE LANE ROAD sign, and a BE PREPARED TO STOP sign.

(Traffic Manual Section 6E.04 - Automated Flagger Assistance Devices)

ITD's policy governing AFAD application is that AFADs can be used if an engineering study estimates that an AFAD use will improve Temporary Traffic Control zone safety or reduce project cost without detrimentally affecting Temporary Traffic Control zone safety. Consider the following in the engineering study:

A. Conditions applicable for the use of Method 1 and Method 2 AFAD operation
B. Highway volume
C. Maximum distance between AFADs
D. Conflicting lenses/indications monitoring
E. Fail safe procedures
F. Need for additional signing and pavement markings
G. Application consistency
H. Use of larger signs or lenses to increase visibility
I. Use of backplates

5.16 LIGHTING

Lighting devices in TTC zones include floodlights and warning lights.

Floodlights

- Use floodlights to illuminate flagger stations, the work area, equipment crossings, and other areas during nighttime work.

- Place floodlights to avoid glare for approaching highway users, flaggers, or workers.

- Provide floodlights capable of illuminating with at least 5 foot-candles or greater. Ensure floodlights are equipped with a meter that records hours of operation.
- Provide lighting 30 minutes before sunset and until 30 minutes after sunrise when workers or operational equipment are present.
- When floodlights are used, provide an extra floodlight onsite for backup.
- When a flagger station or work area is moved, use the backup floodlight to illuminate the new station.

(Spec. 626.02D and K)

Warning lights

Warning lights are portable, powered, yellow, lens-directed, enclosed lights. Warning lights can be installed on signs or channelizing devices to increase conspicuity. If warning lights are used the maximum spacing they use should be the same as channelizing devices.

Here are the four types of warning lights and their uses:

Type A - low-intensity flashing warning lights, used at night on channelizing devices.

Type B - high-intensity flashing warning lights, used 24 hours per day on advance warning signs.

Type C – steady-burn warning lights, used at night to delineate the edge of the traveled way.

Type D – 360-degree steady-burn warning lights, used at night to delineate the edge of the traveled way.

5.17 RUMBLE STRIPS

Rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that alert drivers to unusual roadway conditions. Through noise and vibration, they attract the driver's attention to such features as unexpected changes in alignment and to conditions requiring a stop.

Intervals between rumble strips may be reduced as the distance to the approached conditions is diminished, in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any rumble strip installation.

Rumble strips should be placed transverse to traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.

In urban areas, even though closer spacing might be warranted, care should be taken not to promote panic braking or erratic steering maneuvers by drivers.

Rumble strips should not be placed on sharp horizontal or vertical curves.

Per ITD, provide temporary portable rumble strips that are black, orange, or white, require no adhesives or anchors for installation, weigh at least 100 pounds, have a profile no greater than ¾ inch tall, are at least 10 inches wide, and that can be used on highways with speeds up to 80 mph. *(Supplemental Spec. 626.05M).*

5.18 SCREENS *(MUTCD 6F.88)*

Screens are used to block the road users' view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.

Screens should not be mounted where they could adversely restrict motorist visibility and sight distance and adversely affect the safe operation of vehicles.

Screens may be mounted on top of temporary traffic barriers that separate two-way motor vehicle traffic.

Design of screens should be in accordance with Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11)

5.19 TRAFFIC CONTROL SIGNALS *(MUTCD 6F.84)*

Temporary Traffic Control signals are typically used in work zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges; reversible lanes; and intersections.

Temporary Traffic Control signals (section 4D.20) used to control road user movements through Temporary Traffic Control zones and in other Temporary Traffic Control situations shall meet the applicable provisions of Parts 4 and 6 of the MUTCD.

Per ITD, obtain timing plan approval prior to Temporary Traffic Control signal operations.

Secure the Temporary Traffic Control signal control systems with a lock and change the default control system password to prevent tampering. *(Supplemental Spec. 626.02I)*

CHAPTER 6
Elements of Temporary Traffic Control Plans

6.1 SUMMARY

This chapter describes the four component parts of Temporary Traffic Control zones and discusses the use of various traffic control devices (including TTC devices) to produce a complete traffic control system. The selection of Temporary Traffic Control devices and the required spacing of devices for each of the component parts will be addressed.

6.2 THE TEMPORARY TRAFFIC CONTROL ZONE

A Temporary Traffic Control zone, also referred to as a work zone, extends from the first warning sign motorists encounter through the last traffic control device, where traffic returns to its normal path and conditions. Most work zones can be divided into the following four areas:

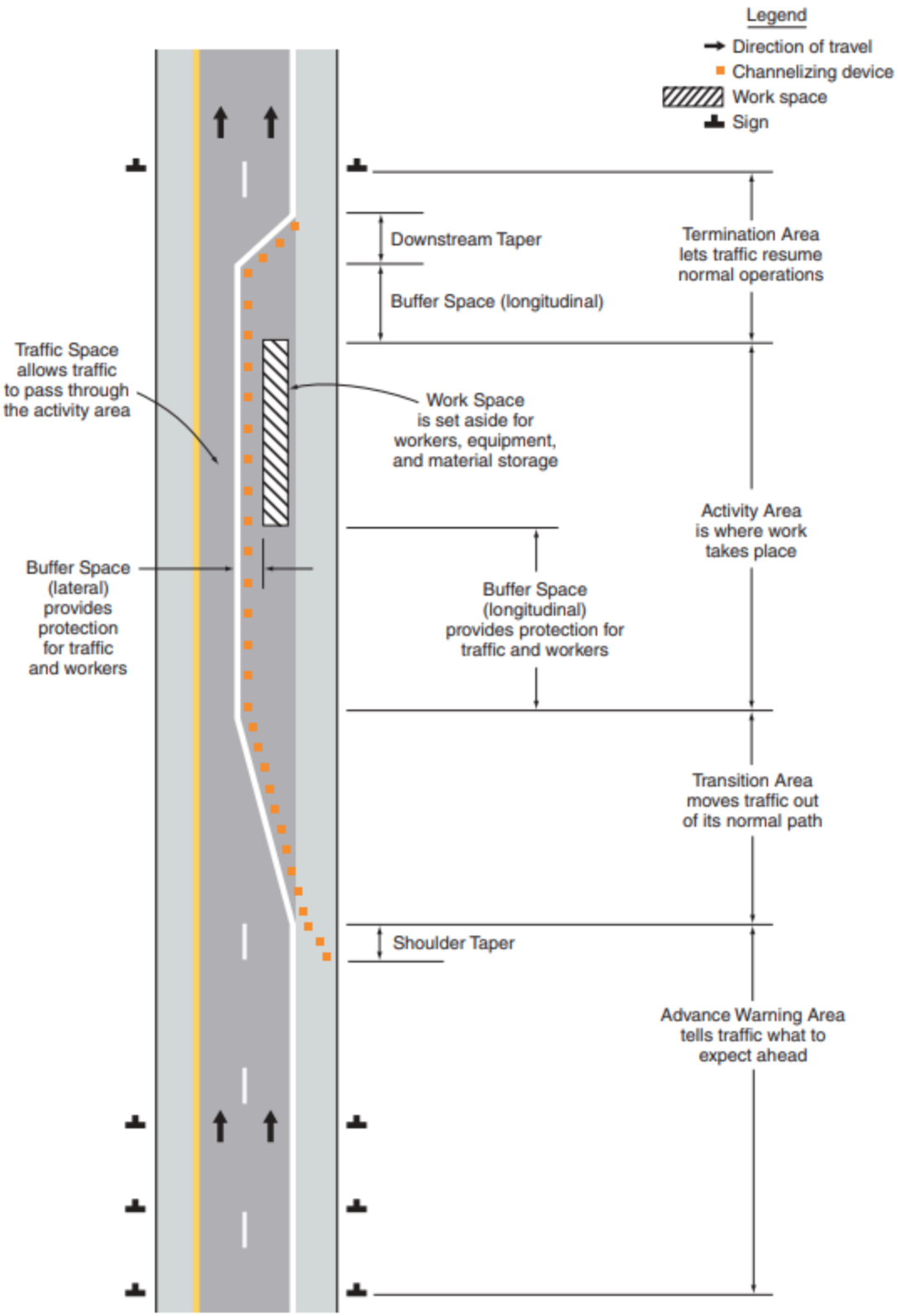
- Advance warning area
- Transition area
- Activity area
- Termination area

The **activity area** can be further divided into sub-areas which are called:

- Work space
- Traffic space
- Buffer space
- Longitudinal buffer space
- Lateral buffer space

MUTCD Figure 6C-1 illustrates these areas and subareas for a typical unidirectional Temporary Traffic Control zone. It should be noted that these four work areas will exist in almost all work zone situations, whether they be stationary, long or short term, related to utility operations, emergency situations, incident management conditions, or mobile operations. The specific field treatment and selection of TTC devices will depend on the character of the operation involved.

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



6.3 ADVANCE WARNING AREA

An advance warning area is necessary for all work zones because it alerts motorists to an unexpected situation and informs them of what to expect. The contents of the advance warning area can vary from a single sign or flashing lights on a vehicle to a series of signs giving specific information about the nature of the work ahead and instructions for motorist action. Drivers must have enough time to read and comprehend the messages contained on advance warning signs, and to react to these messages. Warning signs are the most common type of TTC devices used in the advance warning area.

Warning sign series

Diamond shaped warning signs are used to inform motorists about the potential hazards they are approaching, provide information about conditions ahead, and detail actions which must be taken to safely travel through the Temporary Traffic Control zone. On highways in open country and where travel speeds are moderate to high, a minimum of three advance warning signs are typically employed. The purposes of these signs are:

> The **first sign** in the series, as encountered by the driver, attracts motorists' attention and warns of the roadway work site ahead. The sign may specify the distance to the work area or may contain the message "AHEAD."
>
> The **second sign** provides more detailed information about the situation ahead and advises drivers of changes in the travel path, if any. For example, it may tell motorists if a road is closed, if traffic is detoured, if the number of lanes is reduced or if their widths are narrowed, etc. Specific information about distance to the condition may be indicated on the sign.
>
> The **third sign** in the series advises motorists of the specific action to be taken.

The most common message displayed on the first advance warning sign in construction and maintenance areas is ROAD WORK AHEAD (or ROAD WORK XXX FEET), but other legends are acceptable as illustrated in Part 6 of the MUTCD.

Typical sign series

A typical lane closure on a two-lane, two-way rural highway with high operating speeds would consist of an advance warning sign series of four signs containing the messages:

- ROAD WORK AHEAD
- ONE LANE ROAD AHEAD
- BE PREPARED TO STOP (optional for long queues)

- FLAGGER AHEAD (or the flagger symbol)

On a multi-lane facility, where the work operation requires closure of the right traffic lane in one direction and there is no flagger present, the warning sign sequence may consist of three signs.

- ROAD WORK AHEAD
- RIGHT LANE CLOSED AHEAD
- LANE ENDS

In each of these situations, the information given to motorists becomes more specific as to the nature of the work and the needed motorist action as he/she proceeds through the advance warning area.

Suggested sign spacing

Signs must be spaced far enough apart so that the driver can read the sign, understand the message, and take the appropriate action before being presented with the next sign or traffic control device. Therefore, drivers should have from 3 to 10 seconds to respond to the message, and may need even more time if they also have to interact with other vehicles in heavy traffic.

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.)

Note: ITD Traffic Manual Section 6C.04
For MUTCD Table 6C-1, use the following speeds for low and high speed urban road types, unless otherwise determined by engineering judgment:

- *Urban (low speed): 35 MPH or lower*
- *Urban (high speed): 40 MPH or greater*

Special considerations for advance warning areas

Adjustments in locating the advance warning area for a given Temporary Traffic Control zone may be necessary if special problems are encountered. Situations which may call for such adjustments include:

Urban locations - The spacing between signs may have to be adjusted due to the length of city blocks. Intersections, alleys, shopping center access points, and side streets also may require additional signs and modified sign spacing.

On-street parking - The mounting height of signs may have to be increased so that they are visible over parked vehicles.

Commercial establishments - Sign locations may have to be adjusted to avoid their being obstructed by existing commercial signs, interfere with loading zones, or be blocked by delivery vehicles.

Rural open highways - Warning distances may have to be increased to accommodate higher speeds or larger signs may be needed to increase their conspicuity.

Divided highways and one-way streets with two or more lanes - Consideration should be given to installing signs on both sides of the roadway to assure that the messages are visible to all approaching traffic and to minimize the possibility of blocking the view of signs by vans and trucks. Existing overhead sign structures may be suitable for mounting advance warning signs and to indicate temporary ramp closures.

Existing signs - Work zone signs should be located such that they do not interfere with existing permanent signs which must remain in effect, and vice versa. Those existing signs which are not applicable during the road work activity should be covered or removed. Whenever existing signs are retained during work activities, the spacing between these signs and the Temporary Traffic Control signs must be adjusted so as not to overload the driver's ability to comprehend and respond to all signs in the system.

6.4 TRANSITION AREA

According to the MUTCD section 6C.05, 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.

When redirection of the road users' normal path is required, they shall be channelized from the normal path to a new path.

Roadway tapers

Roadway tapers are an important element of Temporary Traffic Control and are used to move traffic laterally from one path to another. They may be used in the transition and termination areas and are created with a series of channelizing devices and/or pavement markings.

Lengths of tapers may be adjusted whenever they are used near interchange ramps, crossroads, curves, and other influencing factors. Longer tapers may be warranted if merging problems are observed in the transition areas. In urban situations it may be necessary to lengthen tapers at driveways, cross streets, and similar conditions.

Longer tapers are not necessarily better than shorter tapers because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily.

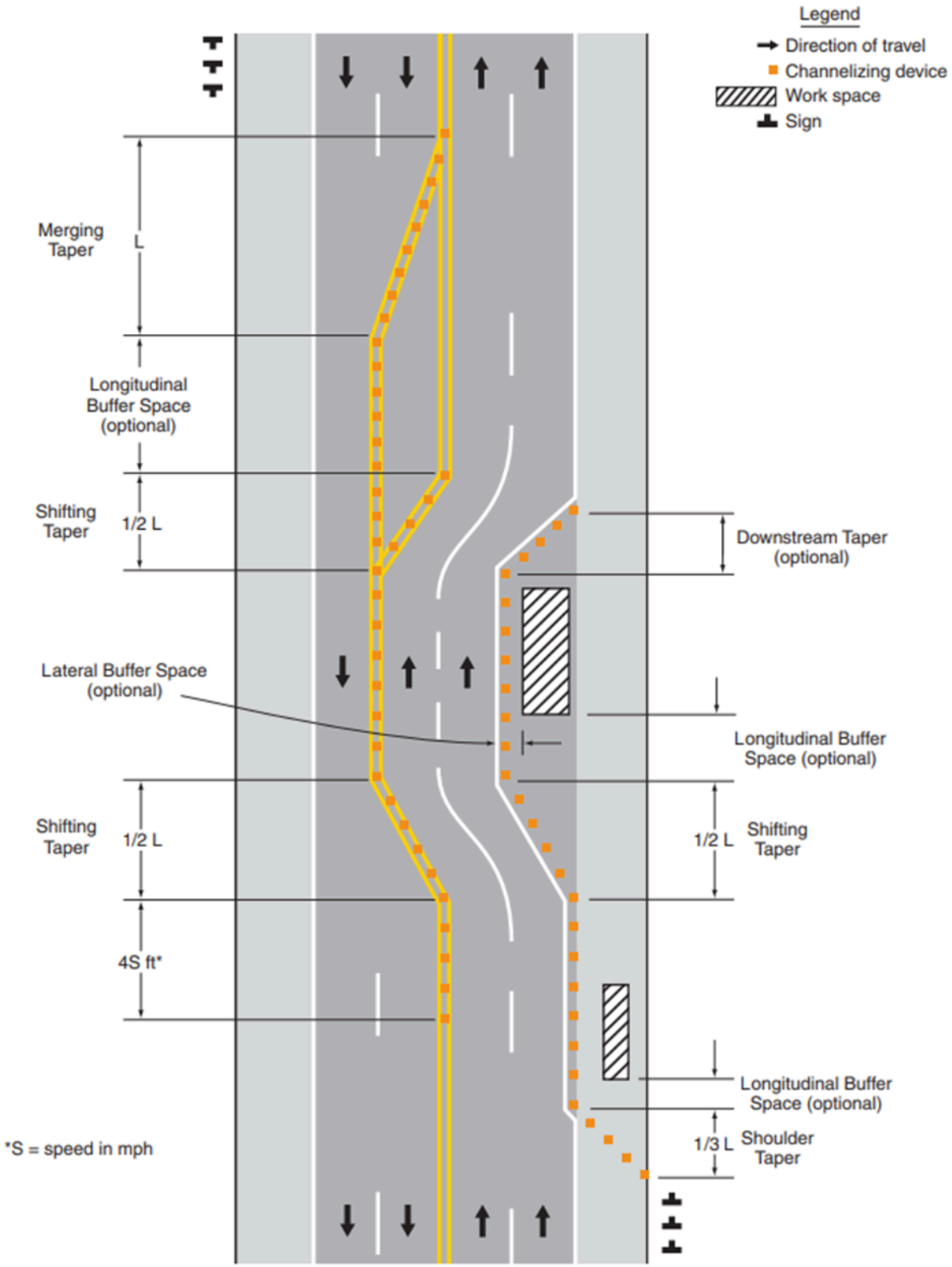
The test of the adequacy of the taper length involves observation of driver performance after the TTC Plan is put into effect.

There are five types of tapers used in Temporary Traffic Control zones:

- Merging taper
- Shifting taper
- Shoulder taper
- One-lane, two-way traffic taper
- Downstream taper *(shown in termination area)*

MUTCD Figure 6C-2 (on the next page) illustrates the different types of tapers.

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



Taper length formula

The computational methods for determining the minimum length of the merging taper (L) are as follows:

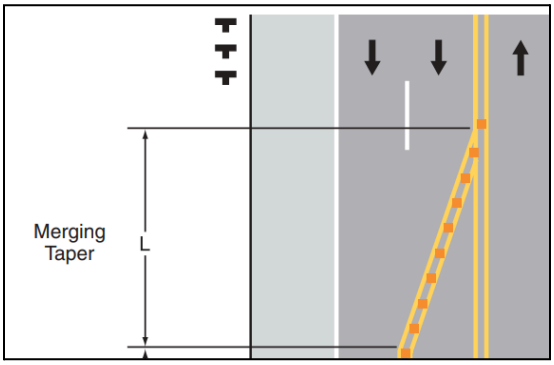
Table 6C-4. Formulas for Determining Taper Length

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

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

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 (1/2 L or L/2)
Shoulder Taper	At least 0.33 L (1/3 L or L/3)
One-Lane, Two-Way Taper	50 feet min, 100 feet max
Downstream Taper	50 feet min, 100 feet max



Merging taper = L minimum

Merging tapers are used to move traffic laterally from its normal lane to merge with an adjacent lane of traffic at prevailing travel speeds. They require the longest distances because they must be long enough to enable drivers to adjust their speeds and merge into a single lane before the end of the taper. Lengths of merging tapers are

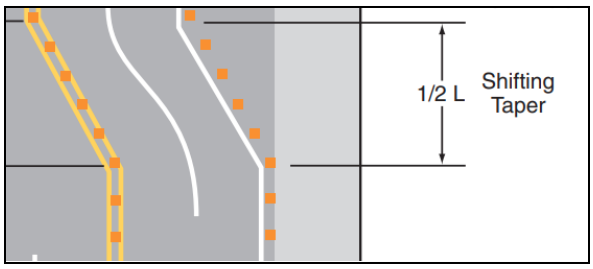
determined by the posted speed limit of the roadway, the off peak 85th percentile speed prior to the start of the work, or the anticipated operating speed.

Lengths of tapers may be adjusted whenever they are used near interchange ramps, crossroads, curves, and other influencing factors. Longer tapers may be warranted if merging problems are observed in the transition areas. In urban situations it may be necessary to lengthen tapers at driveways, cross streets, and similar conditions.

Longer tapers are not necessarily better than shorter tapers because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily.

The test of the adequacy of the taper length involves observation of driver performance after the Traffic Control Plan is put into effect.

When it is necessary to close two or more adjacent lanes on a one-way roadway, the merging tapers for each lane to be closed must be separated along the highway to separate the merging conflicts associated with each of the lane closures. A minimum length of two times the taper length for each lane closure (2L) is used to allow traffic to become stabilized after each merging maneuver. This separation distance of 2L is measured from the end of the first taper to the beginning point of the second taper, and is repeated for each successive lane closure.



Shifting taper = 1/2 L minimum

A shifting taper is used when traffic is moved laterally into a different travel path but the number of through lanes is not reduced. In these situations a merge with adjacent traffic is not required. A taper of approximately one half the length of the merging taper (1/2 L) has been found to be adequate to accommodate this movement. Where more space is available, it may be beneficial to use longer taper lengths and the full value of L is frequently used in these situations. The maximum spacing of channelizing devices (in feet) should be equal to the speed limit (in miles per hour).

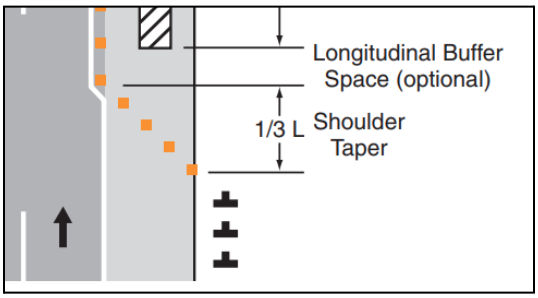
The value of W (width of offset in feet) to be used in computing the length of shifting tapers should be the width of the lateral shift involved. To the degree practicable, changes in alignment of this type should be accomplished by using horizontal curves designed for normal highway speeds.

In a configuration where a lane closure is followed by a lane shift, the spacing between the two tapers should be a minimum of 1/2 L to allow traffic to stabilize between transition movements. The tangent distance of 1/2 L is adequate in this instance because no merging maneuver is required at the lane shift.

Whenever field observations of the completed taper installations indicate operational difficulties, such as erratic maneuvers, frequent use of brakes, skid marks, or displaced channelizing devices, consideration should be given to increasing taper lengths. The advance warning signs should also be reviewed to determine if the information provided to motorists concerning the impending lane shift is adequate.

Shoulder taper = 1/3 L minimum

Per the MUTCD, a shoulder taper may be used on a roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane.



If used, shoulder tapers should have a length of approximately one-third (1/3 L). This treatment is necessary because drivers normally expect to be able to use the shoulder in an emergency. If the shoulder is used as a travel lane, either through practice or during temporary traffic activity, a normal merging or shifting taper should be provided.

Work on the shoulder with minor encroachment

When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 10 feet, the lane should be closed.

Taper Lengths & Number of Devices
Merging, Shifting and Shoulder Tapers only (not using flaggers)

	10 foot wide				11 foot wide				12 foot wide				10 foot Shoulder	
	L		1/2 L		L		1/2 L		L		1/2 L		1/3 L	
MPH	Merg	Device	Shift	Device	Merg	Device	Shift	Device	Merg	Device	Shift	Device	Length	device
20	70	5	50	5	75	5	50	5	80	5	50	5	50	5
25	105	6	55	5	115	5	60	5	125	6	65	5	50	5
30	150	6	75	5	165	7	85	5	180	7	90	5	50	5
35	205	7	105	5	225	8	115	5	245	8	125	5	70	5
40	270	8	135	5	295	9	150	5	320	9	160	6	90	5
45	450	11	225	6	495	12	250	7	540	13	270	7	150	5
50	500	11	250	6	550	12	275	7	600	13	300	7	170	5
55	550	11	275	6	605	12	305	7	660	13	330	7	185	5
60	600	11	300	6	660	12	330	7	720	13	360	7	200	5
65	650	11	325	6	715	12	370	7	780	13	390	7	220	5
70	700	11	350	6	770	12	385	7	840	13	420	7	235	5
75	750	11	375	6	825	12	415	7	900	13	450	7	250	5

**L for shoulder taper equals Shoulder Width x Speed. Figures shown are for a 10' Shoulder*

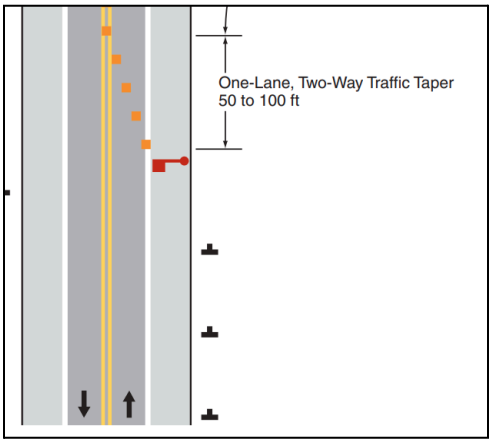
Finding "L"
(merging taper)

LANE/OFFSET WIDTH

SPEED MPH	2	3	4	5	6	7	8	9	10	11	12
20	15	20	30	35	40	50	55	60	70	75	80
25	25	35	45	55	65	75	85	95	105	115	125
30	30	45	60	75	90	105	120	135	150	165	180
35	45	65	85	105	125	145	165	185	205	225	245
40	55	80	110	135	160	190	215	240	270	295	320
45	90	135	180	225	270	315	360	405	450	495	540
50	100	150	200	250	300	350	400	450	500	550	600
55	110	165	220	275	330	385	440	495	550	605	660
60	120	180	240	300	360	420	480	540	600	660	720
65	130	195	260	325	390	455	520	585	650	715	780
70	140	210	280	350	420	490	560	630	700	770	840

One-lane, two-way traffic taper = 100 feet maximum

The one-lane, two-way traffic taper is used in advance of an activity area on a two-lane roadway where a portion of the road must be closed in such a way that the remaining roadway must alternately accommodate traffic in both directions. The purpose of this taper is to alert drivers of potential head-on conflicts. Typically, traffic is controlled by a flagger or a temporary traffic signal. A short taper having a minimum length of 50 feet and a maximum length of 100 feet is used to guide traffic into the one-way section.



The function of this taper is not to merge traffic, but to slow or stop traffic by giving the appearance of restricted alignment. Spacing of channelizing devices should be approximately 20 feet in these situations.

Locations of two-way traffic tapers should be carefully selected relative to the activity area and the configuration of the roadway. To be effective, the taper must be clearly visible to approaching motorists and not be obstructed by horizontal or vertical curves, buildings, vegetation, or other roadside features. It may be necessary to shift the location of the taper by adjusting the distance between the activity area and the taper installation. Consideration should also be given to the extent of the queues which will be generated as a result of the one-way operation and the probable end of the queue of stopped vehicles relative to the advance warning area. Adjustments to sign spacing, the placement of additional signs, operational modifications, or other considerations may be considered when long queues are observed.

6.5 ACTIVITY AREA

The activity area is that area of the roadway where the actual work takes place. It is composed of the work and traffic space, and may contain one or more buffer spaces designed to enhance the safety of motorists as well as workers. These sub-areas of the activity area will be discussed in the order that motorists encounter them as they travel through the TTC zone.

Buffer space

Buffer spaces are optional features of activity areas which separate traffic from the work activity or potentially hazardous areas, and provide recovery spaces for errant vehicles. They provide a margin of safety for motorists and workers by giving any motorist who fails

to properly respond to the advance warning messages or transition areas the opportunity to stop their vehicle before entering the work area. In order to effectively serve this purpose, buffer spaces must not be used for the storage of vehicles, equipment, supplies, or any other obstructions, or for any work activity. In the case of mobile operations, the buffer space is the area between the shadow vehicle, if one is used, and the work crew.

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

Longitudinal buffer space is placed in advance of the work area and is measured from the end of the transition area to the beginning of the work space. If a protection vehicle is stationed in advance of the work space, only the space upstream of the vehicle constitutes the buffer space. Guidelines for the lengths of longitudinal buffer spaces, as a function of speed, are shown in the Table 6E-1 *(same as Table 6C-2)*.

A longitudinal buffer space should also be used where a closed lane separates opposing traffic flows as depicted in Figure 6C-2 of the MUTCD (see illustration in Section 6.4). In these situations, the buffer space separates the tapers for opposing directions of traffic and could help prevent head-on collisions. Typically, this buffer space is formed as a traffic island and defined by channelizing devices.

Lateral buffer space may be used to separate the traffic space from the workspace or a potentially hazardous area, such as an excavation or pavement drop off. It may also be used effectively between two travel lanes, especially those carrying opposing traffic. The width of lateral buffer spaces should be determined by engineering judgment, and care should be taken to design and delineate this space so as to discourage its use as a traffic lane.

Traffic space

The traffic space defines that portion of the roadway in which traffic is routed through the activity area.

Work space

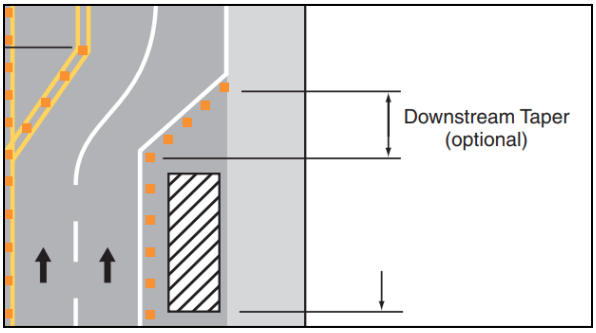
The work space is that portion of the roadway which is closed to traffic and is set aside for the exclusive use of workers, equipment, and construction materials. Work spaces may be fixed or moved as work progresses, such as in mobile operations. Work spaces are usually delineated by channelizing devices or shielded by temporary barriers to exclude vehicular traffic and pedestrians.

6.6 TERMINATION AREA

The termination area shall be used to return road users to their normal path and shall extend from the downstream end of the work area to the END ROAD WORK signs, if posted.

Downstream or termination taper = 100 feet maximum

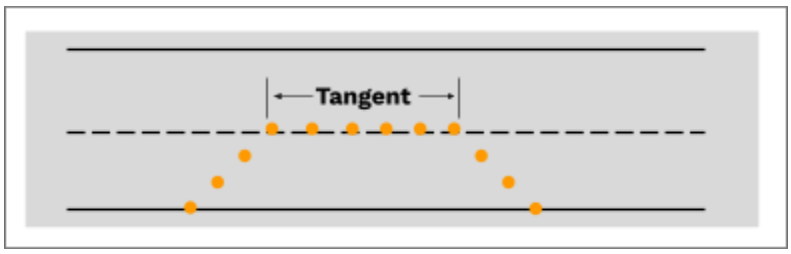
A downstream taper may be used at the end of the activity area to inform motorists that they have passed the work site and that access to the original lane or path, which was temporarily closed to traffic, is again available. This taper should have a minimum length of 50 feet and a maximum length of about 100 feet per lane, with devices spaced at distances of approximately 20 feet.



6.7 CHANNELIZING DEVICE SPACING

According to MUTCD 6F.63, the spacing of channelizing devices should not exceed a distance in feet equal to 1.0 times the speed limit in mph when used for taper channelization, and a distance in feet equal to 2.0 times the speed limit in mph when used for tangent channelization.

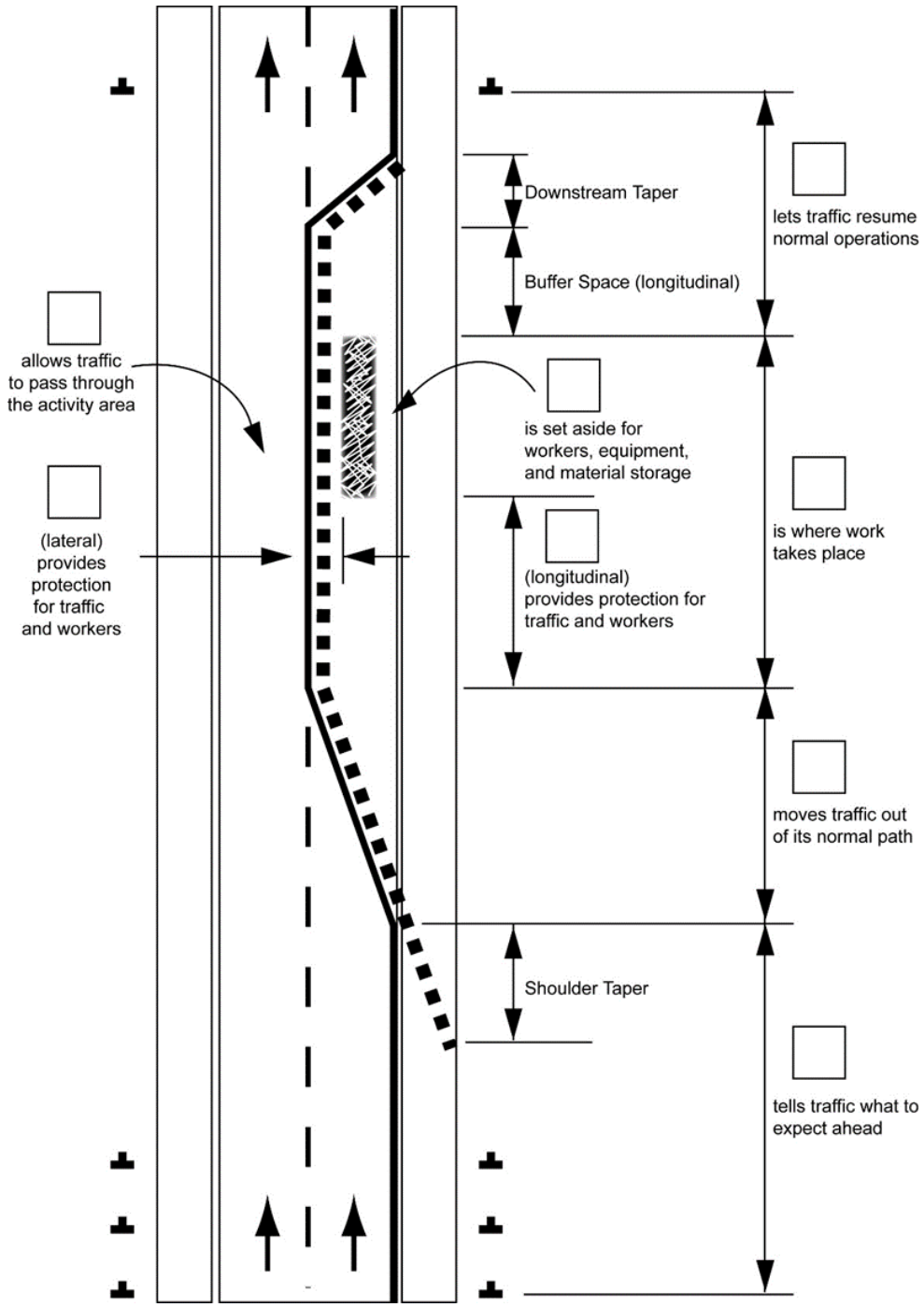
Tangent - The term tangent refers to the straightaway area between the work area and the lane of traffic that runs from the transition taper to the downstream taper.



EXERCISE #1

Traffic Control Plan Element Identification

A. Advanced Warning Area
B. Buffer Space
C. Traffic Space
D. Termination Area
E. Transition Area
F. Activity Area
G. Work Area



CHAPTER 7
Reading and Modifying Temporary Traffic Control Plans

7.1 SUMMARY

This chapter reviews relevant Temporary Traffic Control requirements found in the contract plans. These plans are a resource to assist the TCS during the review and/or development of proposed modifications of Temporary Traffic Control Plans.

Standard Specifications and Supplemental Specifications

- *ITD Standard Specifications:* Outline contractor obligations/responsibilities
- *Supplements to the Standard Specifications:* Shall be used in conjunction with the Standard Specifications.

The specifications, plans, special provisions, and supplementary documents are all essential parts of the contract. In case of discrepancy between contract documents, the discrepancy is resolved by following this order of precedence (i.e., 1 presiding over 2, 3, 4, 5, 6, and 7; 2 presiding over 3, 4, 5, 6, and 7; etc.):

1. Bid schedule
2. DBE Documentation
3. Addenda
4. Special provisions
5. Quality assurance special provision
6. Plan details
7. Plan sheets
8. Standard Supplementals
9. Standard Specifications
10. Standard drawings
11. Quality Assurance manual
12. Electronic files

7.2 CONTRACT PLANS

Temporary Traffic Control Plans

Temporary Traffic Control Plans (TTC Plans) show the placement and type of all Temporary Traffic Control devices to be used in a work zone and contain information about the type of work zone configuration for each phase or stage of the work.

TTC plans are provided as part of the contract whenever traffic will be affected by the project.

Maintenance of traffic *(ITD Standard Specification -105.14 D)*

Maintain the road for use by traffic and minimize traffic delays during roadway construction, unless otherwise directed. Ensure that individual traffic delays do not exceed 15 minutes and traffic delays do not exceed a total of 30 minutes through the length of the project site, unless otherwise approved in writing. Implement remedial action to eliminate the excess traffic delays.

Before starting the work, provide a Temporary Traffic Control Plan for approval. Include the following information:

1. Construction phasing and work areas.
2. Phasing and sequencing for implementing the Temporary Traffic Control Plan and transitioning between phases.
3. Proposed detours.
4. Emergency vehicle and school bus route accommodations.
5. Pedestrian and bicycle accommodations.
6. Plan for preserving access to cross streets and approaches.
7. Temporary Traffic Control devices.

Submit proposed measures to address traffic delays resulting from emergencies, highway incidents, emergency vehicles, and scheduled school bus routes within the project site for approval. Notify the Engineer at least 2 business days before making Temporary Traffic Control Plan changes and submit the revised Temporary Traffic Control Plan for approval.

Provide and maintain access to cross streets and approaches at no additional cost to the Department.

7.3 TYPICAL APPLICATIONS

Typical Application diagrams are available for a large variety of Temporary Traffic Control situations. Some of the more common sources are:

- The MUTCD
- Contract plans

While these Typical Application diagrams cover many Temporary Traffic Control methods and conditions, they do not include a layout for every conceivable work situation. When necessary, Typical Applications should be altered or modified to fit the conditions of a particular Temporary Traffic Control zone. Whenever modifications are deemed necessary and appropriate, the standards presented in the MUTCD should be given priority over the examples given in Typical Applications.

Modifications to Typical Applications

The Typical Application diagrams contained in the MUTCD and various other sources represent procedures for situations which are usually found in the field, but cannot reflect all of the conditions encountered during Temporary Traffic Control procedures. Many variables, such as location of work, road type, traffic speed, travel volumes, roadway geometrics, vertical and horizontal alignment, pedestrians and bicyclists, and intersections, affect the needs of each work zone. Because these conditions are found in the field, and since the goal of Temporary Traffic Control is to provide safety with the minimum disruption to traffic, proper judgment must be used in selecting and adapting these Typical Application diagrams to fit the requirements of each work zone.

Most Typical Applications are considered minimum requirements. When needed, modifications must be made, and higher type treatments than those shown are often required. The following types of modifications may be desirable and necessary to satisfy the needs found in the field:

Additional devices

- High-level warning devices (flag trees)
- Increased number of signs
- Special signs (PCMSs)
- Arrow displays
- More channelizing devices at closer spacing
- Temporary raised pavement markers
- Portable traffic signs
- Portable barriers

- Impact attenuators
- Screens
- Rumble strips
- Intrusion alarms

Upgrading of devices

- Larger signs
- Brighter retroreflective materials
- Brighter and/or wider pavement markings
- Higher type channelizing devices
- Barriers in place of channelizing devices
- A full complement of standard pavement markings in areas of high hazard
- Removal of conflicting pavement markings on long term projects

Improved geometrics

- At detours
- At crossovers

Increased distances

- Longer advanced warning areas
- Increased taper length

Lighting

- Steady-burn lights for channelization
- Flashing lights at isolated hazards
- Illuminated signs
- Floodlights
- Temporary roadway lighting

7.4 DESIGNING WORK ZONE TRAFFIC CONTROL LAYOUTS

TTC Plan design considerations

Design of the TTC Plan requires a thorough understanding of the principles of work zone traffic control and the exercise of good engineering judgment. To develop a workable plan, the designer must assemble information on economic and community characteristics of the locality, traffic and transportation characteristics of the facility, seasonal changes and weather patterns, and provisions for worker safety and mobility.

Analyze the proposed work activities to develop TTC Plans which will satisfy the requirements of different work phases or stages, the complexities of each stage,

overlapping of stages, and periods during which construction or maintenance activities will be underway. Areas which must be considered in detail include:

- The location of the work (on the roadway, shoulders, sidewalks, etc.)
- Number of lanes required for the work activity
- Hours of the day when lanes may be closed
- Whether work may progress simultaneously in both directions of traffic
- The length of the work area (for example, controlled staging to permit removal and immediate replacement of safety appurtenances)
- Time of exposure to hazards, such as drop-offs
- Time involved in curing pavements or bridge decks
- Hazards created by work activities within the recovery area (storage of construction materials, drainage basins, culvert end sections, pipes, sign supports, or exposed guardrail ends, etc.)
- Delays incidental to the installation and removal of Temporary Traffic Controls

While a 24-hour workday may be desirable to accelerate the completion of the work and reduce the number of days during which the area is adversely impacted by the work activity, factors which will affect the design of a TTCP that includes nighttime work are:

- Neighborhood objection to noise at night;
- Higher costs for labor and lighting;
- Higher incidence of drivers under the influence of alcohol and drugs at night; and
- Limited availability of services, such as ready-mix concrete and aggregates.

Note: The remainder of this chapter is intended as a reference for those who may find it necessary to design a Temporary Traffic Control Plan where contract plans are not provided or meet current construction needs.

7.5 SELECTING TYPICAL APPLICATIONS

The decision concerning which of the Typical Application diagrams to select as a basis for developing the optimal TTCP must consider three factors: duration of the work, location of the work, and roadway type.

Duration of work

Five categories of work duration for Temporary Traffic Control situations are defined in the MUTCD. They are:

Long Term Stationary — Work which occupies a location more than three (3) days.

Intermediate Term Stationary — Work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.

Short Term Stationary — Daytime work which occupies a location for more than 1 hour within a single daylight period.

Short Duration — Work that occupies a location up to one hour.

Mobile — Work which moves intermittently or continuously.

Location of work

The type of Temporary Traffic Control needed depends upon the location of the work activity in relationship to the moving traffic stream. Generally, the closer the operation is to traffic, the more traffic control devices will be needed. Most frequently, work activities take place in one or more of four locations, such as:

Outside the shoulder edge — Traffic control may be minimal and consist of a general warning only.

On or near the shoulder — Motorists must be warned that work may be in close proximity to moving traffic, and the shoulder may not be available for emergency use.

In the median of a divided highway — Traffic control in both directions may be required and special protection for workers may be necessary.

On the traveled way — Optimum protection of workers and maximum advance warning for drivers is essential.

Roadway type

The roadway type is a primary factor in determining the Temporary Traffic Control requirements because of the differences in speeds, volumes, and operating characteristics of the facility.

> **Rural roads** often are characterized by relatively low volumes and high speeds, and controls may be readily established by using typical layouts with minor modifications.
>
> **Urban arterials,** with high traffic volumes and moderate speeds, may require additional controls and revised spacing of devices to accommodate closely spaced intersections and access to businesses and public facilities.
>
> **Major arterials, freeways, and expressways,** because of their high speeds and high volumes, demand the highest type of traffic control and modification of typicals to supplement the recommended array of devices is often necessary.

Common work zone configurations for each roadway type are discussed in detail in the following sections.

7.6 RURAL TWO-LANE ROADS

Common TTC zone types on low-volume, two-way, two-lane highways include: work outside the shoulder, work on the shoulder, lane closure, haul road crossings, work in the center of the road, and road closures, diversions and detours.

Work outside the shoulder

Work activities off the roadway and shoulders but within the right of way are usually minimal hazards. Nevertheless, appropriate warning signs should be used if the work activity is likely to affect the road user. The road user needs to be informed of the work activity when any of the following conditions occur:

- Work will be performed very close to the roadway at certain stages of the activity.
- Equipment may be moved along or across the highway.
- Motorists may be distracted by the work activity.

A typical advance warning sign for work within the right of way may be ROAD WORK AHEAD. For long work areas, the warning sign should be repeated every two to three miles to remind motorists that they are still in the activity area, and an END ROAD WORK sign

should be placed at the end of the work zone. Additional ROAD WORK AHEAD signs should be added in advance of the work zone based on observed traffic queueing.

If the work involves equipment traveling along or crossing the roadway, the equipment should be equipped with appropriate flags, flashing lights, and/or the SLOW MOVING VEHICLE symbol.

MUTCD Figure 6H 1 illustrates a typical layout for stationary work outside the shoulder.

Work on the shoulder

When a highway shoulder is closed, motorists must be advised and the workers must be protected. The design of the Temporary Traffic Control zone differs depending on whether or not the shoulder closure encroaches on the travel lane.

Work on the shoulder with no encroachment on the traveled way

If the shoulder of a two-lane rural road is closed and there is no encroachment on the travel lane, then there is no interference with traffic. Usually, the placement of the single warning sign SHOULDER WORK is adequate.

MUTCD Figure 6H-3 shows the traffic control layout for work on the shoulder of a two-lane road with intersections near the workspace.

Work on the shoulder with minor encroachment on the traveled way

When work is on the shoulder or takes up part of a travel lane, traffic volumes, vehicle mix, speed, and capacity should be analyzed to determine if the affected lane should be closed. Bicycle use should also be a consideration. For most roadways, the lane encroachment should permit a remaining lane width of 10 feet, or the lane should be closed. In the case of the two-lane rural road, a 9-foot lane width is acceptable if the volumes and speeds are low and if the traffic mix does not include large, wide, heavy commercial vehicles (otherwise use 10 feet as the minimum design criterion for the remaining lane width). Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate. Additional signs alerting motorists to the temporary condition, such as ROAD NARROWS (W5-2), may be considered. See MUTCD 6G.08.

> MUTCD Figure 6H 6 shows a typical TTCP where the work area encroaches slightly into the travel lane.

Lane closure

When one lane of a two-lane, two-way highway must be closed, the remaining lane must be controlled so that it can accommodate traffic in both directions. Control is provided by flagging or other means to allow alternating traffic on the unobstructed open lane.

Alternate one-way traffic control may be affected by the following means:

- Two flaggers, one at each end of the worksite, or Automated Flagger Assistance Device (AFAD), one at each end of the worksite. (See below for more on flagger control.)
- One flagger who assigns right of way in both directions (short worksite with low traffic volumes and low speeds).
- Traffic may be self-regulating at very short worksites; however, this method is not satisfactory when the work area is near sharp hills and curves.
- Use of one or more pilot cars.
- Temporary traffic signals (long duration projects).

Lane closure with flagger control

The typical procedure for short term work is to utilize flaggers to alternate traffic flow. MUTCD Figure 6H-10 shows the typical layout for a flagging operation.

Traffic approaching the lane closure faces advance warning signs of ROAD WORK XXX FEET and ONE LANE ROAD XXX FEET and finally the advance FLAGGER symbol sign. The advance flagger sign is to be located as recommended in MUTCD Table 6C-1 in advance of the flagger station. This sign must be covered or removed when the flagger is not at this station.

For low volume situations involving short work zones on straight sections of road, a single flagger may be adequate. The flagger assigns right of way for both approaches to the activity area and must be visible to traffic in both directions.

When the temporary lane closure is obscured from view beyond a horizontal curve or over a hillcrest, the work zone should be extended upstream so that the taper is placed in full view of approaching traffic, and flaggers should be stationed at each end of the activity area.

Flagging will be discussed in more detail in Chapter 8.

Lane closure with sign only (self regulating control)

For low traffic volumes on a minor road, where traffic may be self-regulating, there are instances where the flaggers may be eliminated. In order to eliminate flagger control, both of the following conditions must exist:

- Traffic volumes are low enough to provide sufficient gaps for the traffic that must yield; and
- Drivers from both directions must be able to see approaching traffic through and beyond the worksite.

If the above two conditions exist on a low-volume two-lane rural road, the application shown in MUTCD Figure 6H-11 may be used. Essentially, YIELD signs replace the flaggers and the YIELD AHEAD sign serves the same purpose as the advanced FLAGGER sign.

If a night closure is necessary, Type A flashing warning lights, or Type B high-intensity flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs.

Lane closure with temporary traffic signals

MUTCD Figure 6H-12 illustrates the layout for a long term lane closure on a two lane highway. The temporary traffic signal takes the place of the flagger as described above.

The maximum length of the activity area for one-way traffic signal control depends on the level of peak hour traffic demand, and for practical purposes should be determined by the capacity required to handle the peak demand.

If the temporary signal is operated in the flashing mode (either manually or automatically), a red indication shall be flashed to both approaches.

Haul road crossings

When a construction access road or haul road is carried across the highway, flagging or temporary traffic signals, with appropriate advance warning signs will be required.

MUTCD, Figure 6H-14 shows typical layouts for a haul road crossings. The illustration illustrates layouts for both flagging and temporary traffic signal control.

Haul road crossings with flagging control

For short term operations in the daylight, a haul road crossing requires a ROAD WORK AHEAD, a DO NOT PASS, and an ADVANCE FLAGGER symbol sign. When the haul road is closed, the haul road should be barricaded, the highway pavement cleaned, and the signs removed.

Haul road crossings open at night should be supplemented with floodlights.

Haul road crossings with signal control

When the haul road is controlled by temporary traffic signals, two sets of signals are used, one set facing each direction of traffic. The signals shall meet the display and operational requirements of Part 4 of the MUTCD.

Work in the center of the road (including surveying along the centerline of a low-volume road)

If a low-volume, two-lane roadway is wide enough to permit work in the center of the road and still allow at least one 10-foot lane in each direction (measured from the edge of the channelizing devices to the edge of pavement), then the work zone can be established and the roadway left open to two-way traffic. If sufficient width is not available to provide 10 foot lanes, the work may have to be accomplished on one side of the centerline at a time so that traffic can be accommodated on the remaining lane. Another option would be to close the road to through traffic and establish a detour (MUTCD Figures 6H-8 and 6H 9).

MUTCD Figure 6H-15 shows a Temporary Traffic Control Plan for a work area in the center of a two-lane roadway and the recommended deployment of traffic control devices for this situation. Lane transitions can be accomplished with channelizing devices or with a work vehicle displaying a flashing or revolving yellow light.

If work in the center of a low-volume two-way roadway can be limited to 15 minute segments, a temporary road closure as depicted in MUTCD Figure 6H-13 may be used.

Road closures, diversions and detours

Typical layouts for road closures which require diversions or detours are shown in MUTCD Figure 6H-7, 6H-8, and 6H-9.

Diversions

MUTCD Figure 6H-7 shows the proper layout for a situation where the roadway has been closed and a bypass constructed around the closed section. Signs, channelizing devices and pavement markings are used to indicate the transition to the temporary roadway. Note

that the signs shown in Figure 6H-7 are for one direction of traffic only and must be repeated for the opposite approach.

Detours

MUTCD Figure 6H-8 and 6H-9 show the signs and devices needed for a detour. Detour signing is usually done by the traffic engineer who has the authority over the roadway because it is considered a traffic routing problem.

Detour signs are used to direct traffic onto another roadway, through the detour area, and then back to their original route (MUTCD Figure 6H-9). Detour signing should warn road users in advance of the closure so that routing decisions can be made. If the detour is long, signs should be installed periodically to remind and reassure the drivers that they are still on the detour. The appropriate signs for these reminders are the DETOUR MARKER or the DETOUR signs.

If portions of the detour are kept open to local traffic, the ROAD CLOSED TO THRU TRAFFIC sign should be used and the portion of the road open to local traffic should have adequate signing, marking, and protection.

7.7 URBAN STREETS AND INTERSECTIONS

Urban TTC zones present special problems because users other than highway vehicles must be considered. Provisions must be made to accommodate pedestrians and bicyclists, and disruptions to transit operations must be minimized. It is often necessary to divide the control zone into segments and to schedule work only during off-peak hours. Decisions have to be made as to how to control vehicular traffic, the number of lanes which may be closed at various times of the day, and whether turning movements must be prohibited at intersections. Access to businesses, industrial facilities, and residences must often be maintained even if the roadway is closed to vehicular traffic.

Intersections

Work in the vicinity of an intersection

Midblock lane closures, or those for work at the near side of an intersection, should be accomplished in the usual manner with appropriate advance warning signs and transition tapers (MUTCD Figure 6H-21). A significant problem which may occur with a nearside lane closure is a reduction of capacity which may result in congestion and backups. At signalized intersections, adjustment to traffic signal timing and phasing may be necessary to alleviate these problems.

Work on the far side of an intersection

Work activities on the far side of an intersection require special treatment to handle through as well as turning movements. Since merging movements within the intersection should be avoided, the applicable principle is to close the appropriate lane or lanes which do not carry through the intersection at the near side intersection approach (MUTCD Figures 6H-22 through 6H-25). Turning restrictions may have to be imposed or exclusive turn lanes may have to be provided.

Work within the intersection

Whenever work activities occupy space within the intersection, traffic must be channelized into the proper lanes at the near side approaches to all legs of the intersection. Consideration should also be given to using uniformed police personnel for directing traffic at these locations (MUTCD Figures 6H-26 and 6H-27).

Detours

When the entire road or street must be closed temporarily, a detour should be provided and traffic warned of the closure in advance. In addition to providing adequate signing, channelization, and marking at the point of the road closure, detour signing shall be installed along the entire detour route so that traffic will be able to get through the area and return to the original roadway beyond the Temporary Traffic Control zone. In urban areas, it may be necessary to supplement the DETOUR signs with a street name sign to advise motorists of the name of the street being detoured. MUTCD 6F.59, Figures 6H-9, 6H-19, and 6H-20 illustrate typical detour signing in an urban street network.

Since detour routing often affects roadways other than those under construction, it is considered a traffic routing problem and should be coordinated with the traffic engineer with authority over the roadways being impacted. Therefore, communication and cooperation with the appropriate highway authorities is essential.

Pedestrian and transit considerations

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents. (MUTCD 6B.01)

MUTCD Figures 6H-28 and 6H-29 illustrate typical treatments for pedestrians in Temporary Traffic Control zones. Where transit routes serve the area and where pedestrian access is restricted, provisions must be made for relocating bus stops or transfer points, and for providing pullouts and waiting areas for transit patrons. Advance information concerning such temporary changes to transit facilities should be part of the implementation plan.

Multi-lane undivided roads

Typical layouts for multi-lane roadways are discussed in Section 6G-11 of the MUTCD. Applications include right lane closures, left lane closures, multiple lane closures, and closures on five lane roadways. The following sections discuss the application of those typicals to the closure of interior (i.e., left) lanes, multiple lanes, and half road closures.

Closure of interior lanes

If the work activity can be contained entirely within the left (or interior) lane of a multi-lane roadway, it may be appropriate to close only that lane. Impacts on traffic capacity will decrease if fewer travel lanes are actually closed to traffic. Under this scenario, channelizing devices are placed along the centerline and the outside of the work activity to give advance warning to the opposing traffic.

For example, if the northbound left lane of a four lane road is closed to accommodate the work zone, the ROAD WORK AHEAD and the LANE ENDS symbol (W4-2) sign would be spaced as shown in MUTCD Figure 6H-30. The lane closure would be accomplished with channeling devices using a taper length calculated as described in Chapter 6. In the southbound direction, a ROAD WORK AHEAD sign would be placed and cones would be placed along the centerline through the entire work zone.

MUTCD Figure 6H-30 also shows how the transition tapers would be set up if the decision was made to close both interior lanes of a multi-lane roadway. Longitudinal buffer spaces may be provided for each direction of travel between the transition area and the space which is occupied by workers or work vehicles. This layout provides additional protection for the workers and easier access to the work space. The decision to close the interior lane in one or both directions should be made based on overall traffic and worker safety taking into account existing traffic volumes and speeds in each direction.

Closure of multiple lanes

When the work activity occupies more than one lane of a multiple lane roadway, choices can be made about the lane distribution that remains open to traffic. A capacity analysis should be conducted to determine if better traffic capacity balance might be achieved with

an unbalanced flow or if the number of lanes remaining open to traffic during the work activity should be equal in each direction.

Lane closures with unbalanced flows — MUTCD Figure 6H-31 shows the typical layout for a work zone on a four lane street with unbalanced traffic flows. Lane transitions are made such that two northbound lanes are still available to traffic even though the work area is located in one of the existing northbound lanes. This is accomplished by transitioning one northbound travel lane into an existing southbound lane resulting in one closed lane, two northbound lanes and one southbound lane.

MUTCD Figure 6H-31 shows a buffer space in both directions, one to protect the workers in the work area and one to separate opposing directions of traffic. Conflicting pavement markings should be removed for long term projects. Interim markings should be installed where needed.

Half road closures — When the work area takes up multiple lanes, the number of lanes open to traffic may be reduced to one in each direction. Part 6 of the MUTCD Figure 6H-32 shows the proper layout used when a four lane road is reduced to one lane in each direction. In long term operations, the pavement markings should be removed or obliterated and interim markings used as necessary.

Note that the lane transitions on the roadway are made in sequential steps. A taper is provided to reduce two northbound lanes to one lane and then a single lane is provided for at least a distance of 1/2L (where the length “L” is determined by the width of the initial offset and the speed limit of the road). Only after this tangent section of single lane is the second taper introduced to transition the single lane to the new location.

For intermediate term situations, it may not be feasible to remove and restore pavement markings. In these situations the channelization must be emphasized by using a very close device spacing.

7.8 FREEWAYS AND EXPRESSWAYS

Freeways and expressways are characterized by high speeds or high volumes of traffic, or both. Highways are usually access controlled, but access control on expressways may be only partial. The density of traffic on these facilities requires the most careful Temporary Traffic Control procedures, and more conspicuous and supplementary control devices are often needed to adequately protect work crews and motorists. However, the same

important basic considerations of uniformity and standardization of general principles apply to these highways as to other roads and streets.

Work beyond shoulders

Motorists should be warned of work activities which may interfere with traffic movement either directly or by attracting attention due to their presence. If the work space is less than 15 feet from the edge of the roadway, a ROAD WORK AHEAD sign should be used in advance of the operation. If the activity area extends for several miles, the sign should be repeated at least every two miles to remind motorists that they are still within the limits of the work zone. An optional END ROAD WORK sign may be installed to advise the driver that the activity area has ended.

Work on the shoulder

Work on shoulders of high speed highways requires a closure of a portion of the roadway which the driver expects to use in case of emergency. Adequate advance warning signs should be used to indicate the shoulder closure, and the activity area should be defined with channelizing devices preceded by a transition taper MUTCD Figure 6H-5 shows the typical Temporary Traffic Control for a shoulder closure where positive protection is provided for the workforce. Use of barriers is optional, but may be appropriate for intermediate and long duration operations, especially in high traffic volume situations. If an arrow display is used to supplement the required traffic control devices in conjunction with a shoulder closure, the display shall be operated in the caution mode.

When work on the shoulder of a high speed, high volume facility encroaches upon a through traffic lane, consideration should be given to closing the adjacent traffic lane. An analysis of the impact on the capacity of the facility must be made to determine the feasibility of the required lane closure.

The length of the transition taper for a shoulder closure should be a minimum of 1/3L with the width of the shoulder being used in the taper length formula. If the shoulder in advance of the closed section is used as a temporary through traffic lane, the shoulder closure should be treated as a lane closure and a full transition taper length provided.

Single lane closure on a divided highway

MUTCD Figure 6H-33 and 6H-34 show single lane closures without and with barriers respectively. The basic Temporary Traffic Control layout is the same whether the lane closure is for the right or the left lane of a divided highway, with appropriate message changes on the advance warning signs. Spacing of signs can be increased, and additional

signs provided if field conditions require modification of the Typical Application diagrams illustrated. Taper lengths should also be adjusted to reflect operating conditions and to correct problems in the transition area.

When a barrier is introduced to provide positive protection of the work space, the lane shall first be closed using channelizing devices and pavement markings (MUTCD Figure 6H-34). The barrier is placed on a flare beginning beyond the downstream end of the merging taper and should be treated to prevent vehicles from impacting the ends of the barrier. Guidelines for treating barrier ends are given in Chapter 9 of the *AASHTO Roadside Design Guide*.

Double lane closure on a freeway

Adjacent lanes of a multiple lane, one-way roadway may be closed by using two separate tapers, one for each lane closure. These tapers should be spaced at least twice the distance of the required taper length span (2L) to permit traffic to become stabilized after the first merging maneuver and before the second merge is required (MUTCD Figure 6H-37). The minimum length of the entire transition area thus becomes four times the taper length (4L). A careful analysis of roadway capacity should be made before this type of closure is attempted. Note that multi-lane closures are usually feasible only during off-peak traffic periods.

The preferred positions for the arrow displays in this situation are at the beginning of each transition taper. However, the arrow display may be placed in the second closed lane at the beginning of the work space if the display is mounted on the protection vehicle or if the alignment or other conditions create confusion as to which lane is closed by the second arrow display. It may also be placed in the second lane if the arrow display for the closed exterior lane must be located at the end of the first merging taper, for example in the case of narrow or nonexistent shoulders.

Center lane closure

To close the center lane of a three-lane, one-way roadway, traffic must first be transitioned out of the right or left lane into the center lane, and then diverted around the activity area with the use of a shifting taper. Only one arrow display for the initial lane transition should be used for this type of center lane closure. (MUTCD Figure 6H-38)

If off-peak traffic volumes can be accommodated in a single lane, the double-lane closure technique should be employed to close the center lane because it provides for safer operation of the work activity and permits access to the work space by supply vehicles and work crews with minimal interference with through traffic.

Lane shift

A lane shift should be used when work space extends into the right or left lane of a divided highway and when it is not practicable, for capacity reasons, to reduce the number of available lanes. A shoulder of sufficient widths must be available to accommodate the lane shift, or temporary widening of the roadway must be feasible. The minimum width of the shoulder should be 10 feet.

MUTCD Figure 6H-36 illustrates a lane shift on a freeway. Existing conflicting pavement markings must be removed and appropriate temporary markings should be installed. When the lane shift is limited to daylight hours, lanes may be delineated by channelizing devices in lieu of temporary markings. The optional special REVERSE CURVE signs may be used to indicate the initial shift as well as the return to the original alignment. Arrow displays shall not be used on multi-lane roadways to laterally shift all lanes of traffic, because unnecessary lane changing may result.

Two-lane, two-way operation

Two-lane, two-way operations (TLTWO) on one lane of a normally divided highway requires special consideration during the planning, design, and construction phases. Because it has unique operational problems (for example, the risk of serious head on collisions is increased) a number of factors should be considered during the decision making process concerning the application of this mode of Temporary Traffic Control.

MUTCD Figure 6H-39 shows the recommended Temporary Traffic Control Plan for a TLTWO on a normally divided highway. The plan illustrates the proper treatment of the approach to the TLTWO section, and the signing and channelization of the median crossover. See the ITD Traffic Manual for example of pavement markings for two-lane, two-way traffic on a normally divided highway. Treatments for entrance and exit ramps within the two-way roadway portion for this type of operation are shown in MUTCD Figure 6H-40 and 6H-41.

Crossovers for two-lane, two-way operations

The temporary roadways which lead from the closed roadway into the two-way operation and back to the original divided highway are called “two-lane, two-way crossovers.” Guiding principles for the design of these crossovers are as follows:

- Crossovers should be designed for operating speeds not less than 10 miles per hour below the posted speed limit, the off-peak 85th percentile speed prior to the start of the work, or the anticipated speed of the roadway, unless unusual site conditions require that a lower design speed be used.

- Tapers for lane drops should not be contiguous with the crossovers.
- Flat, diagonal crossovers are preferred over reverse curves with superelevation.
- The design of crossovers should accommodate all roadway traffic, including trucks and buses.
- A good array of channelizing devices and properly placed pavement markings are essential in providing good positive guidance to motorists.
- Portable barriers and the excessive use of traffic control devices cannot compensate for poor geometric design of crossovers.
- A clear roadside recovery area should be provided adjacent to the crossover.

Separation devices for two-lane, two-way operations

Throughout the two-way portion of the roadway in a two-lane, two-way operation, opposing traffic must be separated with positive separation devices. The use of striping, raised pavement markers, and complementary signing, either alone or in combination, is not considered acceptable for separation purposes. See ITD Traffic Manual Figure 6G-1.

Design and performance characteristics of separation devices suitable for TLTWO include:

Portable concrete barriers — These provide the greatest protection from potential head on collisions and are the preferred treatment for TLTWO applications, especially for short segments. However, they are often the most costly treatment and require significant time and effort to install and remove.

Drainage and snow Removal — Must be considered when concrete barriers or temporary raised islands are used.

Drums — These are effective separation devices but can be hazardous if hit by passing vehicles.

Barricades — These are suitable for separating opposing traffic streams but susceptible to being blown over or displaced by large vehicles passing close to them.

Vertical panels — These are readily seen due to their height and do not require much road space. They can be mounted semi-permanently on lightweight posts driven into the pavement or set into holes drilled in the pavement. The latter application can be used if the TLTWO is in effect during certain hours of the day only.

Tubular markers — The narrowest devices that can either be weighted or attached to the pavement with an approved adhesive in accordance with the manufacturer's

recommendations. Self-restoring bases are available for these markers which will withstand periodic impacts from passing vehicles. However, the effectiveness of their ability to return to their original position varies widely with different manufacturers.

Opposing traffic lane dividers — New devices manufactured out of lightweight materials and potentially very effective for use in TLTWOs. Experience with these devices is limited at this time.

Cones — These have the advantage of being easy to place and remove and their purchase price is relatively low.

Cones and tubular markers — These are readily displaced or damaged by passing vehicles and subject to intentional abuse by motorists. Continual maintenance of these devices is required if they are to maintain their effectiveness.

Repositioning or replacement of all separation devices will require varying degrees of maintenance and the costs associated with this work can be substantial. Also, this type of maintenance activity entails considerable risk to the workers involved.

Interchanges

On freeways and expressways with interchange ramps, access should be maintained even if the work space is in the lane adjacent to the ramps. If access cannot be maintained, ramps should be temporarily closed by using signs and Type III barricades. If an exit is closed, advance information should be provided to motorists. An effective method of accomplishing this is to place a black-on-orange plate containing the message EXIT CLOSED diagonally across the interchange guide signs. Early coordination with officials having jurisdiction over the affected cross streets is needed prior to ramp closures since these actions may have a major impact on nearby businesses and traffic generators.

MUTCD Figures 6H-42 and 6H-43 illustrate Temporary Traffic Controls for work sites in the vicinity of or on exit ramps. Figure 6H-44 shows the recommended treatments for entrance ramps. Egress to exit ramps should be clearly marked and outlined with channelizing devices and an optional sign provided to indicate that the exit remains open. The temporary exit sign, mounted in the temporary gore, must be clearly visible to approaching traffic. This sign must be mounted high enough so that it can be seen over the channelizing devices, and in no case shall there be less than 3 feet from the pavement surface to the bottom of the sign. The spacing of channelizing devices should be carefully adjusted to clearly indicate the point of departure of the exit ramp from the through traffic lanes.

When a work space interferes with an entrance ramp, a lane on the freeway may need to be closed sufficiently far in advance of the entry point to stabilize traffic flow before reaching the merge area. As the work space in the ramp area changes, ramp traffic may require shifting as indicated in the MUTCD Figure 6H-44.

Short duration work

Short duration work (i.e., work operations taking less than 60 minutes) generally involve different treatments than described earlier in this chapter, because oftentimes it would take longer to set up and remove the Temporary Traffic Control zone than it will to perform the work. Therefore, in order to reduce the exposure to the crew and reduce the impact on traffic, short duration activities are controlled by a simpler strategy.

In a short duration work operation, the use of numerous small traffic control devices is replaced by fewer but more dominant, effective devices. More mobile devices (e.g. signs mounted on work trucks) and larger, more visible, and more imposing devices are used. For example, appropriately colored and marked vehicles with flashing or rotating lights, perhaps augmented with signs or arrow displays, may be used in place of signs and channelization devices shown on the Typical Application diagrams for intermediate and long-term operations. It is important to note that this “simpler” strategy does not compromise the safety of the worker or the road user. It simply replaces one type of traffic control device (smaller, more numerous signs and channelizing devices) with larger, more dominant, but less frequent devices (signs, lights, and arrow displays mounted on work vehicles).

Short duration work beyond the shoulder

MUTCD Figure 6H-1 shows the layout for intermediate and long term work beyond the shoulder. In a short duration work situation, the signs and any channelizing devices may be eliminated if a vehicle with an activated flashing or revolving yellow light is used.

Short duration work on the shoulder

Similar to the situation above, short duration work done on the shoulder can be protected with a vehicle with an activated or flashing yellow light instead of with signs and channelizing devices. MUTCD Figure 6H-4 shows situations where the vehicle may be used in lieu of the signs and channelizing devices.

Short duration work in intersections

MUTCD Figure 6H-26 shows a layout for work done in the center of an intersection. In this application, the channelizing devices may be eliminated if a flashing or revolving yellow light is displayed in the work space.

In general, whether the short duration work takes place on or off the shoulder, in the traffic lane, or at an intersection, the primary purpose of the work zone layout remains the safety of the worker and the road user. The Typical Applications for short duration work give the designer the option of using larger, more dominant devices (e.g., work vehicles equipped with flashing or revolving yellow lights, arrow displays, or changeable message signs) instead of the pattern of signs and channelizing devices used in intermediate and long term operations.

Law enforcement personnel

The responsibility for developing, installing, and maintaining Temporary Traffic Controls at, and in the vicinity of, work sites generally rests with the highway agency and the contractor performing the work. However, conditions may occur which require additional traffic control methods and procedures that can only be provided by law enforcement agencies through increased enforcement activities or the deployment of uniformed police officers. Experience has shown that in those instances where highway work disrupts normal traffic operations, safety benefits are derived when law enforcement agencies become an integral part of project traffic management and take an active role in the implementation of the Traffic Control Plan.

Traffic management plan (planning and coordination)

The important role of law enforcement officials in Temporary Traffic Control should be recognized early in project development by bringing them on board as soon as possible. Coordination with the enforcement agencies will improve the relationship between them and the highway work forces, and will assure cooperation throughout the life of the project. These contacts are also vital for establishing channels of communication among the parties involved in managing traffic control through work zones, and help define the lines of authority and responsibility in case of emergencies.

During the process of developing the TTCP for work operations, the needs and requirements of law enforcement agencies and emergency response teams should be considered. Typically, this would include special provisions to aid police in performing their enforcement duties, such as sites for pulling vehicles off the travel lanes to issue speeding citations or to perform size, weight, and height checks on suspect vehicles. To aid police in

speed limit enforcement, the traffic control scheme should also provide for strategically located stations for radar units and patrol vehicles.

In those instances where police officers are to be employed for Temporary Traffic Control in an off-duty capacity, adequate procedures for obtaining their services must be developed.

The role of law enforcement personnel in Temporary Traffic Control

Deployment of law enforcement personnel in work zones has been most beneficial under the following conditions:

- To provide added protection for work crews during the installation and removal of traffic control devices in the Temporary Traffic Control zone. Strategic positioning of police cruisers equipped with flashing lights increases the conspicuity of the operation and the vehicles can be used to temporarily block traffic lanes to ease the placement of devices. The presence of police officers also tends to reduce travel speeds on the highway section.

- To enforce compliance with reduced statutory speed limits through the work zone. Field studies have demonstrated that speed reductions of 6 to 8 mph can be achieved if police officers are visible to motorists and enforcement actions represent a real threat to violators. The combination of a police vehicle with flashing lights stationed at the beginning of the transition area, and an officer motioning motorists to slow down, has been the most effective technique for achieving speed reductions.

- To manually control traffic movements through intersections in work zones.

- To enforce truck weight, width, and height limits and to enforce parking regulations.

- To assist in operations which involve nighttime traffic control.

While direct involvement of enforcement agencies in project activities may be desirable, higher priorities may preclude the availability of police officers for work zone traffic control. However, enforcement personnel have important responsibilities for traffic management in emergency situations, and they can be of assistance in inspecting and maintaining the viability of the TTCP throughout the duration of the work.

Management of an accident scene is normally a police function as are accident investigation and reporting. Arrangements between the highway agency and the police should include provisions for the timely notification of all parties if accidents or incidents

occur within the Temporary Traffic Control zone, and for the exchange of relevant documentation concerning these events.

Emergency situations

Emergency situations can occur on highways at any time and at any location, and can disrupt the efficient operation of the site. Frequently, these unexpected events reduce the capacity of a roadway section to some degree unless steps have been taken in advance to minimize or mitigate the potentially disruptive impacts of such occurrences. While procedures for managing emergency situations should be considered for all Temporary Traffic Control zones, careful planning is especially critical for longer duration work activities on multi-lane highways which carry high volumes of traffic.

Emergencies due to accidents, mechanical failure and breakdown of vehicles, cargo spills, inclement weather, and other events can reduce the capacity of a highway section from 20 to 80 percent, depending on the type of the event and its location. Experience also indicates that any type of incident sharply increases the potential for accidents. Studies have shown that secondary accidents account for better than 13 percent of all accidents on highways and that approximately 20 to 30 percent of all pedestrian fatalities on freeways can be attributed to some type of emergency situation.

In work zones, the management of emergencies is even more difficult due to the presence of unexpected conditions on or along the roadway, and because of the work activity itself. Reduction or narrowing of travel lanes, shoulder closures, the need for protective barriers at work sites, and distractions created by equipment and workers on or adjacent to the highway all make it more difficult to maintain access to the locations of accidents and incidence. Similarly, these conditions interfere with the efficient removal of disabled vehicles and injured persons. Careful advance planning, as well as the development of effective procedures in cooperation with other emergency management personnel and agencies, is necessary to minimize or mitigate the potentially disruptive effects of incidents and accidents at work sites.

Emergency management procedures

Effective emergency management procedures generally include the following five elements:

- Detection and Verification;
- Response;
- Removal; and
- Motorist Information.

Detection and verification

On small and short term projects, project personnel can usually be relied on to detect emergencies and to report incidents to the proper authorities. Arrangements can also be made with local enforcement officials to increase the frequency of police patrols through the Temporary Traffic Control zone. Electronic surveillance systems have been used successfully on very complex urban projects to detect and verify emergency conditions.

Response

Early and effective response is critically important in emergency situations. Plans to deal with emergencies should be developed prior to the establishment of the Temporary Traffic Control zone in cooperation with appropriate emergency response agencies. At a minimum, local highway agencies, the police, fire department, and ambulance services should be contacted and advised of the planned work activities. Where the potential for hazardous material spills exist, appropriate response teams should be alerted and consulted.

The level of detail of the response plan will be a function of the nature and complexity of the work and the disruption of traffic service which can be anticipated in emergencies.

Removal

Removal of disabled vehicles, injured people, or other obstructions from the roadway should be expedited as much as possible to restore the capacity of the roadway. Field studies have shown that each minute of incident duration causes four to five minutes of delay during off-peak hours and up to eight minutes of delay during peak-hour flows. However, in some instances it may be better to defer the removal of disabled vehicles if removal operations are more disruptive than the incident itself. Judgment is required to determine the best course of action in these situations.

When planning for emergencies during development of Traffic Control Plans, provisions can be incorporated into the TTCP which will aid in the removal of damaged or disabled vehicles from the traffic lanes and facilitate the investigation phase of the incident. Widened shoulders and pull-offs have been used successfully on high speed, high volume urban highway sections to temporarily store disabled vehicles in case of emergencies. Contractor furnished service vehicles or tow-trucks can be stationed at strategic locations within the work zone to expedite the removal of stranded or damaged vehicles.

Motorist information

The notification of motorists concerning traffic conditions ahead and the appropriate course of action to be taken is the last element of an effective emergency management process. The objective of this phase is to provide information to motorists which will reduce their level of frustration with roadway conditions and to reduce traffic hazards in the proximity of accident or incident locations. By providing relevant information to drivers, vehicle operating speeds can be reduced and, occasionally, traffic volumes passing the site of the temporary disruption can be reduced.

The most frequently employed technique for communicating emergency information to motorists is through the use of signing. Warning signs on temporary supports are the simplest method to furnish information to drivers, but the technique has severe limitations. Changeable message signs are much more effective for advising motorists of the conditions ahead, and they offer the flexibility to display precise instructions concerning the best course of action.

7.9 SUMMARY

The detailed design of plans for Temporary Traffic Control zones builds upon the product of the traffic and transportation planning process which generates the basic strategies for controlling traffic in conjunction with highway construction and maintenance activities. During the detailed design of the TTC Plan, the control strategy is revised and fine tuned to reflect impacts which may not be apparent in the early stages of the proposed project.

Temporary Traffic Control Plans can range in complexity from specific plans for each construction stage and phase for a given project to being a mere reference to the application diagrams shown in the MUTCD, to standard designs developed by state and local highway agencies, or utility company drawings.

The design of TTC Plans requires a thorough understanding of work zone traffic control principles and the exercise of good engineering judgment. The plan must be responsive to the economic and community characteristics of the area, must consider traffic and transportation patterns of the facility, accommodate seasonal changes and weather patterns, and provide for the safety of workers and highway users.

Typical Application diagrams contained in the MUTCD provide a good starting point for the development of the final TTC Plan. However, since it is very rare that the actual project location and site conditions exactly duplicate the conditions illustrated in the typical application examples shown in the manual, appropriate modifications must be made to these typicals. It must also be kept in mind that the applications shown represent minimum requirements, and additional and upgraded devices may be needed for a given situation.

The requirements for the design of TTC Plans for the most frequently encountered Temporary Traffic Control situations have been presented, and the use of typical plans and their modifications for rural two-lane roads, urban streets and intersections, multi-lane undivided roads, and freeways and expressways were illustrated. Short duration work was discussed, including acceptable modification of standard traffic control layouts to reflect the short term nature of these types of operations.

Exercise #2
Reading Temporary Traffic Control Plans

You and your co-worker are TCSs for an ITD Project.

You are reviewing the application of the Standard Drawing on the next page which has been provided to you by the Project Traffic Engineer.

Using the following factors, answer the questions below:

- This is a rural highway with a speed limit of 60 mph.
- Existing lanes are 12 feet wide.
- The shoulder is 10 feet wide.
- We are closing one lane.
- The activity area is 1600 feet long.
- The Transportable Attenuator is 80 feet long with a roll ahead distance of 172 feet

Exercise #2 Worksheet

What are the values of:

Sign spacing = _____

L (merging taper) = _____

B (buffer) = _____

How long is:

Shoulder Taper = _____

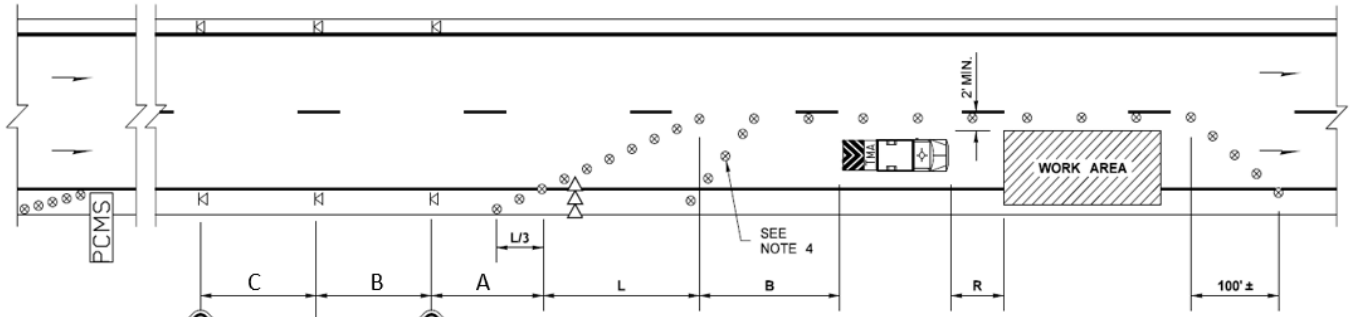
Downstream Taper (if used) = _____

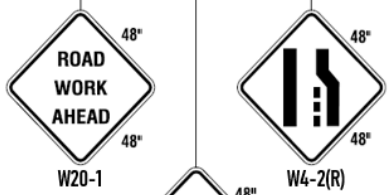
What is the minimum number of drums you will need?_____

What Arrow Board mode would you use in this drawing?_____

Minimum Lane Closure Taper Length = L (Feet)											
Lane Width (feet)	Posted Speed MPH										
	25	30	35	40	45	50	55	60	65	70	75
10′	105	150	205	270	450	500	550	600	650	700	750
11′	115	165	225	295	495	550	605	660	715	770	825
12′	125	180	245	320	540	600	660	720	780	840	900

Minimum Shoulder Taper Length = 1/3 L (Feet)											
Lane Width (feet)	Posted Speed MPH										
	25	30	35	40	45	50	55	60	65	70	75
8′	30	40	55	75	120	135	150	160	175	190	200
10′	35	50	70	90	150	170	185	200	220	235	250
Use a minimum of 3 devices in shoulder tapers less than 8 feet.											





	Distance Between Signs		
Road Type	A	B	C
Urban (low speed) 35 mph or lower	100 feet	100 feet	100 feet
Urban (high speed) 40 mph or greater	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway/Freeway	1,000 feet	1,500 feet	2,640 feet

MUTCD Maximum Channelizing Device Spacing	
TAPERS	SPACING
• MERGING – SHIFTING – SHOULDER	NOT TO EXCEED 1 X SPEED LIMIT IN FEET
• DOWNSTREAM	20 FOOT SPACING REGARDLESS OF SPEED
TANGENT	NOT TO EXCEED 2 X SPEED LIMIT IN FEET

LEGEND

- TEMPORARY SIGN LOCATION
- TRAFFIC SAFETY DRUM
- SEQUENTIAL ARROW PANEL
- TRANSPORTABLE ATTENUATOR
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

Buffer Data											
	Longitudinal Buffer Space = B										
Speed (MPH)	25	30	35	40	45	50	55	60	65	70	75
Length (ft)	155	200	250	305	360	425	495	570	645	730	820

NOTES

1. EXTEND DEVICE TAPER AT 1/3L ACROSS SHOULDER.
2. DEVICES SHALL NOT ENCROACH INTO THE ADJACENT LANE.
3. DEVICE SPACING FOR THE DOWNSTREAM TAPER SHALL BE 20′ (FT).
4. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000′ (FT) (RECOMMENDED).
5. ALL SIGNS ARE BLACK ON ORANGE.
6. FIELD LOCATION OF PCMS I-MILE IN ADVANCE OF LANE CLOSURE SIGNING.

CHAPTER 8
FLAGGING

8.1 SUMMARY

This chapter covers the proper use of flaggers in Temporary Traffic Control situations. Criteria for selecting and maintaining proper traffic controls and the safe and effective positioning of flagger stations will be addressed. This chapter will also present guidance on flagging techniques to reduce the potential hazards associated with this type of traffic control

8.2 THE FLAGGING FUNCTION

The primary function of Temporary Traffic Control is to move vehicles and pedestrians safely and expeditiously through or around work zones while protecting on-site workers and equipment. Flagging should only be used when all other methods of traffic control are inadequate to properly carry out this function. Flaggers are used to stop traffic intermittently at work sites and to assign right-or-way, or to slow traffic past the activity area to help protect the work crew.

Flaggers have very important functions in Temporary Traffic Control, which are:

- Directing traffic through the Temporary Traffic Control zone.
- Protecting the lives and property of road users and pedestrians.
- Protecting workers.
- Ensuring a safe separation between equipment operations and traffic movement.
- Courteously and intelligently respond to motorists' questions.

Flaggers and workers should be advised that every reasonable effort must be made to prevent excessive delays to the road users.

8.3 QUALIFICATIONS OF FLAGGERS

Individuals assigned to flagging operations should be certified and carefully selected because they are responsible for public safety and have the greatest number of public contacts of all highway workers.

The Traffic Control Supervisor (TCS) also shares in the responsibility for ensuring that flagging is performed properly. They should provide detailed instructions to flaggers concerning the nature of the activity and the flagging procedure to be employed, and periodically check on the performance of flaggers. Since flaggers must be alert at all times, they should be relieved from time to time and given the opportunity to rest. Supervisors also must ensure that flaggers stay on the job throughout the Temporary Traffic Control situation, and that proper advance warning signs are in place before flagging control begins.

Minimum qualifications for flaggers

- Be at least 18 or older
- Receive and communicate specific instructions clearly, firmly, and courteously.
    - Be able to see, hear, and comprehend information and instructions that are presented verbally or in writing.
    - Be able to communicate effectively with others and take positive appropriate action when needed.
    - Understand and apply safe traffic control practices, sometimes in stressful or emergency situations.
- Able to control signaling devices (such as a STOP/SLOW paddle) and physical motions to provide clear and positive guidance to drivers in frequently changing situations.
- Able to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.
- Move and maneuver quickly, stand for long periods, and perform other physical tasks.
    - Be able to see and hear warnings and hazards.
    - Be able to move quickly in order to avoid danger.
    - Be able to stand for prolonged periods on uneven surfaces (up to 10 hours).
    - Be able to move around on uneven surfaces and terrain; stoop, kneel, crouch, grasp, push, pull; and occasionally lift or move up to 40 pounds.
    - Be able to handle exposure to vibrations; working near moving mechanical parts; extreme cold, wet, or humid outdoor weather conditions; and fumes or airborne particles.
    - Be able to work in an environment with high noise levels.
    - Be able to work during irregular hours, under on-call status, and/or shift times.

ITD Traffic Manual 6E.01 Qualifications for Flaggers

Flaggers must be trained and possess a current flagger certification from ATSSA or Evergreen Safety Council, or possess a current flagger certification that was obtained in Washington, Oregon, Montana, or Utah. ITD has reciprocity agreements to recognize certifications obtained in those states. Refer to the *Work Zone Safety and Mobility Program.*

8.4 EQUIPMENT AND CLOTHING

Equipment

The MUTCD (Section 6E.03) contains minimum requirements for the two hand signaling devices which may be used by flaggers in Temporary Traffic Control situations: the STOP/SLOW paddle and the red flag.

The STOP/SLOW paddle should be the primary and preferred hand-signaling device because it 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 in 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 retroreflective.

A larger 24-inch STOP/SLOW paddle may be used to improve visibility. Larger paddles, equipped with 6 to 7 foot staffs, are frequently used because they are less prone to being misused and are easier to hold in the correct flagging position for extended periods of time. The longer staff also elevates the STOP/SLOW paddle above the level of stopped vehicles, making them easier to see by approaching road users.

Flaggers should also be equipped with a device capable of providing audible warning to the work crew in case of an emergency, such as an out-of-control vehicle or inattentive driver. Whistles, radios or air horns are frequently used for this purpose.

Standard Specifications 626 - Flagger Equipment. Ensure flaggers wear high-visibility safety apparel and are provided a STOP/SLOW paddle.

Automated Flagger Assistance Device (AFADs)

According to MUTCD Section 6E.04, Automated Flagger Assistance Device (AFADs) enable flaggers 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.

According to ITD's Traffic Manual section 6E.04, ITD's policy governing AFAD application is that AFADs can be used if an engineering study estimates that AFAD use will improve TTC zone safety, or will reduce project cost without detrimentally affecting TTC zone safety. Consider the following in the engineering study:

a. Conditions applicable for the use of Method 1 and Method 2 AFAD operation
b. Highway volume
c. Maximum distance between AFADs
d. Conflicting lenses/indications monitoring
e. Fail safe procedures
f. Need for additional signing and pavement markings
g. Application consistency
h. Use of larger signs or lenses to increase visibility
i. Use of backplates

High visibility safety apparel (MUTCD Section 6E.02)

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 and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure.

The apparel background (outer) material shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material color 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 ft. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

For nighttime activity, high-visibility safety apparel that meets the Performance Class 3 requirements of the ANSI/ISEA 107-2004 should be considered for flaggers.

Safety apparel refers to the outermost layer excluding the hard hat.

8.5 FLAGGER STATIONS

Per MUTCD 6E.08:

Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.

Except in emergency situations, flagger stations shall be preceded by an advance warning sign or signs. Except in emergency situations, flagger stations shall be illuminated at night.

Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.

The distances shown in Table 6E-1, which provides information regarding the stopping sight distance as a function of speed, may be used to determine the location of the flagger station. These distances may be increased for downgrades and other conditions that affect stopping distance.

Table 6E-1. 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

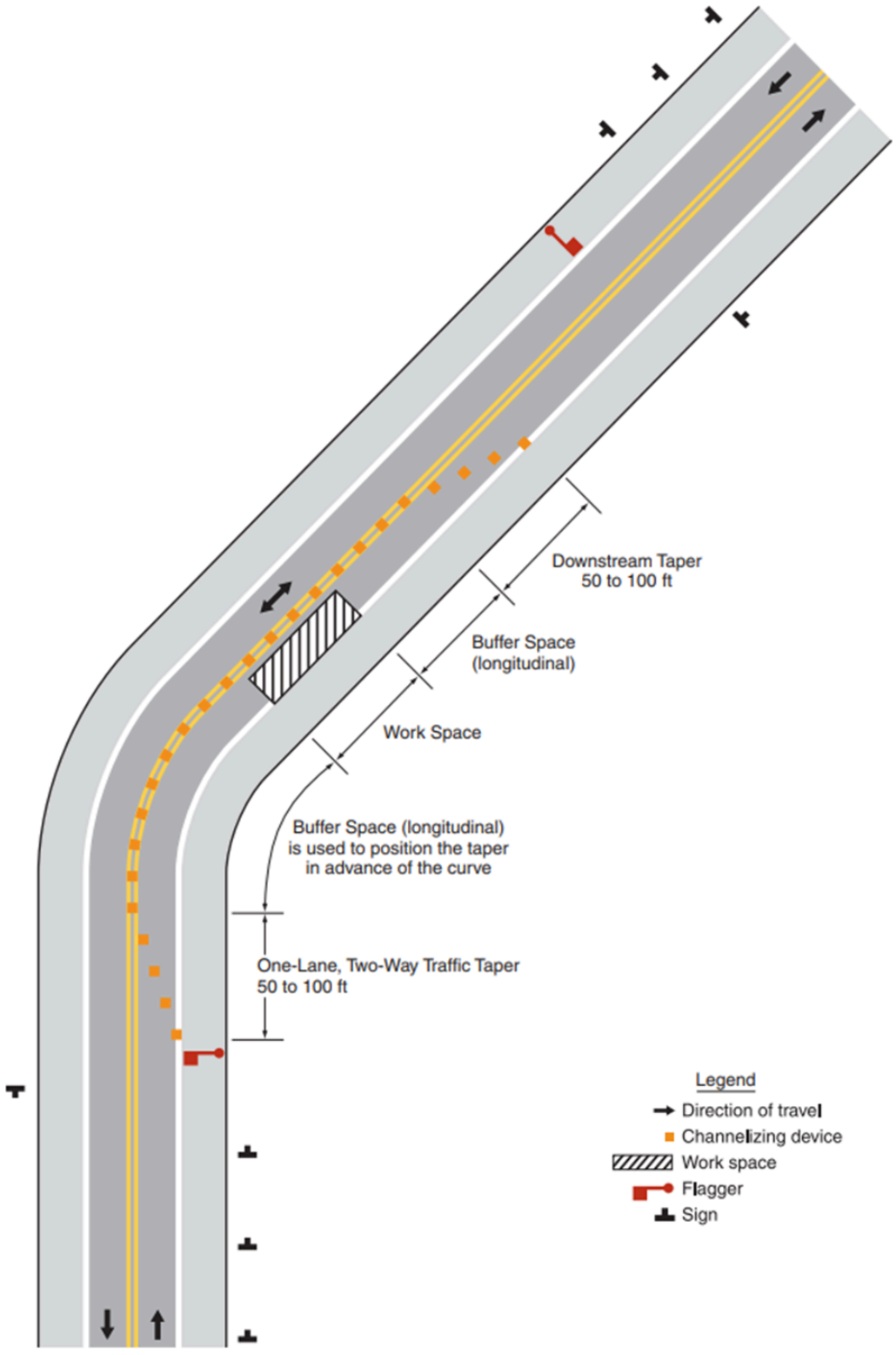
As much advance sight distance as can reasonably be obtained should be provided in selecting the flagger station. This is especially critical at crest vertical curves and at horizontal curves where the flagger station must be moved upstream to assure adequate sight distance for approaching traffic.

Visibility guidelines

The following should also be considered when selecting flagger stations:

- The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns, radios or whistles) of approaching danger by out-of-control vehicles.
- The flagger should stand either on the shoulder adjacent to the road user being controlled, or in the closed lane prior to stopping road users.
- A flagger should only stand in the lane being used by moving road users after road users have stopped.
- The flagger should be clearly visible to the first approaching road user at all times.
- The flagger also should be visible to other road users.
- The flagger should stand alone, never permitting a group of workers to congregate around the flagger station.
- At spot lane closures where adequate sight distance is available for the reasonably safe handling of traffic, the use of one flagger may be sufficient.

Figure 6C-3. Example of a One-Lane, Two-Way Traffic Taper



Flagger rules of conduct

- Be clearly visible to approaching traffic at all times.
- Motorists should be able to see you from 500 feet away.
- Do not stand in front of parked/stopped vehicles.
- Always be aware of oncoming traffic.
- Do not step into, or turn your back on, traffic.
- Stand on the shoulder of the road observing traffic and the work zone. Sometimes you may have to stand on the opposite side of the road to effectively direct traffic around the work area.
- Choose the best flagging position that will provide the greatest color contrast between you and the background.
- If at all possible, do not stand in the shade.
- Never flag from inside a vehicle.
- Do not lean, sit or lie on a vehicle.
- Stand alone. Do not permit a group of workers to congregate around you.
- Familiarize yourself with the nature of the work being performed. Be able to answer motorists' questions.
- Establish a warning signal with the work crew in case of an emergency.
- Plan an escape route in case of an emergency.
- Stay alert! Be ready to respond to an emergency.
- Record the license number and description of any vehicle whose driver disobeys your instructions and threatens the safety of the work area. Report this information to the authorities.
- Be courteous and professional.
- Keep your mind on your job. Be aware of the work in progress.
- Do not do any other work when flagging.

- Do not use cell phones or other handheld or audio devices while performing flagger duties (two-way radios used to communicate with other flaggers are acceptable).
- Do not involve yourself in unnecessary conversation with workers, pedestrians, or motorists.
- Do not leave your position until you are appropriately relieved.
- Cover, turn, or remove the “FLAGGER AHEAD” sign when a flagger is no longer on duty,
- Always carry your flagger certification card and government issued ID while on the job.

8.6 FLAGGER PROCEDURES

Per MUTCD Section 6E.07:

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

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.

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 motorists to proceed.

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.

To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users may motion up and down with the free hand, palm down.

8.7 FLAGGING SITUATIONS

The flagger method of one-lane, two-way traffic control

When a one-lane, two-way TTC zone is short enough to allow a flagger to see from one end of the zone to the other, traffic may be controlled by either a single flagger or by a flagger at each end of the section.

When a single flagger is used, the flagger should be stationed on the shoulder opposite the construction or work space, or in a position where good visibility and traffic control can be maintained at all times.

Two flaggers should be used when good visibility and traffic control cannot be maintained by one flagger station. Traffic should be controlled by a flagger at each end of the section. One of the flaggers should be designated as the coordinator. Flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals.

Flag transfer method of one-lane, two-way traffic control

In this method, the driver of the last vehicle proceeding into the one-lane section is given a red flag (or other token) and instructed to deliver it to the flagger at the other end. The opposite flagger, upon receipt of the flag, then knows that it is safe to allow traffic to move in the other direction.

A variation of this method is to replace the use of a flag with an official pilot car that always follows the last road user vehicle proceeding through the section.

The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually not more than 1 mile in length.

Pilot car method of one-lane, two-way traffic control

A pilot car may be used to guide a queue (group) of vehicles through the Temporary Traffic Control zone or detour.

The operation of the pilot vehicle should be coordinated with flagging operations or other controls at each end of the one-lane section. The pilot car should have the name of the contractor or contracting authority prominently displayed.

Per the ITD Standard Specifications for Highway Construction (626.02L):

Provide a vehicle with a PILOT CAR FOLLOW ME sign mounted on the rear of the pilot vehicle. Show the company name of the pilot car contractor on each side of the vehicle.

Per MUTCD 6F.58:

"The PILOT CAR FOLLOW ME (G20-4) sign shall be mounted at a conspicuous location on the rear of the vehicle".

If at any time during one way, two-lane operations either of the flaggers loses track of which direction has the right of way, or if a driver violates the signals of the flagger, all traffic should be stopped until the right of way is firmly reestablished.

Flagging in one direction

Flagging may be required in one direction of traffic only, such as to facilitate loading or unloading of vehicles, and at points of entry to and exit from the work site. In these situations, traffic may have to be stopped intermittently in one lane for short periods of time only. The flagger should maintain a position on the shoulder or at the side of the roadway out of the direct path of oncoming traffic, and stop approaching vehicles in the usual manner. When the operation is completed and the road is clear of work vehicles, the STOP/SLOW paddle should be turned one quarter turn with the STOP message facing the flagger. In this position the sign paddle is parallel to the roadway and neither message is visible to motorists approaching from either direction.

Haul road crossings

At haul road crossings, temporary stoppage of all traffic may be accomplished by use of one or two flaggers, depending on traffic volumes, travel speeds, and sight distance. The first vehicle shall be stopped by the flagger from the position on the shoulder or at the side of the road, and he or she should then move to the centerline of the roadway to stop additional approaching traffic. When the area is clear of work vehicles the flagger should return to the shoulder or side of the road and release traffic in the usual manner.

Consideration should be given to controlling traffic at haul road crossings with temporary traffic signals rather than the use of flaggers. If signals are used for these purposes, they must meet the physical and operational requirements of conventional traffic signals as described in MUTCD Figure 6H-14.

Special flagging situations

Flaggers are sometimes needed to advise motorists of specific conditions or hazards which may be encountered in a TTC zone, to control the speed of passing traffic, to protect

workers involved in the installation or removal of traffic control devices, to protect survey crews working within the roadway, to assist during mobile operations, and in emergency situations. Individuals assigned to these duties should be fully advised as to the nature of the operation and the control strategy to be implemented. The flagger should observe the principles discussed earlier in conjunction with proper positioning of flagger stations.

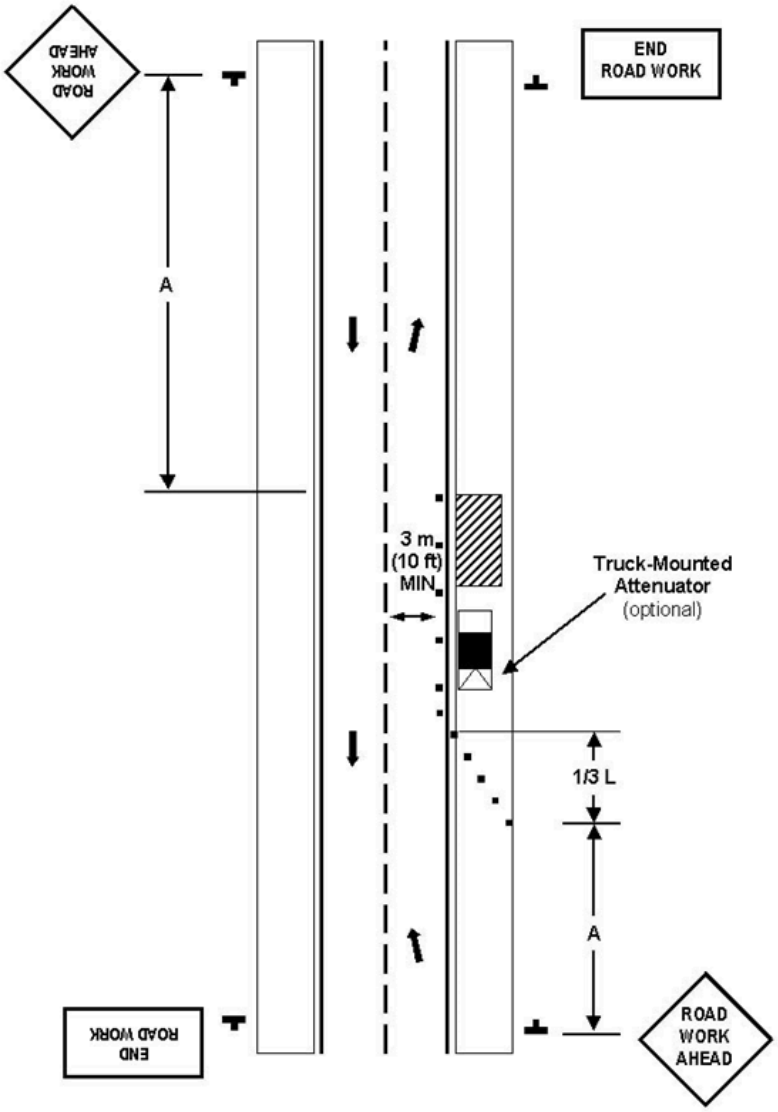
Long term operations

For long term stationary operations, the installation of a temporary traffic signal is preferable to a flagging operation. Issues such as flagger and driver safety, nighttime visibility, and cost effectiveness suggest strong consideration be given to traffic signal usage (see Figure 6H-12 and Chapter 4G of the MUTCD).

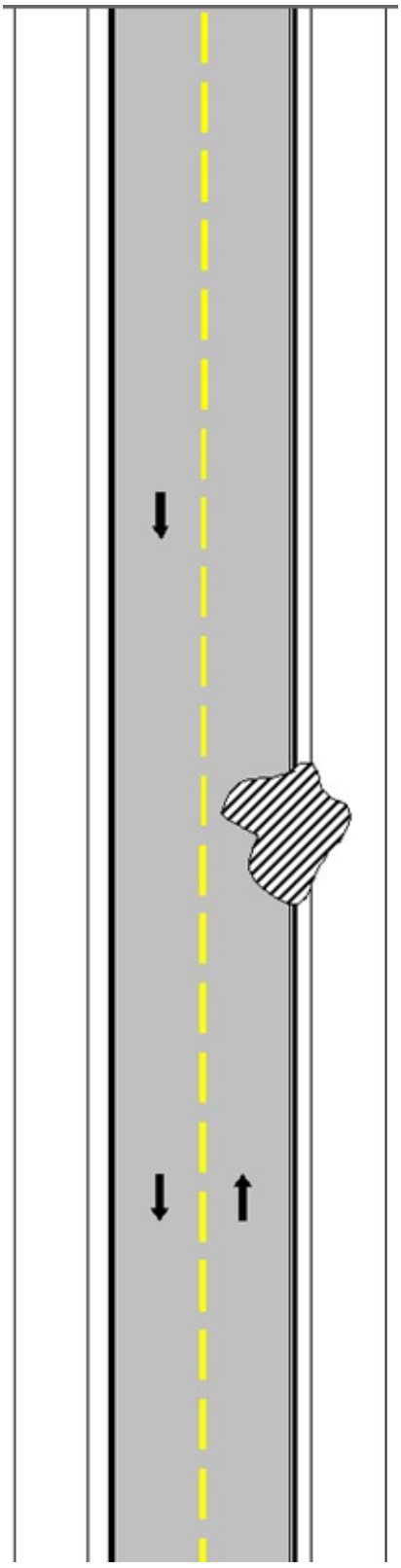
Exercise #3

Identifying Special Requirements When Flaggers Are Used

You are the TCS for the following work operation. You initially received this approved Temporary Traffic Control Plan from the project coordinator. However, unforeseen circumstances require that the work crew move their work 5 feet into the lane of traffic. On the next page, illustrate the changes in the Traffic Control Plan you will recommend to the project coordinator to safely move motorists through the work zone. The speed limit is 35 MPH and the lane is 11 feet wide. The shoulder is 10 feet wide. The activity area is 100 feet long. The work operation is scheduled from 2pm to 9pm.



Exercise #3 Worksheet



CHAPTER 9
Installing and Removing Temporary Traffic Control Devices

9.1 SUMMARY

This chapter discusses the process of installing and removing traffic control devices in Temporary Traffic Control zones, including preparation, the order of device installation, the treatment of existing signs, and the use of “shadow” or “protection” vehicles. Procedures for safely modifying, reinstalling, and moving traffic control devices are also discussed.

9.2 PREPARATION FOR INSTALLATION

The installation, modification, and removal of traffic control devices for roadway construction, maintenance, utility, and incident management operations can be enhanced by adequate preparation. This is particularly important because of the hazards associated with these activities. Installation and removal of Temporary Traffic Control zones create situations that are often far more hazardous than the operation of the completed zone. These hazards are often greater than those during the work activity because:

- Workers placing advance warning signs and channelizing devices will be in the roadway at points of high conflict without the full protection of the devices being placed.
- The placement operation constitutes an unexpected situation for motorists as they are confronted with a roadway partially closed and a partial Temporary Traffic Control zone.

The inherent danger of these operations can be lessened by using techniques that emphasize safety. Also, to reduce the exposure to hazards, the installation should be done as quickly as possible. To this end, several elements must be considered before the installation of the TTC zone is undertaken.

Coordination with affected groups

Prior to the installation of a TTC zone, the planned activities and the starting times should be coordinated with all affected organizations and groups, including the following:

- Police
- Traffic department
- Fire department

- Rescue department
- School system
- News media
- Businesses and industries
- Public transportation
- Residents

Planning the installation

Analysis of the specific requirements for a given situation prior to the installation of the Temporary Traffic Control zone greatly improves the safety and efficiency of the installation.

A visit to the site is often necessary to gain better familiarity with the roadway geometrics and other conditions, which may not be indicated on project plans or in contract documents.

Inventory and storage

A complete inventory, listing all required traffic control devices and equipment for all phases of the operation, should be prepared.

All traffic devices required for the initial installation and subsequent maintenance of the Temporary Traffic Control zone should be on hand and in good condition. Also, special equipment, trailers, and trucks should all be operating properly and safely.

Traffic control devices need to be stored properly to avoid marring or otherwise damaging retroreflective surfaces, and all devices need to be kept clean.

- Proper sign storage techniques are discussed in Chapter 5. All mechanical and electrical elements and equipment require routine maintenance to assure that they will function properly. It is important to maintain a readily accessible inventory of spare parts for control devices, signs, and mounting devices. The replacement of damaged devices after an incident or an accident or even after a routine inspection is much easier and faster if an inventory of spare parts is available.

Training and instruction

All crew members should be trained for their tasks, with particular emphasis on safety. To ensure that all crew members know their installation assignments, are thoroughly familiar with the mechanical operation of special devices, and to assure an efficient and speedy operation, the supervisor should review the installation process with the crew before going

into the field. If a new or different procedure is to be used, or if new people are in the crew, these instructions are essential. In some cases, a rehearsal in the company yard, parking lot or, if available, on an abandoned segment of a roadway may be desirable.

Installation crews should be cautioned to always face oncoming traffic during the establishment, modification, and removal of Temporary Traffic Control zones, and to prepare for emergencies by planning escape routes in advance.

9.3 INSTALLATION

Installation sequence

Devices are installed in the direction that traffic moves — that is, moving "downstream." The first device placed is the first advance warning sign. The installation then proceeds with the:

- Advance warning area,
- Transition area,
- Activity area, and
- Termination area.

When traffic in both directions is affected

If traffic in both directions will be affected, such as with work in the center lanes, the devices can be placed in both directions at the same time, starting at each end farthest from the activity area or work space. Alternatively, one direction can be installed before the other.

Opposing lanes

When one direction of traffic will be directed into opposing traffic lanes, such as in MUTCD Figure 6H-10, 6H-24, 6H-31, and 6H-39, or when traffic in both directions must alternately operate in the same travel lane, the signs, channelizing devices, and pavement markings for the opposing traffic should be placed first. It is essential to channelize opposing traffic out of its lane before moving the oncoming traffic into the lane. When all signs and devices are placed for opposing traffic, the devices for the oncoming direction can then be set up.

Repeated installation and removal of devices

When signs or channelizing devices are to be installed and removed several times during the work operation, a spot may be painted on the roadway surface to indicate where each device is located. This enables the crew to reinstall the devices quickly and properly.

Detours

The installation and removal sequences for detours are the opposite of that described above, because drivers must be given adequate guidance once they are instructed to divert to a detour roadway. Similarly, the first signs to be removed when the detour is no longer needed are those which motorists would normally encounter at the upstream terminus of the detour.

Using lights, signs, and other devices during installation

Drivers do not expect workers to be in the roadway setting up a Temporary Traffic Control zone. Since the goal is to make the entire operation safe, flashing vehicle lights and special lighting devices should be used to warn motorists of the presence of workers. It may be necessary to use temporary signs during the installation sequence to protect workers while they are installing the more permanent signs for a Temporary Traffic Control zone. Flashing arrow panels and TMAs are valuable to assist the workers during placement or removal of channelizing devices for lane closures.

Installation procedure

Work vehicles should be parked in a safe location, such as legally at the curb, on the shoulder, or on a side street, while unloading crews and devices.

The work vehicle may serve as the advance warning device by using its flashing/rotating lights while the first warning signs are being placed. To protect the crew, the truck should be located upstream of them. This can be awkward, however, if signs need to be unloaded from the rear of the truck.

On high-speed roads, a “shadow” and/or “protection” vehicle should be used. When the first signs are placed, this vehicle should be positioned on the shoulder 100 feet or more behind the truck holding the devices. The shadow vehicle should be equipped with special lights, a rotating dome light, and/or a flashing arrow display to alert and warn approaching traffic. When the crew needs to work on the roadway, the shadow vehicle is moved into the traveled lane. Truck mounted attenuators are desirable for these vehicles.

Placing channelizing devices

When closing a lane, tapers are laid out in a straight line, starting at the shoulder. Each channelizing device is then placed in sequence, moving downstream. When placed by hand, the devices should be moved out from the shoulder, with the worker looking toward traffic as they move into the lane to place the device.

Cone placement

Cones may be placed either by workers on foot or from a moving vehicle. When working from a vehicle, the truck should be equipped with an approved worker platform and railing. On high-speed roadways, a shadow vehicle should be used to protect a worker who is working from the back of the truck.

Lateral position

For some lane closures, traffic does not have to be excluded from the entire width of the lane in order to establish a safe work space. Under these circumstances, channelizing devices should be placed a few feet back from the lane line to:

- Reduce the chances of the devices being hit, and
- Provide increased lateral clearance, thereby increasing capacity.

The setback distance should not exceed 4 to 5 feet to preclude the use of this offset space as a travel lane.

Ballast

Drums (MUTCD 6F.67)

Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze, causing a hazard if struck by a road user.

Ballast shall not be placed on the top of a drum.

Barricades (MUTCD 6F.63)

On high-speed expressways or in other situations where barricades may be susceptible to overturning in the wind, ballasting should be used.

Option: Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

Lane closures on freeways and expressways

Lane closures on multi-lane, unidirectional highways are of two types. “Exterior” lanes are those where the lane is bordered by a shoulder along one edge. “Interior” lanes, such as the center lane of a three-lane roadway, are bordered by travel lanes on both sides.

Exterior lane closures

The lane is closed by having a protection vehicle along the shoulder or exterior lane, if no shoulder is available. The vehicle should be equipped with warning lights and possibly a flashing arrow display. The protection vehicle stops in a blocking position at least 100 feet upstream while the first advance warning sign is placed. This operation is repeated for all warning signs — first for one side, then the other side of the roadway.

When all signs are in place, channelizing devices are placed. The protection vehicle gradually encroaches upon the exterior lane as workers install the taper in front of the protection vehicle. Finally the protection vehicle is positioned in the closed lane while the channelization for the activity area is installed.

Interior or center lane closures

When work is necessary on an interior or center lane, it is recommended to also close an adjacent exterior lane to avoid an “island” closure. Where, because of volumes or geometrics, traffic must be directed around both sides of a work space occupying an interior lane, it is preferred to reduce the number of travel lanes by closing an exterior lane upstream of the activity area and then to shift traffic back into the exterior lane around the work space. Part 6 of the MUTCD, Section 6H, Figure 6H-38 illustrates this type of traffic control scheme, but the use of a flashing double arrow display for high-speed conditions is highly controversial, because drivers are confused about which direction to drive.

The following procedure should be used for a center lane closure:

- Advance warning signs are placed on both sides of the approach roadway and the exterior lane is closed in the usual manner to create an “empty” work space.
- The protection vehicle, preferably equipped with a flashing arrow display and a TMA, moves to the downstream end of the closed exterior lane and blocks the adjacent center lane.
- The taper which moves traffic to the previously closed exterior lane is installed, and channelization for the closed center lane is established on both sides of the activity area.
- Required signing is placed in the closed center lane and the protection vehicle may be moved to a blocking position in the work space.
- In the final configuration, traffic is permitted to flow around both sides of the activity area.

9.4 REMOVAL

Removal sequence

Temporary Traffic Control zones should be removed by picking up the devices in the reverse sequence to that used for installation. This requires moving backwards or upstream through the work zone. An alternate procedure, especially applicable where no suitable shoulders exist, is to remove the traffic control devices in the reverse order of installation and to temporarily place them on the side of the highway. The work vehicle then can travel in the downstream direction to collect the devices.

In a detour situation, the signs at the beginning of the detour should be removed first as soon as the original route is again open to traffic. The remainder of the detour signs/devices can then be removed.

Placement and removal of portable barriers requires special care and planning. Frequently, the lane adjacent to the barrier must be closed temporarily while the barrier sections are installed. This operation should be scheduled to cause as little traffic disruption as possible.

Fundamental Principles of Temporary Traffic Control (MUTCD-Section 6B.01)

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.

Where extensive modifications to the Temporary Traffic Control zone are required, for example when switching a closure from one side of the roadway to the other, it may be necessary to remove the entire installation and then reinstall it in the new configuration.

Traffic control devices should be inspected carefully when they are returned to inventory and those found to be nonstandard or in poor condition should be retired, modified, or repaired.

9.5 SPECIAL EQUIPMENT AND TECHNIQUES

Several highway agencies, contractors, and manufacturers have devised special equipment to facilitate and expedite the installation process. One feature that is often found are racks

in which signs are loaded in the reverse sequence to that needed in the field; that is, the last sign put on is the first one to be taken off.

Special traffic control vehicles should be available for Temporary Traffic Control zone installation, maintenance, and removal. Such vehicles are also useful in emergency situations.

Cone dispensers

Special cone chutes have been developed which permit cones to be placed on the roadway from a moving vehicle. This technique enables high-speed highway lanes to be closed quickly and safely.

When plastic drums or barricades are used on channelizing tapers for long-term construction projects, cone dispensers may be used to install a temporary channelizing taper. The barricades or plastic drums are then installed inside the cones, allowing adequate time for their placement and ballasting.

Exercise #4

Temporary Traffic Control Device Inventory

Using the Temporary Traffic Control Plan you recommended in Chapter 8, Exercise #2, develop a Temporary Traffic Control Device Inventory.

List the number and types of all devices you will use to adequately set up the Temporary Traffic Control Zone.

Device	Quantity

CHAPTER 10
TCP Management and Evaluation

10.1 SUMMARY

This chapter will discuss the tasks and procedures involved in the management and evaluation of Temporary Traffic Control zones. Topics to be addressed include the initial inspection of the Traffic Control Plan, maintenance of the traffic control devices to assure their proper performance throughout the duration of a project, collection and analysis of accident and incident data, and modification of the TCP to correct problems or deficiencies.

10.2 TRAFFIC CONTROL PLANS (TCPs)

ITD Administrative Policy 5530

Construction contracts shall include a comprehensive Traffic Control Plan that addresses the safety, public convenience, and mobility of traffic, pedestrian, and bicycle movement during construction. The Engineer or designee shall approve any changes to the Traffic Control Plan prior to implementation. Work activities within the construction work zone shall not commence until the approved traffic control devices are in place in accordance with the approved Traffic Control Plan. When traffic must be maintained through all or part of a construction work zone, an inspector trained in traffic control shall be assigned to monitor the approved Traffic Control Plan and recommend changes.

Traffic crashes and injuries associated with other modes of transportation that occur within a construction work zone shall be documented and reported to the Construction Engineer and the District Safety Coordinator.

10.3 IMPLEMENTING THE TRAFFIC CONTROL PLAN

The installation, removal, inventory, and maintenance of traffic control devices are covered in Chapter 9.

Advance preparation

A good time to discuss inspection procedures is during the pre-construction conference. This discussion should identify:

- The TCS who will perform the inspection;
- Who has the authority to make changes;

- Who can be called upon for assistance and expert advice; and
- The responsibilities of the contractor during the inspection itself and in making changes to the plan and traffic control devices.

On many projects, a large number of different Traffic Control Plans may be needed during various phases and stages of operations. Each of these plans should be evaluated and approved in the same manner as the initial plan as before they are implemented in the course of the work.

10.4 INITIAL INSPECTION OF THE TRAFFIC CONTROL PLAN

The Contractor shall provide an individual who is a certified Traffic Control Supervisor to direct the installation, modification, and maintenance of the required traffic control. *(ITD Standard Specifications Section 105.14)*

A newly implemented TCP may not operate as well as it was designed to operate. To lessen potential hazards to motorists and workers, Traffic Control Plans should be inspected and evaluated immediately after they have been implemented to determine if changes are needed. The information obtained during the initial inspection of the work zone may disclose deficiencies and operational problems which indicate potential hazards and can be corrected before any accidents occur.

During the initial inspection, the following should be reviewed:

1. Field installations of devices should comply with the plans and specifications to assure that the proper devices have been correctly mounted and installed at the proper locations.
2. Message content of signs should be reviewed to see if they communicate the proper information to motorists.
3. At all transitions, the location of the tapers, their lengths, channelizing device type and spacing should be checked and evaluated for proper operation.
4. Any existing signs, traffic signals, and other permanent traffic control devices which are not needed or are in conflict with the Temporary Traffic Controls, should have been removed or covered.
5. Temporary pavement markings should have been applied and permanent markings completely removed if required by the Traffic Control Plan.

6. Verify that proper protection has been installed through the activity area to separate the buffer and work spaces from the traffic space and that a clear travel path has been defined for motorists.

7. A determination should be made about whether the work zone can safely and efficiently be operated without flaggers. If it can be, flaggers need not be exposed to the hazards associated with this type of operation.

8. If flaggers are used, their appearance, equipment, flagging techniques, and location should be checked for correct practices.

9. Workers in the immediate vicinity of the traveled way should be properly equipped with safety vests or clothing, and instructed to avoid unnecessary exposure to traffic.

10. Work vehicles should be parked away from traffic so as not to create an unnecessary fixed hazard.

The initial inspection should also include a night visit to the Temporary Traffic Control zone.

11. The system of control devices should be checked to determine if they properly delineate the traffic path through the work zone.

12. Signs which are not needed after the workday has ended should be covered, turned or laid flat.

13. Warning lights should be operating in the proper mode and retroreflective materials on signs and channelizing devices should be clean and bright.

14. Temporary pavement markings should be in good condition and clearly delineate the travel path, and unwanted permanent markings should have been completely removed so motorists will not be misled.

Modifications to the Traffic Control Plan

Modifications to Temporary Traffic Control 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 shall have the approval of the responsible highway agency prior to implementation. Notify the Engineer at least 2 business days before making Traffic Control Plan changes and submit the revised Traffic Control Plan for approval. *(ITD Standard Specification 104.05(d))*

10.5 MAINTENANCE

Maintenance inspections

Once a Temporary Traffic Control zone has been established, it must be maintained so that it will function as effectively as when initially installed.

Periodic review of traffic control devices is necessary to assure that they are performing satisfactorily, that their condition and retroreflectivity is adequate, and that they have not been moved, damaged or otherwise rendered ineffective.

> **ITD Standard Specifications (626.03):**
>
> Ensure Temporary Traffic Control devices are in acceptable condition, or repair or replace marginal and unacceptable devices, as defined in the *ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features*. Repair or replace devices that are unacceptable as defined in the ATSSA guidelines.
>
> Ensure that Temporary Traffic Control devices remain in place and serviceable during the time their use is required. Provide weighted bases when necessary to ensure that channelizing devices remain in place.

Perform periodic maintenance of traffic control devices, service equipment, and take corrective actions as the result of any combination of the following factors or events:

- Traffic accidents
- Device displacement due to:
    - Vehicular contact
    - Work activities
    - Slip stream from trucks
    - Wind or storms
    - Worker actions
- Damage caused by construction activities
- Weather damage
- Equipment malfunction and bulb burnouts
- Spent fuel or batteries
- Physical deterioration
- Road dust, dirt, grime, splatter, etc.
- Vandalism
- Vegetation growth
- Improper sign covers

- Abrasion of pavement markings

Inspection frequency

Monitor and maintain traffic control devices during non-working hours and non-working days. During non-working hours, have an employee available to maintain traffic control devices. During non-working days, perform required maintenance and review the traffic control at least once per day as approved. Provide a written statement describing the time and work performed during non-working hours and non-working days. *(ITD Standard Specification 105.14(d))*

Traffic control devices may need to be inspected more than once per day. Inspections should occur at least once during each work shift, after the initial inspection. The following factors must be considered in determining the frequency of inspection of the traffic control installation:

- Project size and duration
- Traffic volumes and speed
- Severity of the hazards
- Frequency at which damage is occurring

Provisions should also be made to inspect the Temporary Traffic Control zone when no active construction activities are underway. This would include periods when work is temporarily suspended, but the work zone remains in place, such as during weekends and holidays. Especially critical are weekends which also include a holiday because of typically higher recreational traffic volumes during these periods and the increased exposure of the TTC devices to traffic.

Drive-through inspection

One way of performing an inspection is to drive through the work zone and observe motorists traveling through the area. The drive-through inspection enables the observer to see the traffic control devices from the perspective of motorists and to perform the maneuvers required of other drivers. This type of inspection should be conducted in all lanes and in both directions, on crossroads, from all entry and exit points within the control zone, and during day and night. Any other routes, such as detours and temporary diversions, should also be driven.

10.6 DOCUMENTATION

Documentation is an essential part of the traffic control function. It is necessary for good planning and project accounting, and essential in instances of legal action.

Documentation serves to ensure the integrity of the project traffic control by providing a means of:

- Identifying the changes/maintenance needed,
- Getting changes/maintenance started,
- Checking to see that changes/maintenance are done, and
- Documenting that changes/maintenance were done.

(ITD Contract Administration Manual 626.01 - ITD personnel only)

The Construction Inspection Report (ITD-1406) shall be used to document conformity of the traffic control provided on the project to the plans, Traffic Manual, standard drawings, MUTCD, and any approved modification of the Traffic Control Plan (TCP) at the initiation of the traffic control operation and when changes are implemented. A nighttime review should be included to verify the visibility and adequacy of traffic control devices under the condition of darkness. Subsequent day and night reviews should be made by the Engineer or other qualified staff members periodically and the results documented in the project files using the ITD-1406 form.

The Standard Construction Diary (ITD form 0025) should be used by the TCS to document daily activities and inspection.

Reports should include information about the Temporary Traffic Control devices used on the project, how their arrangement permits traffic to flow, and any changes which were made to the Traffic Control Plan.

A good technique for documenting the immediate thoughts and observations of the person performing the inspection is to use a portable audio recorder. Photos, time-lapse cameras, photo-logging, and videotaping have been used to capture the driver's perspective of the Temporary Traffic Control zone and to create a permanent record of the completed installation. It is important that all such pictures and recordings be keyed to the project by station or milepost, and that these records be dated and identify the person who performed the inspection.

These periodic inspections must be documented for use in the event of lawsuits resulting from accidents in a work zone, or if complaints and grievances are filed by injured or inconvenienced roadway users. The work zone traffic control can then be reconstructed.

Daily diary content

Documentation should include:

1. Starting and ending time of work
2. Time and location of installation and removal of traffic control
3. Location of work
4. Revisions to the Traffic Control Plan
5. Names of personnel
6. Type of equipment used
7. Lighting utilized at night
8. Changes in temporary or permanent regulatory devices
9. Observations of traffic conditions

Several methods of recording traffic controls are available. These include:

- **Photographs** either keyed to a diary or containing a brief description of:
    - Time
    - Location
    - Direction
    - Photographer's name
- **Video** of the work zone drive-through can also be used to document the placement and condition of traffic control devices.
- **Special notes on construction plans** (preferably the Traffic Control Plan sheet)
- **Diary entries** of times, location, and names of individuals (when known) involved in the installation, modification, or removal of traffic control devices

All pictures and recordings should be keyed to the project by station, milepost and work zone area. Include the name of the person performing the inspection.

When the inspection process reveals a condition that requires correction, the documentation should include:

- Description of the correction needed, when it was noted, and by whom,
- Corrections made or deferred and why,
- Replacements made or deferred and why, and
- Any other needed actions.

EXERCISE #5

Preparing a Daily Traffic Control Diary

During your initial drive-through inspection of the traffic control zone from Chapter 9, you found the following deficiencies:

1. The north bound "FLAGGER AHEAD" sign was lying flat on the ground.
2. There were two cones out of place in the tangent.
3. The south bound flagger was flagging traffic from the center of the active south bound lane.

Record your findings on the “Standard Construction Diary” (found on next page). Be as detailed as possible on the observations you made during your drive-through inspection and include any corrective actions you took.

ITD 0025 (Rev. 3-05)
Supply # 27-008200-1

Standard Construction Diary

Key Number	Date	Inspector's Name (Initial if Filling Out Electronically)

Page _____ of _____

Notes

Weather Conditions and Temperatures	Time Contractor Started Work	Time Contractor Stopped Work

Contractor	Chargeable Days ☐ Yes ☐ No	Date and Day of Week

Inspector's Signature	Reviewer's Signature

Project Number	Project Location	Key Number	Diary Number

Distribution: Original for Project File Copy to Remain in Book

Construction Inspection Report

ITD 1406 (Rev. 10-16)
itd.idaho.gov

Phase ☐ Intermediate ☐ Final ☐

Key Number	Project Number	District/LHTAC	Location

Resident Engineer	Inspection Made By	Date

In Company With	Contractor Name

Traffic Interference or Delays	Signing	Condition of Detours

FHWA Project of Interest? ☐ Yes ☐ No

Distribution: Resident Engineer Inspecting Engineer Construction/Materials Engineer
District Engineer

Other _____

10.7 WORK ZONE ACCIDENTS

The Federal Code of Regulations (23 CFR Part 630, Subpart J) contains language requiring that “construction zone accidents shall be analyzed” and used to continually correct deficiencies which are found to exist on individual projects, and to improve the content of future Traffic Control Plans.

ITD Contract Administration 107.10 - ITD PERSONNEL ONLY

Documenting Motor Vehicle Accident Information

Occasionally, state employees witness or come upon motor vehicle accidents that occur on the State highway system, or vehicle accidents sometimes occur within the limits of a construction or maintenance project involving persons other than employees of the state or its contracting agencies.

Motor Vehicle Accident Documentation

Whenever an ITD employee witnesses or comes upon a motor vehicle accident, a record shall be made in their diary of the date, time, highway route, and milepost. The weather condition, general condition of the travel way, and a short narrative description of how the accident happened should be included. Any assistance rendered by the employee to the accident victim such as first aid, calling of police, ambulance, etc., should be recorded. Brief sketches may be desirable to help explain the accident and can be made and attached to the diary entry page. A copy of the information shall be sent to the District EEO/Safety/Training Coordinator.

Additionally,

- If the accident is of a serious nature (considerable property damage, injury, or fatality), then the report shall be made on ITD-645, Traffic Accident Field Report. Sketches, diagrams, and photographs should show the general layout of the accident scene, location and distance of traffic control devices, and any other data relevant to the accident.

- Accidents that occur on a project, but are not witnessed, also require that all known facts and data be recorded as a diary entry.

The supervisor in charge of the project or highway should review the reports and ensure that the accident is properly documented and made a permanent part of the

project records or diary. The appropriate Contractor's personnel shall be notified. When an accident occurs on a state project, the appropriate District Engineer and District EEO/Safety/Training Coordinator shall be notified.

The District EEO/Safety/Training Coordinator will send copies of all reports, photos, and diagrams of accidents to the department's Employee Safety/Risk Manager for information and coordination with the appropriate headquarters' section.

Accident reports

Work zone accident data can be recorded in the TCS's daily traffic control inspection report or on a special accident report form.

The purpose of the accident report form is to record information about the accident and the work zone traffic control existing at the time of the accident.

The accident investigation conducted by the project manager should focus on the status of the traffic controls at the time of the accident. All traffic controls should be shown in the accident diagram section of the accident report form, including advance signing, flaggers, or police vehicles. (It may be possible to refer to either photographs or a Traffic Control Plan if traffic controls are extensive.) The accident diagram will show the paths of vehicles involved and their relationship to the work activity and the work area traffic controls.

The accident narrative describes what happened in the accident, with emphasis on:

- the involvement of the work activity at the time of the accident;
- any problems observed in the work area traffic control devices; and
- comments of the investigating officer and witnesses.

Information about the condition of traffic control devices or confirmation of the presence of specified devices should be included.

Additionally, the report must document actions which were taken by project personnel to identify and/or correct problems and hazards associated with the Temporary Traffic Control layout, if any.

Accident analysis

Accidents are the most serious indication of work zone traffic control problems. When one occurs, all possible steps should be taken to determine its cause and to make corrections that will reduce the probability of additional accidents.

When an accident occurs within the project limits, however, it does not automatically mean that a change in work zone traffic controls is required. Accidents are a statistically rare occurrence, and the cause of any one accident can be very hard to determine. Most accidents are the result of a combination of factors.

The first step in determining the cause is to examine the relationship of the accident to the existing work zone traffic controls. If there appears to be a connection, the problem can be further examined by collecting conflict data or other data on work zone traffic operations that might be helpful, such as accident data on the roadway before the work project started. If accidents in the project area have increased significantly since the work zone was established, and if there are significant differences between the types of accidents during the work activity and the types before the work began, the problem is probably associated with the work zone traffic control or the work activity.

The analysis of a set of accident data should include classifying the accidents and finding which classifications occur most frequently. Accidents are most commonly classified by location, accident type, time of day, weather, light, road surface conditions, and severity.

The location of the accident can be classified as being at an intersection or at another location in the work zone. For many work zones, particularly stationary ones, the location of accidents can be specified by the area of the work zone (advance warning, transition, activity or termination).

Also, any special circumstances or driver comments about the accident should be noted, such as “accident occurred during a period of traffic backup” or “driver did not perceive lane closure early enough to merge into the open lane.”

Incident data

The collection of incident data can be useful either to support the accident data or to point out a hazardous condition before an accident occurs. Incident information should be recorded so it can be used by more than one person, can be referred to later, and can be used as a record of past conditions.

Like accidents, incidents should be recorded in the daily traffic control inspection reports, daily construction diary, or on special incident report forms.

Record basic information about the incident, including the apparent paths of the vehicles involved in the incident or to show the location of damaged channelizing devices, skid marks, debris, etc.

Document any traffic control changes or other actions taken. If, for example, the locations of some advance warning signs were changed because of incidents in the transition area, the reasons for the changes should be documented. The reasons for not changing the locations of the other advance warning signs should also be documented.

Analysis of other data

In addition to accidents and incidents, the analysis of other data may also be needed to supplement accident and incident data. The kinds of data that are used to supplement accident and incident data include traffic volumes, speed data, and plans and photographs.

Project and statewide summaries

The work zone accident data process has two objectives:

1. To promote immediate analysis of work zone accidents and incidents by project managers.
2. To develop a database for statewide analysis of work zone accidents. Data should be sent by the project manager to the district traffic engineer (or, alternatively, to the district construction or maintenance section or utility company) and used to analyze project accident experience.

10.8 MODIFICATIONS

Problem identification and correction

When the analysis of accident, incident, and other data indicates that a problem with the Temporary Traffic Control arrangement exists, and when patterns for these problems have been determined, changes in the control strategy may be required. The following tables are designed to provide for the identification of possible safety and operational problems and the corresponding traffic control changes which may be appropriate to correct the condition. Problems and the suggested corrective measures are classified by the following indicators:

- Location of problem
- Accident type
- Time of day or weather conditions

TABLE 10-1 : Problem identification and correction by location of problem

Location	Possible problems	Possible TTC change
1. Accidents or incidents in the *warning or approach area (queue)* of the work zone.	Insufficient advance warning signs	• Add warning signs • Increase size of advance warning signs • Use variable message signs or arrow board
	Speeds too high or high variance in speeds	• Add advisory speed signs • Provide speed enforcement patrols • Install rumble strips
	Improper flagging technique	• Train flaggers • Move flaggers upstream • Replace flaggers with signals
	Insufficient work zone traffic capacity	• Provide alternate routes • Increase capacity by routing traffic onto shoulder • Change work schedule to exclude peak traffic periods
	Signs not visible at night	• Mount signs as correct height above roadway • Install flashing warning lights or signs • Replace signs not meeting visibility requirements • Illuminated signs
	Improper lane changes	• Add arrow board • Lengthen taper • Move taper position upstream
2. Accidents or incidents occurring in the transition area of the work zone	Insufficient advance warning	• Add advance warning signs • Increase size of advance warning signs • Move taper upstream to increase sight distance • Use variable message sign or arrow boards

Location	Possible problems	Possible TTC change
	Lack of sufficient sight distance to taper	• Move taper upstream to increase sight distance
	Improper merging at lane closures	• Add arrow board • Move taper upstream to increase sight distance • Lengthen taper
	Insufficient work zone capacity	• Provide alternate routes • Increase capacity by routing traffic onto shoulder • Change work schedule to exclude peak traffic periods
	Transition not visible at night	• Illuminate or reflectorized channelizing devices. • Add arrow board • Add temporary pavement markers
	Speeds too high or high variance in speeds	• Provide speed enforcement patrols • Install rumble strips • Add advisory speed signs
	Advance warning signs too far upstream from transition	• Move warning signs more frequently
3. Accidents or incidents occurring on curves.	Inadequate design for prevailing vehicle speeds	• Improve curve design • Improve edge line delineation • Add advisory speed signs
4. Accidents or incidents occurring in the work area of the work zone.	Workers or equipment too near traffic stream	• Move equipment • Add portable concrete barriers • Instruct workers to wear hard hats and safety vests • Instruct workers to stay as far as possible from traffic stream • Install Highway Advisory Radio

Location	Possible problems	Possible TTC change
	Motorists watching work activity	• Install sight barriers
	Speeds too high or high variance in speeds	• Install rumble strips • Provide speed enforcement patrols • Add advisory speed signs
	Access and egress of work vehicles into traffic stream	• Relocate work vehicle access and egress points. • Provide flaggers
	Insufficient work zone traffic capacity	• Provide alternate routes • Increase capacity by routing onto shoulder • Change work schedule to exclude peak traffic periods • Install Highway Advisory Radio • Reduce length of work area
5. Accidents or incidents on two-lane, two-way traffic operations on divided highways	Passing in no-passing zone	• Reduce length of section • Provide police enforcement • Provide cones or tubes on centerline of two-way section • Provide concrete median barriers • Change to alternate type of work zone such as bypass roadway or detour • Use variable message signs
	Insufficient work zone traffic capacity	• Provide alternate routes • Build bypass roadway • Widen lanes
6. Accidents or incidents on one-lane sections with alternating direction traffic operations.	Excessive vehicle queues and delays	• Reduce length of section • Provide pace vehicle
	Improper flagging technique	• Train flaggers • Move flaggers upstream • Replace flagger with signal

Location	Possible problems	Possible TTC change
7. Accidents or incidents occurring at median crossovers	Insufficient crossover delineation	• Remove old pavement markings • Install new pavement markings • Install raised pavement markers • Install lights on channelizing devices
	Speeds too high or high variance in speeds	• Provide speed enforcement patrols • Improve crossover design • Add advisory speed signs • Install rumble strips
	Shifting of cargo loads in trucks	• Improve crossover design • Provide speed enforcement patrols • Add advisory speed signs

TABLE 10-2 Problem identification and correction by accident type

Location	Possible problems	Possible TTC change
1. Fixed object accidents	Narrow work zone roadway	• Widen roadway by moving channelizing devices or by using narrower devices • Improve reflectivity and delineation of devices • Illuminate or use reflectorized channelizing devices • Increase roadway width by routing traffic onto the shoulder
	Insufficient advance warning	• Move taper upstream to increase sight distance • Add arrow board
	Drums rolling into travel lane	• Increase ballast on drums • Increase traffic control device inspection frequency
	Too many traffic control devices in or near roadway	• Provide portable concrete barriers • Increase spacing between devices
2. Pedestrian accidents or incidents involving pedestrians	Pedestrians on the roadway	• Build separate walkway • Install barriers between pedestrians and traffic • Restrict pedestrian movements
	Workers in or near traffic	• Install barriers between pedestrians and traffic
3. Truck accidents or incidents involving trucks	Speeds too high or high variance in speeds	• Ensure trucks can negotiate roadway geometry using modeling tools. • Provide speed enforcement patrols • Add advisory speed plates • Add rumble strips • Use variable message signs
	Work zone roadway too narrow for large vehicles	• Provide truck detours • Widen work zone roadway

Location	Possible problems	Possible TTC change
	Inadequate work zone pavement thickness to support large vehicles	• Provide truck detours • Increase pavement strength
	Low truck speeds on grades	• Provide climbing lanes • Provide truck detours
4. Head-on accidents or passing conflicts	Divide highway with two-way traffic operations	• Install median barriers • Use an alternate type of work zone • Shorten length of two-way traffic operation • Install channelizing devices on center line
	Slow-moving maintenance operations	• Require work train to allow vehicles to pass occasionally • Improve signing and lighting on work vehicle • Change work schedule to periods of lower traffic volume
5. Rear-end accidents or slow-moving vehicle conflicts	Insufficient work zone traffic capacity	• Provide alternate route • Change work schedule to exclude peak traffic periods • Increase capacity by routing traffic onto shoulder • Reduce length of work area • Install warning signs
	Poor work vehicle access or egress to traffic stream	• Change work vehicle access or egress points • Provide flagger
	Improper flagging technique	• Train flaggers • Move flagger upstream • Replace flagger with signals • Provide extra flagger positioned near the upstream end of vehicle queue
	High variance in vehicle speeds	• Provide reasonable speed limits • Provide speed enforcement patrols

Location	Possible problems	Possible TTC change
6. Sideswipe same direction accidents, merging accidents and lane change or slow-to-merge conflicts	Insufficient taper length	• Lengthen taper • Add arrow board • Position arrow board near start of taper • Move taper upstream to increase sign distance
	Insufficient acceleration lane length	• Lengthen taper • Install yield or stop signs on on-ramp • Close on-ramp • Build temporary ramp downstream
	Incorrect taper placement	• Move taper upstream to increase sight distance • Add arrow board • Position arrow board near start of taper
8. Run-off-road	Narrow roadway	• Widen roadway • Provide speed enforcement patrols • Improve edge line delineation

TABLE 10-3 Problem identification and correction by time-of-day/weather conditions

Time/weather	Possible problem	Possible TTC Change
1. Nighttime accidents	Poor visibility or delineation	• Illuminate or use reflectorized channeling devices • Remove old pavement markings • Add temporary pavement markings • Add temporary pavement edge lines • Add arrow board
	Equipment or vehicles stored near roadway	• Store vehicle and equipment at location away from roadway
2. Accidents or incidents during periods of peak traffic volume	Insufficient work zone traffic capacity	• Provide alternate routes • Increase capacity by routing traffic onto shoulder • Change work schedule to exclude peak traffic periods • Change work zone type
	Access and egress of work vehicles into traffic stream	• Relocate work vehicle access and egress points • Provide flaggers
3. Accidents or incidents during weekend periods	Vandalized or stolen traffic control devices	• Provide nighttime security personnel • Increase police patrols
	Trucks or recreational vehicles unable to negotiate curves	• Redesign work zone using higher design speed • Broadcast warning messages via commercial or citizen band radio • Lengthen tapers
4. Accidents or incidents during inclement weather	Poor visibility or delineation	• Remove old pavement markings and replace with new pavement markings • Install raised pavement markers
	Poor drainage	• Improve super elevation • Patch low pavement areas • Prevent mud from washing onto roadway

Implementation of corrective action

When making corrective changes, the work team usually will start at the upstream end of the work zone. A device should not be moved from its original position to the new location if an additional hazard will be created by the absence of the device. For example, if the project engineer decides to move the entire set of advance warning signs upstream of a horizontal curve to improve sight distance, the best way is to install a new set of signs before removing the original signs.

In changing the location of a lane taper, the new taper should always be made fully operational before the existing taper and related traffic controls are removed. Taper refers to the cones, pavement markings, and/or barricades used to physically define the boundary of a lane closure. Depending on the location of the new taper, the advance warning signs also may have to be moved. If the taper is moved upstream, the signing may not provide adequate warning time and distance. Downstream moves may leave such a large gap between the advance warning signs and the activity area that motorists either forget that they are approaching a work space or else lose respect for signing that appears to be needless. In either case, motorists could be surprised to discover that they are required to maneuver their vehicle through an activity area. Therefore, signing changes as discussed above should usually precede changes in the lane taper.

Corrective actions should be implemented as soon as possible: however, trade-offs between leaving the existing hazard and creating a new hazard by making the change under adverse traffic conditions must be considered. For example, if a change to alleviate rush hour congestion is needed, should motorists suffer through another day of congestion and possible rear end accidents, or should the team try to make an immediate change? The presence of the team making the change may be more hazardous than the congestion. Maybe the change is best implemented during an off peak period.

Of course, each work zone is different and will have to be analyzed individually. Every corrective traffic control change must be justified, planned, carefully implemented, and documented to avoid creating additional hazards.

The procedures expected of the contractor in performing corrective traffic control changes should be detailed in the contract and in the Traffic Control Plan. More than likely, the meaning of these procedures will need to be discussed. The time to iron out all problems that could arise from misinterpreting these procedures is at the preconstruction conference.

Procedures for payment for changes to the Traffic Control Plan must be defined in the contract document.

Exercise #6

Documenting Work Zone Accidents

During your investigation of two rear-end accidents in the work zone, both drivers tell you that the flagger signals were unclear and hard to understand. Using the tables, identify the possible traffic control changes that may help to eliminate the problem.

Documenting changes

All traffic control changes should be documented. At a minimum, documentation should include:

- What was changed
- When it was changed
- Why it was changed
- Who changed it

Temporary Traffic Control Plans should be updated to reflect existing conditions. Any standards or specifications that were followed as well as instructions to contractors should be noted in the project diary. Photography is also a good way to record the physical details of a traffic control change.

Evaluating changes

All traffic control changes should be evaluated to ensure that the corrections are producing the desired results.

After implementing a corrective action, the TCS should inspect and evaluate the change to ensure that traffic flow and work zone safety have not been degraded. A minor change, such as relocating one sign, may require only a drive-through inspection to see that the sign has the correct message, is in the desired location, and is properly positioned toward oncoming traffic. A moderate or major traffic control change will require a more detailed investigation.

Exercise #7

Traffic Control Plan Modifications

You have just received word that due to unforeseen changes in traffic volumes, the Project Traffic Engineer has changed the work hours on your project from the daytime hours of 8:00 AM - 5:00 PM to nighttime hours of 5:00 PM - 8:00 AM. This is to accommodate an increase in traffic volumes through the traffic control zone during daylight hours. Also, several accidents have occurred in the transition area at the merging taper.

Using the same Traffic Control Plan from Exercise #2, note all modifications you would present to the Project Traffic Engineer to accommodate these changes and concerns.

Suggested changes:

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

CHAPTER 11

ITD Traffic Manual: Idaho Supplementary Guidance to the MUTCD 2020

CHAPTER 6A. GENERAL

Section 6A.01 General

Use the "Work Zone Safety and Mobility (WZSM) Program" on highway projects. The WZSM program provides guidance associated with federal regulations 23 CFR 630 Subpart J – Work Zone Safety and Mobility, and Subpart K – Temporary Traffic Control Devices. Also refer to the ITD "Operations Manual."

CHAPTER 6B. FUNDAMENTAL PRINCIPLES

Section 6B.01 Fundamental Principles of Temporary Traffic Control

Maintenance of traffic and maintenance of temporary detours are addressed in Section 105 of ITD's "Standard Specifications for Highway Construction."

CHAPTER 6C. TEMPORARY TRAFFIC CONTROL ELEMENTS

Section 6C.01 Temporary Traffic Control Plans

Training requirements for personnel involved in the development, design, implementation, operation, inspection, and enforcement of TTC plans on Federal-aid highway projects are listed in the "Work Zone Safety and Mobility Program."

Section 6C.02 Temporary Traffic Control Zones

See *Administrative Policy 5546 – Special Events on State Highways* – for information about Special Event requirements, applications, agreements, and fees.

Section 6C.03 Components of Temporary Traffic Control Zones No supplemental information.

Section 6C.04 Advance Warning Area

For MUTCD Table 6C-1, use the following speeds for low and high speed urban road types, unless otherwise determined by engineering judgment:

- Urban (Low Speed): 35 mph or lower
- Urban (High Speed): 40 mph or greater

Section 6C.05 Transition Area No supplemental information.

Section 6C.06 Activity Area No supplemental information.

Section 6C.07 Termination Area No supplemental information.

Section 6C.08 Tapers No supplemental information.

Section 6C.09 Detours and Diversions

Coordinate detours that route traffic off of the highway system with the local highway agency. Consider initiating a cooperative agreement between ITD and the local highway agency if the traffic is being detoured for long periods of time or if the detoured traffic is anticipated to cause damage to the local highway system.

Section 6C.10 One-Lane, Two-Way Traffic Control No supplemental information.

Section 6C.11 Flagger Method of One-Lane, Two-Way Traffic Control No supplemental information.

Section 6C.12 Flag Transfer Method of One-Lane, Two-Way Traffic Control No supplemental information.

Section 6C.13 Pilot Car Method of One-Lane, Two-Way Traffic Control No supplemental information.

Section 6C.14 Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control No supplemental information.

Section 6C.15 Stop or Yield Control Method of One-Lane, Two-Way Traffic Control No supplemental information.

CHAPTER 6D. PEDESTRIAN AND WORKER SAFETY

Section 6D.01 Pedestrian Considerations

Refer to the "Work Zone Safety and Mobility Program" for an ITD policy statement regarding pedestrians and other road users within work zones.

Section 6D.02 Accessibility Considerations No supplemental information.

Section 6D.03 Worker Safety Considerations

Use the "Work Zone Positive Protection Guidance" workbook (ITD Form 0283) to determine where and when to use positive protection, such as temporary traffic barriers. Refer to the "Work Zone Safety and Mobility Program."

Training requirements for personnel involved in the development, design, implementation, operation, inspection, and enforcement of TTC plans on Federal-aid highway projects are listed in the "Work Zone Safety and Mobility Program."

CHAPTER 6E. FLAGGER CONTROL

Section 6E.01 Qualifications for Flaggers

Flaggers must be trained and possess a current flagger certification from ATSSA or the Evergreen Safety Council or possess a current flagger certification that was obtained in Washington, Oregon, Montana, or Utah. ITD has reciprocity agreements to recognize certifications obtained in those states. Refer to the "Work Zone Safety and Mobility Program."

Section 6E.02 High-Visibility Safety Apparel No supplemental information.

Section 6E.03 Hand-Signaling Devices No supplemental information.

Section 6E.04 Automated Flagger Assistance Devices

ITD's policy governing AFAD application is that AFADs can be used if an engineering study estimates that AFAD use will improve Temporary Traffic Control zone safety or reduce project cost without detrimentally affecting Temporary Traffic Control zone safety. Consider the following in the engineering study:

A. Conditions applicable for the use of Method 1 and Method 2 AFAD operation
B. Highway volume

C. Maximum distance between AFADs
D. Conflicting lenses/indications monitoring
E. Fail safe procedures
F. Need for additional signing and pavement markings
G. Application consistency
H. Use of larger signs or lenses to increase visibility,
I. Use of back-plates.

Section 6E.05 STOP/SLOW Automated Flagger Assistance Devices No supplemental information.

Section 6E.06 Red/Yellow Lens Automated Flagger Assistance Devices No supplemental information.

Section 6E.07 Flagger Procedures No supplemental information.

Section 6E.08 Flagger Stations No supplemental information.

CHAPTER 6F. TEMPORARY TRAFFIC CONTROL ZONE DEVICES

Section 6F.01 Types of Devices

Temporary traffic control devices are specified in Section 626 of the ITD "Standard Specifications for Highway Construction." Maintain Temporary Traffic Control devices to the acceptable or marginal levels described in the ATSSA "Quality Guidelines for Temporary Traffic Control Devices and Features."

Section 6F.02 General Characteristics of Signs

Indicate the background color of warning signs on the TTC plan. For example, if the SOFT SHOULDER (W8-4) sign is used, indicate the sign number and color as W8-4(O).

Warning signs and plaques larger than those shown in MUTCD Table 6F-1 are encouraged.

The ROAD WORK NEXT XX MILES (G20-1) sign size may be increased to 60 x 24 inches.

The END ROAD WORK (G20-2) sign size may be increased to 48 x 24 inches for conventional roads.

Section 6F.03 Sign Placement

Ensure that sign placement does not inhibit intersection sight triangles as defined in AASHTO's "A Policy on Geometric Design of Highways and Streets."

Section 6F.04 Sign Maintenance No supplemental information.

Section 6F.05 Regulatory Sign Authority No supplemental information.

Section 6F.06 Regulatory Sign Design No supplemental information.

Section 6F.07 Regulatory Sign Applications No supplemental information.

Section 6F.08 ROAD (STREET) CLOSED Sign (R11-2) No supplemental information.

Section 6F.09 Local Traffic Only Signs (R11-3a, R11-4) No supplemental information.

Section 6F.10 Weight Limit Signs (R12-1, R12-2, R12-5)

Idaho Statute 49-1005 – Special Regulations and Notice – gives ITD authority to reduce the permissible size, weight, or speeds of vehicles operating on a highway for a period of time for the protection of the highway or for public safety due to climatic or other reasons. *IDAPA 39.03.14 – Rules Governing Policy During Spring Breakup Season* – provides additional information about the application of the statute.

Use Weight Limit signs (R12 Series) when vehicle weight loadings are restricted to a maximum weight or maximum weight per axle (see Section 2B.59). Use the BEGIN (R3-9cP) and END (R3-9dP) plaques to inform road users where the weight limit begins and ends (see Section 2B.25). Use additional Weight Limit (R12 Series) signs within the restricted section of highway at intersections where overweight vehicles may enter the highway.

Because climatic conditions that cause weight restrictions are usually regional, detours for vehicles weighing more than the posted limit should generally not be provided.

IDAPA 39.03.03.730 – Rules Governing Policy During Spring Breakup Season – provides information about marking highways when speeds for trucks and buses with a gross weight of 10,000 pounds or more are restrictions due to climatic or other conditions. Use red or green markers to indicate the status of the speed restriction. A red marker indicates that the speed is restricted to 30 mph. Green markers may be used when the District Engineer temporarily waives the spring breakup restrictions.

When used, attach 6 x 18 inch red or green markers vertically to existing signposts along the highway segment where speeds are restricted. The markers should usually be attached below Speed Limit (R2-1) signs, but can be posted below other highway signs. Do not cover or alter existing Speed Limit (R2-1) signs. End the restricted speed zone with one or more green markers.

Refer to the ITD “Operations Manual” for additional information.

Section 6F.11 STAY IN LANE Sign (R4-9)

No supplemental information.

Section 6F.12 Work Zone and Higher Fines Signs and Plaques

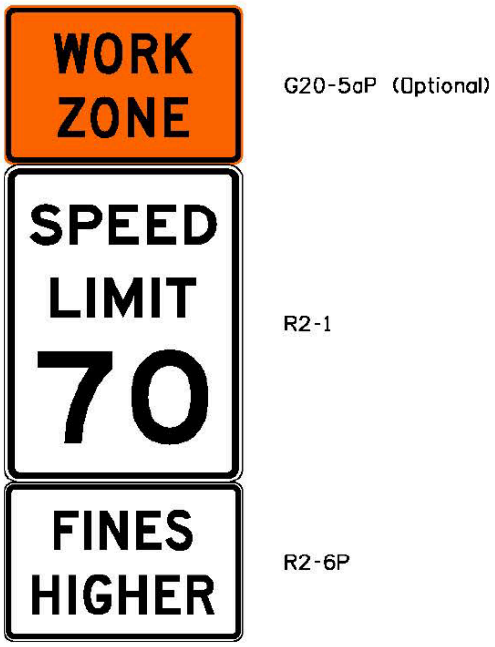
In accordance with *Idaho Statute 49-657*, enforcement agencies can penalize violators of work zone speed limits with a higher fine if the work zone limits are indicated, the speed limit is reduced, and notice is given for an enhanced penalty for exceeding the reduced speed limit.

To indicate that the penalty is enhanced for exceeding the reduced speed limit, use the FINES HIGHER (R2-6P) plaque beneath the Speed Limit (R2-1) sign (see Figure 6F-1). The WORK ZONE (G20-5aP) plaque can also be used above the Speed Limit sign to emphasize the reduced speed limit in the work zone. If the FINES HIGHER plaque is used, install the END HIGHER FINES ZONE (R2-11) sign at the downstream end of the zone.

Do not use the BEGIN HIGHER FINES ZONE (R2-10) sign because it does not indicate that the higher fines apply to the reduced speed limit. Do not use the FINES DOUBLE (R2-6aP) plaque because Idaho statute sets the additional fine at $50 (*see Idaho Statute 49-657*). See *IDAPA 39.03.41 – Rules Governing Traffic Control Devices.*

By 2021 discontinue the use of the INCREASED FINES FOR WORK ZONE SPEED VIOLATIONS (R2-1001) sign.

Figure 6F-1 Work Zone Higher Fines Assembly



Section 6F.13 PEDESTRIAN CROSSWALK Sign (R9-8)

No supplemental information.

Section 6F.14 SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)

No supplemental information.

Section 6F.15 Special Regulatory Signs

No supplemental information.

Section 6F.16 Warning Sign Function, Design, and Application

Typically, 48 x 48 inch warning signs are used except when available space does not allow.

Section 6F.17 Position of Advance Warning Signs No supplemental information.

Section 6F.18 ROAD (STREET) WORK Sign (W20-1) No supplemental information.

Section 6F.19 DETOUR Sign (W20-2) No supplemental information.

Section 6F.20 ROAD (STREET) CLOSED Sign (W20-3) No supplemental information.

Section 6F.21 ONE LANE ROAD Sign (W20-4) No supplemental information.

Section 6F.22 Lane(s) Closed Signs (W20-5a) No supplemental information.

Section 6F.23 CENTER LANE CLOSED AHEAD Sign (W9-3) No supplemental information.

Section 6F.24 Lane Ends Sign (W4-2) No supplemental information.

Section 6F.25 ON RAMP Plaque (W13-4P) No supplemental information.

Section 6F.26 RAMP NARROWS Sign (W5-4) No supplemental information.

Section 6F.27 SLOW TRAFFIC AHEAD Sign (W23-1) No supplemental information.

Section 6F.28 EXIT OPEN and EXIT CLOSED Signs (E5-2, E5-2a) No supplemental information.

Section 6F.29 EXIT ONLY Sign (E5-3) No supplemental information.

Section 6F.30 NEW TRAFFIC PATTERN AHEAD Sign (W23-2) No supplemental information.

Section 6F.31 Flagger Signs (W20-7, W20-7a) No supplemental information.

Section 6F.32 Two-Way Traffic Sign (W6-3) No supplemental information.

Section 6F.33 Workers Signs (W21-1, W21-1a) No supplemental information.

Section 6F.34 FRESH OIL (TAR) Sign (W21-2) No supplemental information.

Section 6F.35 ROAD MACHINERY AHEAD Sign (W21-3) No supplemental information.

Section 6F.36 Motorized Traffic Signs (W8-6, W11-10) No supplemental information.

Section 6F.37 Shoulder Work Sigs (W21-5, W21-5a, W21-5b) No supplemental information.

Section 6F.38 SURVEY CREW Sign (W21-6) No supplemental information.

Section 6F.39 UTILITY WORK Sign (W21-7) No supplemental information.

Section 6F.40 Signs for Blasting Areas No supplemental information.

Section 6F.41 BLASTING ZONE AHEAD Sign (W22-1) No supplemental information.

Section 6F.42 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2) No supplemental information.

Section 6F.43 END BLASTING ZONE Sign (W22-3) No supplemental information.

Section 6F.44 Shoulder Signs and Plaque (W8-4, W8-9, W8-17 and W8-17P) No supplemental information.

Section 6F.45 UNEVEN LANES Sign (W8-11) No supplemental information.

Section 6F.46 STEEL PLATE AHEAD Sign (W8-24) No supplemental information.

Section 6F.47 NO CENTER LINE Sign (W8-12) No supplemental information.

Section 6F.48 Reverse Curve Signs (W1-4 Series) No supplemental information.

Section 6F.49 Double Reverse Curve Signs (W24-1 Series) No supplemental information.

Section 6F.50 Other Warning Signs No supplemental information.

Section 6F.51 Special Warning Signs

Warning signs such as AVOID WINDSHIELD DAMAGE (W8-703) sign (see Figure 6F-2) may be used on seal coat projects. If used, provide an Advisory Speed (W13-1P) plaque below the sign.

Figure 6F-2 Avoid Windshield Damage Warning Sign

W8-703

Section 6F.52 Advisory Speed Plaque (W13-1P) No supplemental information.

Section 6F.53 Supplementary Distance Plaque (W7-3aP) No supplemental information.

Section 6F.54 Motorcycle Plaque (W8-15P) No supplemental information.

Section 6F.55 Guide Signs No supplemental information.

Section 6F.56 ROAD WORK NEXT XX MILES Sign (G20-1)

The ROAD WORK NEXT XX MILES (G20-1) sign can be enlarged to 60 x 30 inches. See the "ITD Supplement to the Standard Highway Signs and Markings" book for alternate size information.

Section 6F.57 END ROAD WORK Sign (G20-2) No supplemental information.

Section 6F.58 PILOT CAR FOLLOW ME Sign (G20-4)

In addition to the PILOT CAR FOLLOW ME (G20-4) sign, warning signs such as WAIT FOR PILOT CAR (G20-401) sign (see Figure 6F-3) may be used on low volume intersecting roads when a pilot car is in operation on a highway or major road. If used, the WAIT FOR PILOT CAR (G20-401) sign should be 30 x 30 inches or 36 x 36 inches. See Section 6F.02 and the "ITD Sign Chart: Idaho Supplement to the Standard Highway Signs and Markings Book" for alternate size information.

Figure 6F-3 Wait For Pilot Car Warning Sign

G20-401

Section 6F.59 Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10) No supplemental information.

Section 6F.60 Portable Changeable Message Signs No supplemental information.

Section 6F.61 Arrow Boards No supplemental information.

Section 6F.62 High-Level Warning Devices (Flag Trees) No supplemental information.

Section 6F.63 Channelizing Devices No supplemental information.

Section 6F.64 Cones No supplemental information.

Section 6F.65 Tubular Markers

Tubular markers or other channelizing devices are typically used in the activity area and buffer space of TTC zones (See MUTCD Figure 6C-1). Use tubular markers that are at least 36 inches in height and have at least 3 inches in width when facing traffic.

Section 6F.66 Vertical Panels No supplemental information.

Section 6F.67 Drums

Drums are typically used in the transition area of TTC zones (See MUTCD Figure 6C-1) and may be used in tangent sections.

Section 6F.68 Type 1, 2, or 3 Barricades

ITD specifies a wider Type 3 barricade that is 7 feet (or 84 inches) in length in the “Standard Specifications for Highway Construction.”

Section 6F.69 Direction Indicator Barricades No supplemental information.

Section 6F.70 Temporary Traffic Barriers as Channelizing Devices No supplemental information.

Section 6F.71 Longitudinal Channelizing Devices No supplemental information.

Section 6F.72 Temporary Lane Separators No supplemental information.

Section 6F.73 Other Channelizing Devices No supplemental information.

Section 6F.74 Detectable Edging for Pedestrians No supplemental information.

Section 6F.75 Temporary Raised Islands No supplemental information.

Section 6F.76 Opposing Traffic Lane Divider and Sign (W6-4) No supplemental information.

Section 6F.77 Pavement Markings No supplemental information.

Section 6F.78 Temporary Markings

The following is ITD's policy regarding the temporary use of edge lines, channelizing lines, lane-reduction transitions, gore markings, and other longitudinal markings:

A. Provide temporary edge lines on Interstate highways and Expressways. For other highways, temporary edge lines are optional unless otherwise shown on the project plans.
B. Provide temporary channelizing lines on Interstate highways and Expressways. For other highways, temporary channelizing lines are optional unless otherwise shown on the project plans.
C. Provide temporary lane-reduction transition markings when temporary edge lines, temporary channelizing lines, or both are used.
D. Provide temporary gore markings when temporary edge lines, temporary channelizing lines, or both are used.
E. Use engineering judgment to determine whether to place other temporary longitudinal markings.

The following is ITD's policy regarding the temporary use of various non-longitudinal markings such as stop lines, railroad crossings, crosswalks, words, symbols, and arrows:

A. Temporary stop lines are optional unless required elsewhere in the MUTCD.
B. Temporary railroad crossing markings are optional.
C. If crosswalk markings are shown on the permanent pavement marking plan, provide temporary crosswalk markings when temporary stop lines are used.

D. Temporary word markings are optional.
E. Temporary symbols markings are optional.
F. Temporary arrow markings are optional.

ITD's policy is to use engineering judgment when considering the use of DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (R14-3) signs on low volume roads for situations lasting more than 14 days.

Section 6F.79 Temporary Raised Pavement Markers No supplemental information.

Section 6F.80 Delineators No supplemental information.

Section 6F.81 Lighting Devices No supplemental information.

Section 6F.82 Floodlights No supplemental information.

Section 6F.83 Warning Lights No supplemental information.

Section 6F.84 Temporary Traffic Control Signals No supplemental information.

Section 6F.85 Temporary Traffic Barriers

ITD completed an engineering study to develop positive protection guidelines in accordance with 23 CFR 630 Subpart K. A worksheet was developed to quantitatively determine positive protection use. The worksheet is found in ITD Form 0283. Also refer to the "Work Zone Safety and Mobility Program."

Section 6F.86 Crash Cushions

Use ITD's "Crash Cushion and Roadside Terminal Categorization Charts" when selecting temporary crash cushions.

Section 6F.87 Rumble Strips No supplemental information.

Section 6F.88 Screens No supplemental information.

CHAPTER 6G. TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES

Section 6G.01 Typical Applications

See *Administrative Policy 5546 – Special Events on State Highways* – for information about Special Event requirements, applications, agreements, and fees. Section

6G.02 Work Duration No supplemental information.

Section 6G.03 Location of Work No supplemental information.

Section 6G.04 Modifications to Fulfill Special Needs No supplemental information.

Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities No supplemental information.

Section 6G.06 Work Outside of the Shoulder No supplemental information.

Section 6G.07 Work on the Shoulder with No Encroachment No supplemental information.

Section 6G.08 Work on the Shoulder with Minor Encroachment No supplemental information.

Section 6G.09 Work Within the Median No supplemental information.

Section 6G.10 Work Within the Traveled Way of a Two-Lane Highway No supplemental information.

Section 6G.11 Work Within the Traveled Way of an Urban Street No supplemental information.

Section 6G.12 Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway No supplemental information.

Section 6G.13 Work Within the Traveled Way at an Intersection No supplemental information.

Section 6G.14 Work Within the Traveled Way of a Freeway or Expressway No supplemental information.

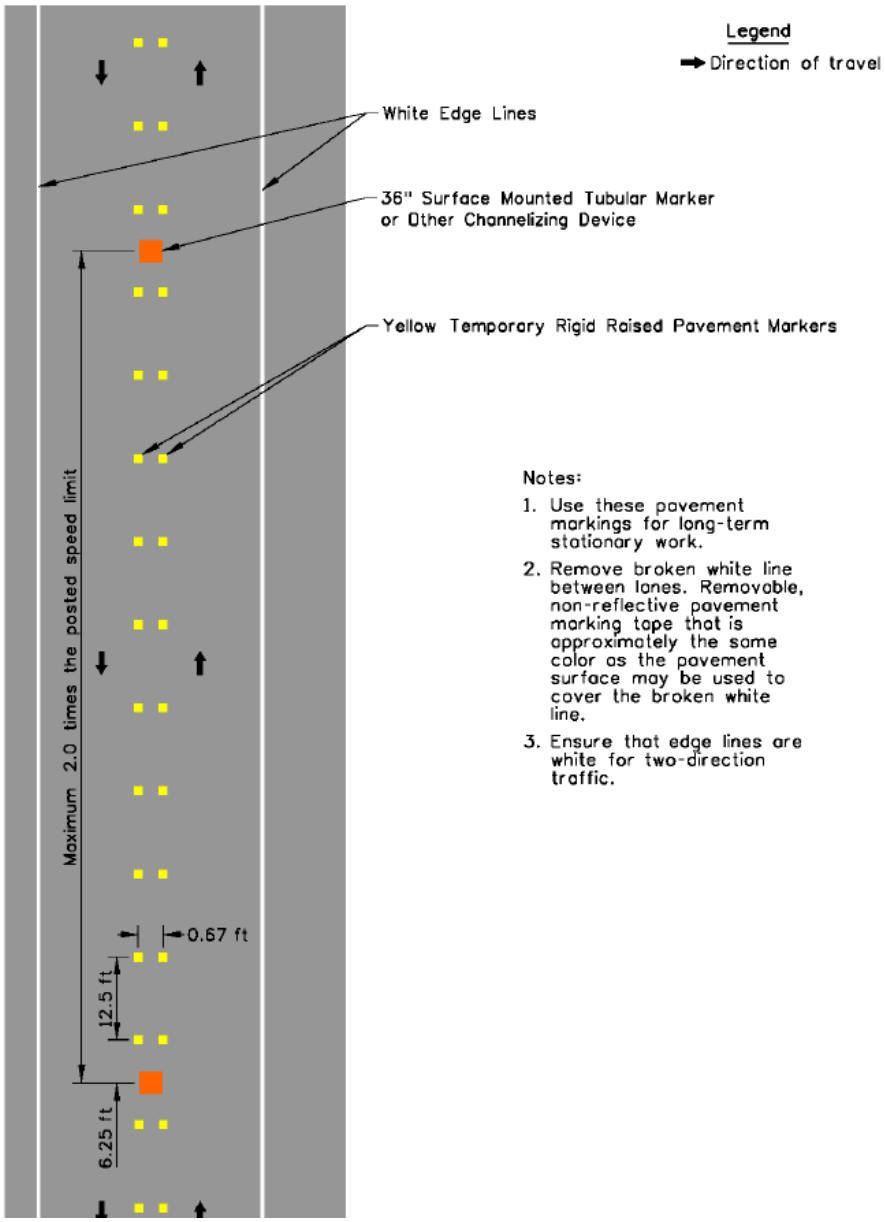
Section 6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Figure 6G-1 shows example pavement markings for two-lane, two-way traffic on one roadway of a normally divided highway. Use Figure 6G-1 with MUTCD Figure 6H-39. See MUTCD Section 6F.63 for tubular marker spacing. See MUTCD Section 6F.79 for temporary raised pavement marker spacing. Use 50 for the value of N in the spacing equations.

Section 6G.16 Crossovers

ITD has chosen to use median crossovers on divided highways projects unless a waiver is issued by the Chief Engineer. See the "Work Zone Safety and Mobility (WZSM) Program" for additional information.

Figure 6G-1 Example Pavement Markings for Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway (Next page)



Section 6G.17 Interchanges No supplemental information.

Section 6G.18 Work in the Vicinity of a Grade Crossing No supplemental information.

Section 6G.19 Temporary Traffic Control During Nighttime Hours No supplemental information.

CHAPTER 6H. TYPICAL APPLICATIONS

Section 6H.01 Typical Applications

For MUTCD Table 6H-3, use the following speeds for low and high speed urban road types, unless otherwise determined by engineering judgment:

- Urban (Low Speed): 35 mph or lower
- Urban (High Speed): 40 mph or greater

Use Figure 6G-1 with MUTCD Figure 6H-39.

CHAPTER 6I. CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

Section 6I.01 General No supplemental information.

Section 6I.02 Major Traffic Incidents No supplemental information.

Section 6I.03 Intermediate Traffic Incidents No supplemental information.

Section 6I.04 Minor Traffic Incidents No supplemental information.

Section 6I.05 Use of Emergency-Vehicle Lighting No supplemental information.

Chapter 12
Accident Data

Motor Vehicle Crashes in Work Zones

Table 46
Crashes in Work Zones: 2017-2021

	2017	2018	2019	2020	2021	Change 2020-2021	Avg. Change 2017-2020
Work Zone Crashes	453	630	590	753	693	-8.0%	20.1%
Fatalities	9	10	7	5	5	0.0%	-15.8%
Suspected Serious Injury	16	34	18	26	28	7.7%	36.6%
Suspected Minor Injury	73	100	66	99	112	13.1%	17.7%
Possible Injuries	166	197	203	277	225	-18.8%	19.4%
% All Crashes	1.8%	2.6%	2.2%	3.3%	2.5%	-24.7%	28.7%
Workers Injured	1	1	1	0	1	100.0%	-33.3%

Workers on the roadway are especially vulnerable since their attention is focused on the task at hand rather than on the traffic passing by. While most crashes occurring in work zones do not involve a worker, there have been a few crashes that have involved workers.

A worker was struck while setting up a flashing arrow-board trailer in Ada County in 2017. A flagger was struck in 2018 in Canyon County. A worker was struck while standing next to traffic cones in a lane closure in 2019. A flagger was struck in 2021 in Twin Falls County.

Single-vehicle crashes comprised 19% of the crashes in work zones in 2021. Overturn (25%) was the predominant most harmful event in single-vehicle crashes in work zones followed by Concrete Traffic Barrier (19%), Other Object – Not Fixed (16%), Ditch (5%), and Embankment (5%).

The majority of work zone crashes involve multiple vehicles and Rear End (63%) was the predominant most harmful event for multiple-vehicle crashes in work zones followed by Side-Swipe - Same Direction (14%), Angle Turning (4%), Angle (2%), Head-On Turning (2%), and Side-Swipe – Opposite Direction (2%).

Table 47 shows work zone crashes by road type.

Table 47
Work Zone Crashes by Roadway Type: 2021

	Fatal Crashes		Injury Crashes		Property Damage Crashes		All Crashes	
Interstate								
Urban	1	20.0%	105	44.1%	191	42.4%	297	42.9%
Rural	3	60.0%	37	15.5%	64	14.2%	104	15.0%
U.S. or State Highway								
Urban	0	0.0%	18	7.6%	52	11.6%	70	10.1%
Rural	1	20.0%	28	11.8%	26	5.8%	55	7.9%
Local								
Urban	0	0.0%	39	16.4%	100	22.2%	139	20.1%
Rural	0	0.0%	11	4.6%	17	3.8%	28	4.0%
Total	**5**	**0.7%**	**238**	**34.3%**	**450**	**64.9%**	**693**	

Table 48 shows the severity of crashes by transportation district. Transportation district boundaries can be found in Appendix A.

Table 48
Crashes in Work Zones by Transportation District: 2021

	Fatal Crashes	Injury Crashes	Property Damage Crashes	Total Crashes
District 1	0	23	52	75
District 2	0	4	4	8
District 3	2	176	342	520
District 4	1	18	30	49
District 5	1	7	5	13
District 6	1	10	17	28
Statewide	**5**	**238**	**450**	**693**

In 2021, the economic cost of crashes in work zones was nearly $116 million dollars. This represents 2% of the total cost of Idaho crashes (as shown in Table 4).

Figure 3
Single-Vehicle Crashes – Contributing Circumstances: 2020

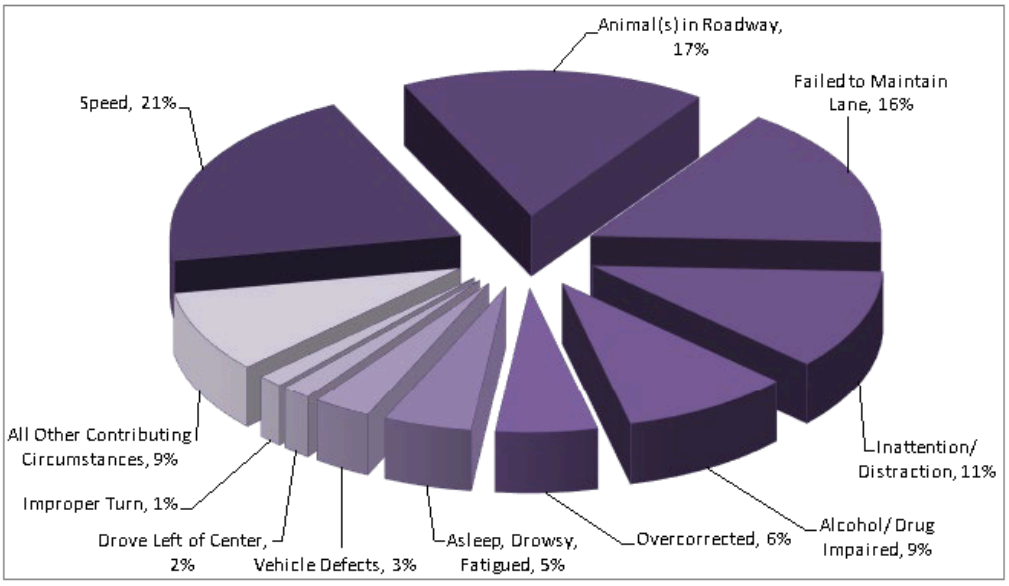


Figure 4
Multiple-Vehicle Crashes – Contributing Circumstances: 2020

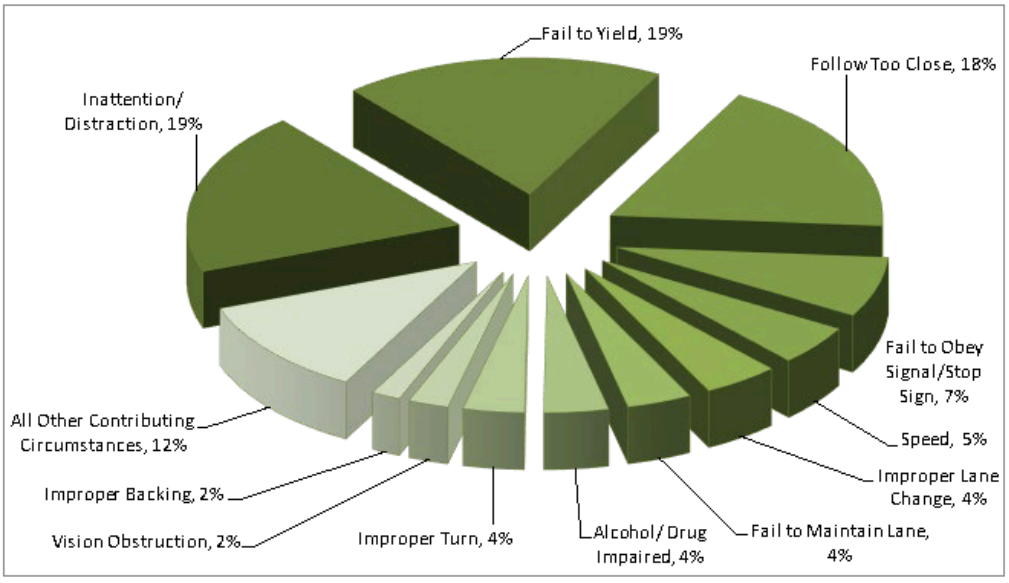


Table 7 shows the most harmful events for fatal single- and multiple-vehicle crashes.

Table 7
Most Harmful Events for Fatal Crashes Involving Single and Multiple Vehicles: 2020

Single-Vehicle Crashes	Multiple-Vehicle Crashes*
Overturn (68.7%)	Head On (32.1%)
Tree (9.6%)	Angle (15.4%)
Embankment (8.4%)	Pedestrian (11.7%)
Immersion (4.8%)	Angle - Turning (7.1%)
Ditch (3.6%)	Rear-End (5.8%)
Building Wall (1.2%)	Side Swiped Opposite (5.8%)
Guardrail Face (1.2%)	Overturn (4.6%)
Other Fixed Object (1.2%)	Side Swiped - Same Direction (3.8%)
Vehicle Equipment Failure (1.2%)	Head On - Turning (3.3%)
	Pedalcycle (2.5%)
	Fire / Explosion (2.1%)
	Delineator Post (0.8%)
	Non-Contact Unit (0.8%)
	Other (0.8%)
	Same Direction Turning (0.8%)
	Struck by Falling/Shifting Cargo (0.8%)
	Backed Into (0.4%)
	Other Non-Collision (0.4%)
	Other Object Not Fixed (0.4%)
	Utility / Light Support (0.4%)

*The percentages represent the number of vehicles the most harmful event was attributed to. Multiple units involved in a single crash may not have the same most harmful event. In 2020, there were 240 units involved in the 105 fatal multiple vehicle crashes.

Overturn was the leading most harmful event for fatal single-vehicle crashes. Single-vehicle rollovers accounted for 66% of the single vehicle fatalities and 29% of all fatalities in 2020.

Of the 46 passenger motor vehicle occupants killed in single-vehicle rollovers, 8 (or 17%) were wearing seat belts or were in a child safety seat. Of the 38 passenger motor vehicle occupants who were killed in single-vehicle rollovers and not wearing a seat belt, 36 (or 95%) were totally or partially ejected from their vehicle.

Seat belts are estimated to be more effective in preventing fatalities in rollover crashes. Seat belt use reduces fatalities by 74% in rollover crashes involving passenger cars and by 80% in rollover crashes involving light trucks[3]. By these estimates, 30 of the 38 unbelted passenger motor vehicle occupants killed in rollover crashes may have survived if they had been wearing their seat belt.

Crashes and Injuries by Month

Table 8 shows the number of crashes and injuries by severity for each month.

Table 8
Severity of Crashes and Type of Injury by Month: 2020

	Fatal Crashes	Injury Crashes	Total Crashes	Fatal Injuries	Suspected Serious Injuries	Suspected Minor Injuries	Possible Injuries
January	6	690	1,658	6	70	261	651
February	15	657	1,466	15	68	264	627
March	8	489	1,159	8	63	185	449
April	9	404	1,129	9	53	199	321
May	18	623	1,710	21	110	291	488
June	19	705	1,928	22	93	341	586
July	24	751	2,067	26	138	395	637
August	25	785	2,178	29	133	396	623
September	16	754	2,221	18	129	352	613
October	15	769	2,343	19	86	361	665
November	12	630	2,250	14	84	283	503
December	21	665	2,419	27	75	309	553
Totals	**188**	**7,922**	**22,528**	**214**	**1,102**	**3,637**	**6,716**

In 2020, July and August had the highest number of fatal crashes. December and October had the highest number of total crashes. Usually the winter months have the highest number of total crashes. Crashes occurring in the winter months are more likely to be attributed to severe weather such as ice and snow; however, these crashes usually tend to be less severe as people generally slow down and are more cautious when driving in adverse weather conditions.

Crashes by Day of the Week

Figures 5 and 6 show the number of fatal and total crashes by day of the week.

Figure 5
Fatal Crashes by Day of the Week: 2020

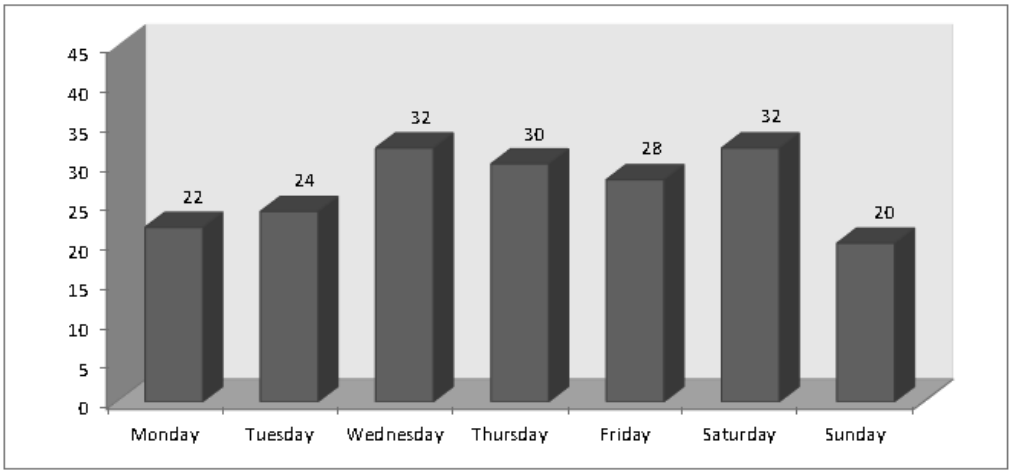
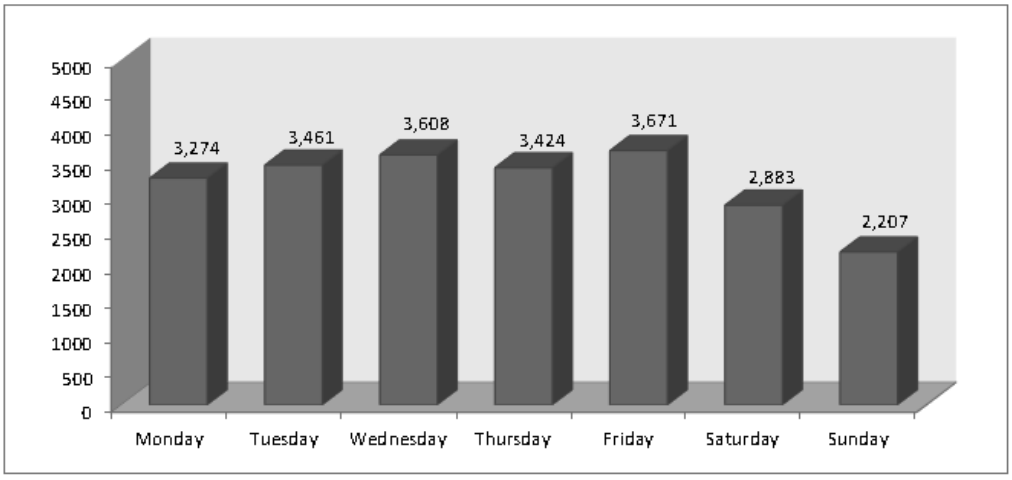


Figure 6
Total Crashes by Day of the Week: 2020



Crashes by Time of Day

Figures 7 and 8 show the number of fatal and total crashes by the time of day.

Figure 7
Fatal Crashes by Time of Day: 2020

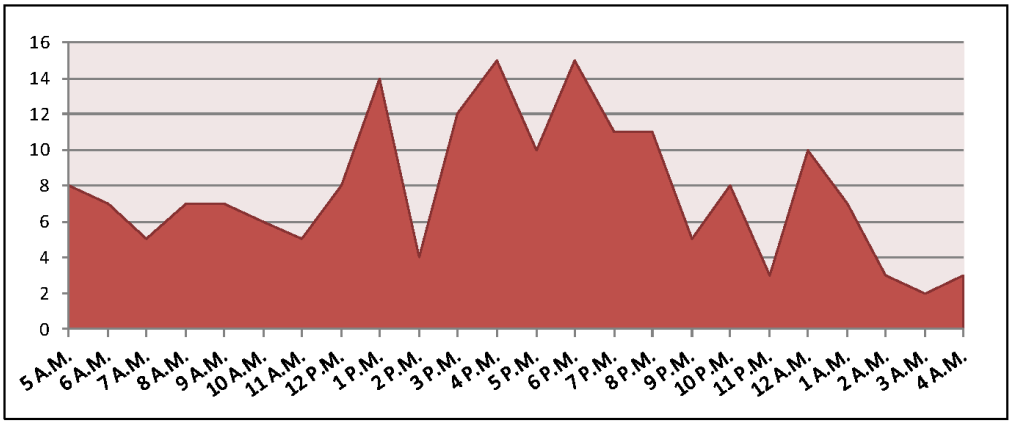
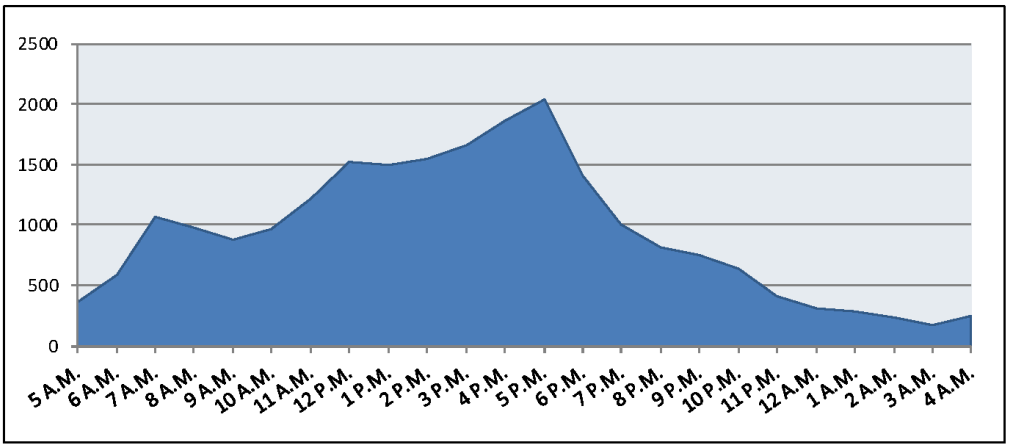


Figure 8
Total Crashes by Time of Day: 2020



Crashes by Roadway Classification

Table 9 compares the number of fatal, injury, and total crashes by urban and rural classification. Urban roadways are defined as those within the city limits of cities with 5,000 people or more. Urban roadways tend to carry higher volumes of traffic at lower speeds, while rural roads carry lower traffic volumes at higher speeds.

Table 9
Comparison of Crashes by Roadway Classification: 2016-2020

	2016	2017	2018	2019	2020	Change 2019-2020	Avg. Change 2016-2019
Fatal Crashes	232	224	215	201	188	-6.5%	-4.7%
Urban	50	54	59	52	44	-15.4%	1.8%
Rural	182	170	156	149	144	-3.4%	-6.4%
Injury Crashes:	9,327	8,818	9,083	9,153	7,922	-13.4%	-0.6%
Urban	6,209	5,957	6,118	6,285	5,124	-18.5%	0.5%
Rural	3,118	2,861	2,965	2,868	2,798	-2.4%	-2.6%
Total Crashes:	25,328	25,851	24,031	27,015	22,528	-16.6%	2.5%
Urban	16,492	17,153	16,217	18,478	14,653	-20.7%	4.2%
Rural	8,836	8,698	7,814	8,537	7,875	-7.8%	-0.8%

In 2020, 77% of fatal crashes occurred on rural roads, whereas 35% of all crashes occurred on rural roads. In Idaho in 2020, 87% of the total road mileage was classified as rural roadway. Rural roads tend to have higher speed limits. Crashes at higher impact speeds have a greater probability of resulting in a fatality.[3]

Table 10
Comparison of Crash Rates per 100 Million AVMT by Roadway Classification: 2016-2020

	2016	2017	2018	2019	2020	Change 2019-2020	Avg. Change 2016-2019
Fatal Crash Rate	1.19	1.35	1.21	1.11	1.08	-2.7%	-1.6%
Urban Fatal Crash Rate	0.60	0.69	0.78	0.65	0.60	-8.7%	3.8%
Rural Fatal Crash Rate	1.63	1.84	1.53	1.47	1.44	-2.2%	-2.4%
Injury Crash Rate	54.32	54.38	51.29	50.69	45.64	-10.0%	-2.2%
Urban Injury Crash Rate	82.78	85.39	81.26	79.07	69.54	-12.1%	-1.5%
Rural Injury Crash Rate	33.05	31.56	29.13	28.37	28.01	-1.3%	-4.9%
Total Crash Rate	144.15	147.67	135.70	149.60	129.78	-13.3%	1.5%
Urban Total Crash Rate	216.46	226.80	215.39	232.47	198.86	-14.5%	2.6%
Rural Total Crash Rate	90.13	89.43	76.76	84.45	78.83	-6.7%	-1.6%

Table 11 shows the number of crashes and crash rates on local and state system roadways (both interstate and non-interstate) for 2016-2020, and the number of crashes and crash rates statewide. Crash rates are lower than the statewide fatality and injury rates shown in Table 2 because multiple fatalities or injuries may result from a single crash.

Table 11
Crash Rates for Local and State System Roadways: 2016-2020

Roadway Information	2016	2017	2018	2019	2020	Change 2019-2020	Avg. Change 2016-2019
Local Roads:							
VMT (100 millions)	77.3	76.6	77.2	79.4	76.4	-3.8%	0.9%
Fatal Crashes	92	92	81	82	75	-8.5%	-3.6%
Injury Crashes	5,318	4,958	5,223	5,372	4,548	-15.3%	0.5%
Total Crashes	15,067	15,256	14,185	16,083	12,632	-21.5%	2.5%
Fatal Crash Rate	1.2	1.2	1.0	1.0	1.0	-5.0%	-4.4%
Injury Crash Rate	68.8	64.7	67.6	67.7	59.5	-12.0%	-0.5%
Total Crash Rate	195.0	199.1	183.6	202.6	165.3	-18.4%	1.6%
U.S. and State Highways:							
VMT (100 millions)	52.1	53.1	55.0	56.0	55.1	-1.6%	2.4%
Fatal Crashes	94	93	95	88	91	3.4%	-2.1%
Injury Crashes	3,002	2,838	2,927	2,727	2,530	-7.2%	-3.1%
Total Crashes	8,055	8,210	7,630	7,813	7,216	-7.6%	-0.9%
Fatal Crash Rate	1.8	1.7	1.7	1.6	1.7	5.1%	-4.5%
Injury Crash Rate	57.6	53.4	53.2	48.7	45.9	-5.7%	-5.4%
Total Crash Rate	154.6	154.5	138.6	139.4	130.9	-6.1%	-3.2%
Interstate Highways:							
VMT (100 millions)	42.1	43.2	44.8	45.2	42.0	-6.9%	2.4%
Fatal Crashes	46	39	39	31	22	-29.0%	-11.9%
Injury Crashes	1,007	1,022	933	1,054	844	-19.9%	1.9%
Total Crashes	2,206	2,385	2,216	3,119	2,680	-14.1%	13.9%
Fatal Crash Rate	1.1	0.9	0.9	0.7	0.5	-23.8%	-14.0%
Injury Crash Rate	23.9	23.6	20.8	23.3	20.1	-14.0%	-0.3%
Total Crash Rate	52.4	55.1	49.5	69.1	63.8	-7.7%	11.5%
Statewide Totals:							
VMT (100 millions)	171.5	173.0	177.1	180.6	173.6	-3.9%	1.7%
Fatal Crashes	232	224	215	201	188	-6.5%	-4.7%
Injury Crashes	9,327	8,818	9,083	9,153	7,922	-13.4%	-0.6%
Total Crashes	25,328	25,851	24,031	27,015	22,528	-16.6%	2.5%
Fatal Crash Rate	1.4	1.3	1.2	1.1	1.1	-2.7%	-6.3%
Injury Crash Rate	54.4	51.0	51.3	50.7	45.6	-10.0%	-2.3%
Total Crash Rate	147.7	149.4	135.7	149.6	129.8	-13.3%	0.7%

Driver Age Distribution

Table 16 shows the changes in the number of licensed drivers in Idaho since 2010.

Table 16
Age Distribution of Licensed Drivers: 2010, 2015, 2020

Age	2010	2015	2020	Change 2010-2020	Change 2015-2020
15*	2,592	3,443	3,447	33.0%	0.1%
(%)	0.2%	0.3%	0.3%		
16-24	153,891	160,140	176,921	15.0%	10.5%
(%)	14.4%	14.0%	13.4%		
25-34	191,583	196,056	217,998	13.8%	11.2%
(%)	17.9%	17.1%	16.6%		
35-44	177,226	186,231	220,029	24.2%	18.1%
(%)	16.6%	16.3%	16.7%		
45-54	195,441	186,222	194,912	-0.3%	4.7%
(%)	18.3%	16.3%	14.8%		
55-64	177,521	195,777	212,609	19.8%	8.6%
(%)	16.6%	17.1%	16.2%		
65+	171,288	216,423	290,484	69.6%	34.2%
(%)	16.0%	18.9%	22.1%		
TOTALS	1,069,542	1,144,292	1,316,400	23.1%	15.0%

**On September 1, 1989, legislation took effect increasing the driving age from 14 to 16 years old.*
On September 1, 1991, legislation lowered the driving age from 16 to 15 years old.

The graduated driver's license law took effect January 1, 2001. The law changed the requirements for operating a vehicle with a supervised instruction permit. These requirements must be met to obtain a class D driver's license: the permittee may not apply for a driver's license sooner than 15 years of age and no sooner than 6 months after completing a driver's training course; during the 6 month period, the permittee must accumulate 50 hours of supervised driving time with a licensed driver 21 years of age or older and 10 of the hours must be at night. All occupants of the vehicle must be properly restrained. If the permittee is convicted of any traffic violation or is found in violation of any of the restrictions of the supervised instruction permit, the permit is canceled and the 6 month period starts over from the date a supervised driving permit is reissued. The conditions of the supervised driving permit apply to everyone under 17 years of age that is attempting to obtain a driver's license. Once a class D license is obtained, driving is restricted to daylight hours for persons under 16 years of age. An amendment, taking effect July 1, 2003, allows 15 year old drivers to drive at night, as long as another licensed driver over the age of 21 is present. Another amendment, taking effect July 1, 2007, increased the number of months for the supervised driving period to 6 months and restricted the number of passengers not related to the driver to no more than one for drivers under the age of 17.

Driver Age and Crash Involvement

Table 17
Driver Age as a Factor in Crashes: 2020

	Licensed Drivers		Drivers in All Crashes			Drivers in Fatal and Injury Crashes		
Age	Number	%	Number	%	Involvement*	Number	%	Involvement*
15	3,447	0.3%	336	0.9%	3.4	145	1.0%	3.9
16	11,395	0.9%	893	2.3%	2.7	293	2.1%	2.4
17	16,925	1.3%	1,117	2.9%	2.3	404	2.8%	2.2
18	18,178	1.4%	1,347	3.5%	2.5	490	3.5%	2.5
19	21,264	1.6%	1,311	3.4%	2.1	472	3.3%	2.1
20	22,176	1.7%	1,166	3.0%	1.8	445	3.1%	1.9
21	20,056	1.5%	1,127	2.9%	1.9	393	2.8%	1.8
22	21,819	1.7%	1,089	2.8%	1.7	404	2.8%	1.7
23	22,182	1.7%	988	2.6%	1.5	359	2.5%	1.5
24	22,926	1.7%	946	2.5%	1.4	341	2.4%	1.4
25-34	217,998	16.6%	7,796	20.4%	1.2	2,927	20.6%	1.2
35-44	220,029	16.7%	6,075	15.9%	0.9	2,287	16.1%	1.0
45-54	194,912	14.8%	4,714	12.3%	0.8	1,821	12.8%	0.9
55-64	212,609	16.2%	4,318	11.3%	0.7	1,588	11.2%	0.7
65-74	184,195	14.0%	2,716	7.1%	0.5	1,039	7.3%	0.5
75+	106,289	8.1%	1,359	3.5%	0.4	531	3.7%	0.5
Not Stated or Other			986	2.6%		242	1.7%	
TOTALS	**1,316,400**		**38,284**			**14,181**		

** Involvement is calculated by dividing the percent of drivers in Crashes by the percent of licensed drivers. Over-representation occurs when the value is greater than 1.0.*

Drivers, ages 19 and under, were involved in 2.4 times as many fatal or injury traffic crashes as expected. This age group comprised 5.4% of all licensed drivers and accounted for 12.7% of drivers in fatal & injury crashes. Drivers, ages 20 to 24, were involved in 1.7 times as many fatal or injury crashes as expected. Young drivers continue to be over-involved in crashes.

Crash Involvement by Driver Age and Gender

Figure 10 shows driver involvement by age and gender for all crashes and Figure 11 shows driver involvement by age and gender for fatal and injury crashes. Figure 11 corresponds with the involvement numbers in Table 17 and shows how the involvement numbers breakdown by gender. For example (in Figure 11), 15 year-old male drivers were involved in 3.6 times as many fatal and injury crashes as expected, while female 15 year-old drivers were involved in 4.3 times as many fatal and injury crashes as expected.

Figure 10
Involvement by Driver Age and Gender in All Crashes: 2020

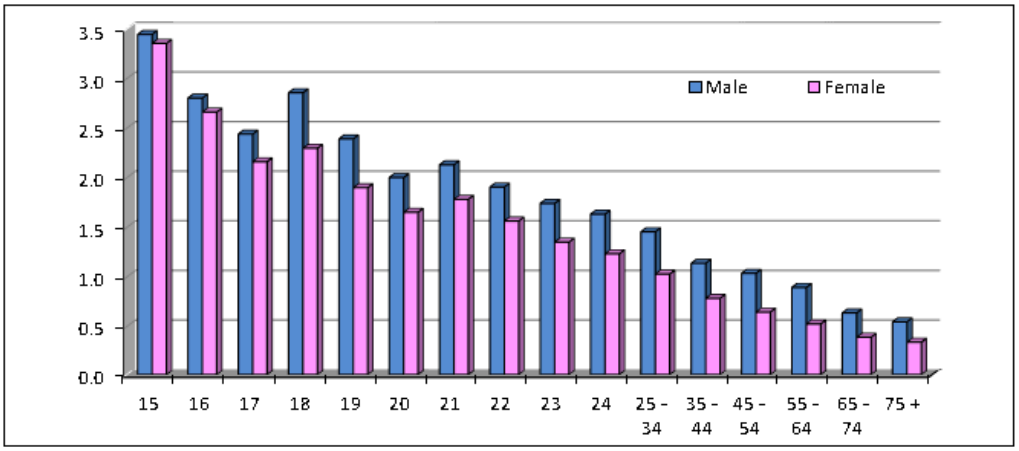
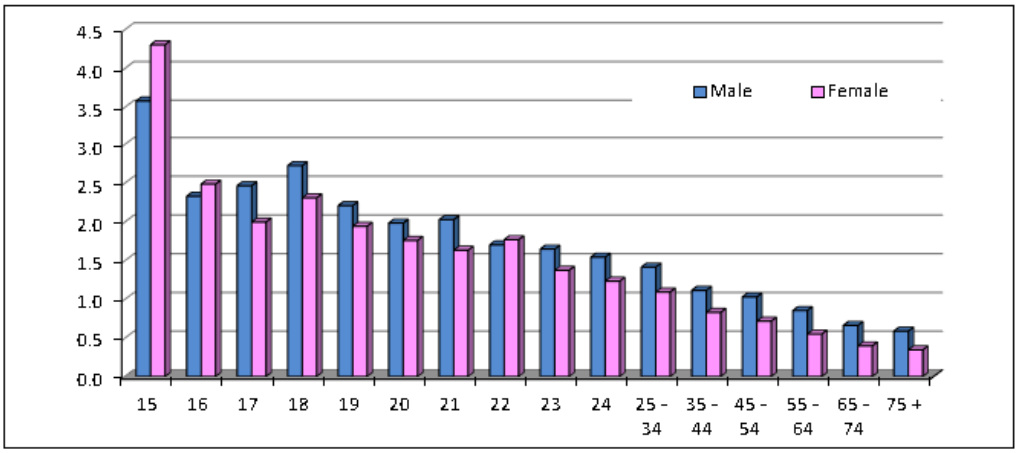


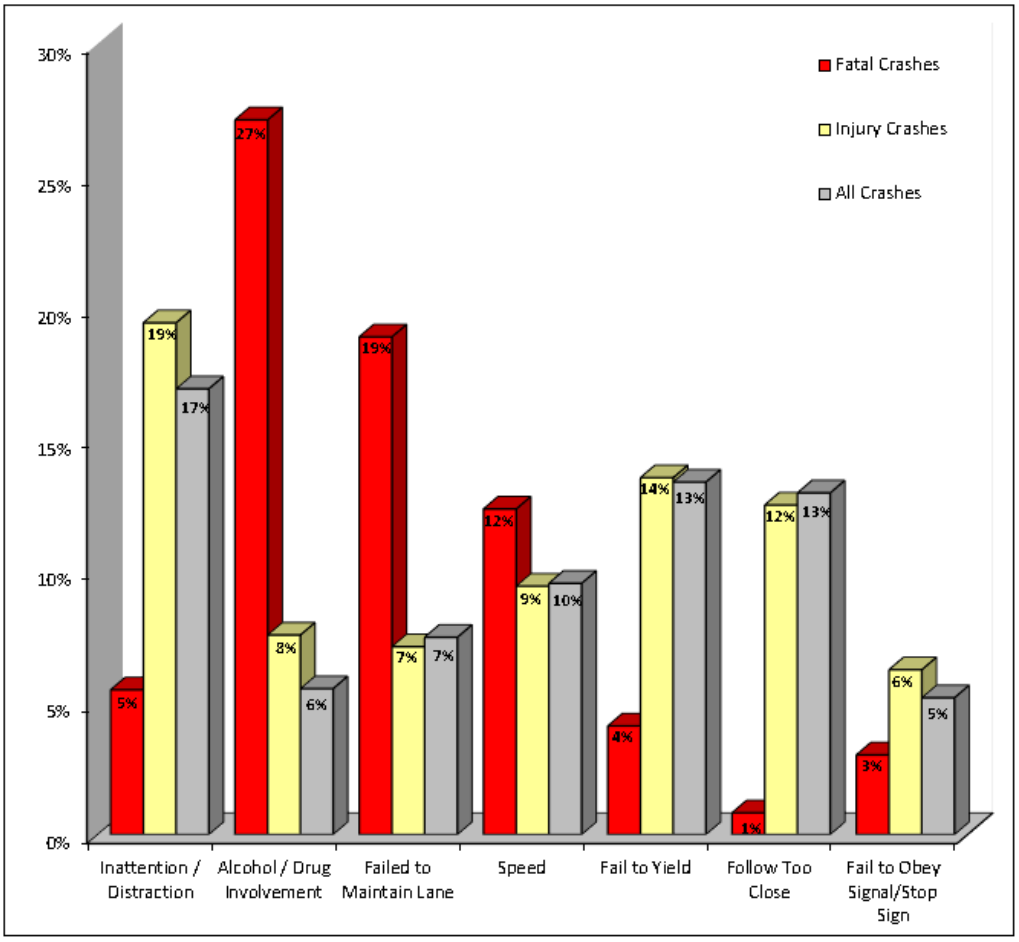
Figure 11
Involvement by Driver Age and Gender in Fatal & Injury Crashes: 2020



Contributing Circumstances in Crashes

Figure 12 portrays the seven most prevalent contributing circumstances recorded for fatal crashes, injury crashes, and all crashes. For every vehicle involved in a crash, the investigating officer may indicate up to three circumstances that may have contributed to the occurrence of the crash.

Figure 12
Top Seven Most Prevalent Contributing Circumstances Cited for Traffic Crashes in 2020



Impaired Driving

An impaired driving crash is identified by information provided on the crash report. A law enforcement officer determines whether the driver was alcohol or drug impaired or whether alcohol or drugs contributed to the crash, regardless of whether a Blood Alcohol Content (BAC) test was given or not. Crashes where a sober driver collided with an impaired pedestrian or bicyclist are also included.

Table 21
Impaired Driving Crashes: 2016-2020

	2016	2017	2018	2019	2020	Change 2019-2020	Avg. Change 2016-2019
Impaired Driving Crashes	1,535	1,529	1,456	1,501	1,513	0.8%	-0.7%
Fatalities	88	80	78	99	92	-7.1%	5.1%
Suspected Serious Injury	223	218	212	217	234	7.8%	-0.9%
Suspected Minor Injury	397	338	334	329	385	17.0%	-5.8%
Possible Injuries	482	489	523	525	548	4.4%	2.9%
Impaired Driving Crashes as a % of All Crashes	6.1%	5.9%	6.1%	5.6%	6.7%	20.9%	-2.8%
Impaired Driving Fatalities as a % of All Fatalities	34.8%	32.7%	33.3%	44.2%	43.0%	-2.7%	9.5%
Impaired Driving Injuries as a % of All Injuries	8.1%	8.1%	8.0%	8.0%	10.2%	26.8%	-0.1%
All Fatal and Injury Crashes	9,559	9,042	9,298	9,354	8,110	-13.3%	-0.7%
Impaired Fatal/Injury Crashes	821	764	808	789	831	5.3%	-1.2%
% Impaired Driving	8.6%	8.4%	8.7%	8.4%	10.2%	21.5%	-0.6%
Impaired Driving Fatality and Serious Injury Rate per 100 Million Vehicle Miles Of Travel	1.81	1.72	1.64	1.75	1.88	7.3%	-1.0%
Annual DUI Arrests by Agency*							
Idaho State Police	1,305	1,400	1,518	1,555	1,410	-9.3%	6.0%
Local Agencies	6,015	5,927	6,412	6,529	5,529	-15.3%	2.8%
Total Arrests	7,320	7,327	7,930	8,084	6,939	-14.2%	3.4%
DUI Enforcement Rate**	0.63	0.61	0.63	0.63	0.53	-16.4%	0.2%

**Source: Idaho State Police, Bureau of Criminal Identification*

***DUI Arrests per 100 Licensed Drivers per Year.*

In 2020, while total crashes decreased substantially from 2019, the number of impaired driving crashes actually increased slightly. While fatalities resulting from impaired driving crashes decreased by 7%. More than 10% of all fatal and injury crashes involved an impaired driver, an impaired pedestrian, or an impaired bicyclist. In 2020, 43% of all fatalities were the result of an impaired driving crash. Only 29% of the passenger motor vehicle occupants killed in impaired driving crashes were wearing a seatbelt.

Distracted Driving

Distracted driving crashes are those where investigating law enforcement officer indicates that either inattention or a distraction in or on the vehicle was a contributing factor in the crash. Distraction is defined by the National Highway Traffic Safety Administration as a specific type of inattention that occurs when drivers divert their attention away from the task of driving to focus on another activity. Distraction is categorized into the three following types: visual (taking your eyes off the road), manual (taking your hands off the wheel), and cognitive (taking your mind off the road).

Table 35
Distracted Driving Crashes: 2016-2020

	2016	2017	2018	2019	2020	Change 2019-2020	Avg. Change 2016-2019
Total Distracted Driving Crashes	4,973	4,808	4,750	5,066	4,253	-16.0%	0.7%
Fatalities	64	39	48	36	22	-38.9%	-13.7%
Suspected Serious Injury	367	318	343	250	237	-5.2%	-10.9%
Suspected Minor Injury	1,193	989	1,028	903	863	-4.4%	-8.4%
Possible Injuries	2,121	2,020	2,081	2,112	1,637	-22.5%	-0.1%
Distracted Driving Crashes as a % of All Crashes	19.6%	18.6%	19.8%	18.8%	18.9%	0.7%	-1.4%
Distracted Driving Fatalities as a % of All Fatalities	25.3%	15.9%	20.5%	16.1%	10.3%	-36.0%	-10.0%
Distracted Driving Injuries as a % of All Injuries	26.9%	25.7%	26.0%	24.5%	23.9%	-2.4%	-3.1%
All Fatal and Injury Crashes	9,559	9,042	9,298	9,354	8,110	-13.3%	-0.7%
Distracted Fatal/Injury Crashes	2,355	2,151	2,244	2,131	1,852	-13.1%	-3.1%
% DistractedDriving	24.6%	23.8%	24.1%	22.8%	22.8%	0.2%	-2.5%
Distracted Driving Fatality and Serious Injury Rate per 100 Million Vehicle Miles Of Travel	2.51	2.06	2.21	1.58	1.49	-5.8%	-13.1%

Distracted driving crashes made up 19% of all crashes in 2020 and were responsible for 10% of all fatalities. While 71% of all distracted driving crashes occurred on urban roadways, 85% of the fatal distracted driving crashes occurred on rural roadways.

While only 21% of all distracted driving crashes involved a single vehicle, 25% of fatal distracted driving crashes involved a single vehicle.

The economic cost of crashes involving distracted driving was over $601 million dollars in 2020. This represents 16% of the total costs of Idaho crashes (as shown in Table 4).

Figures 15 and 16 on the following page show what the distractions were for crashes where the officer indicated Distracted in or on Vehicle as a contributing circumstance. There were 4 fatal and 995 total crashes that involved Distracted in or on Vehicle. Inattention makes up a larger portion of the distracted driving crashes. Of course, both Inattention and Distracted in or on Vehicle could be contributing circumstances in a single crash.

Figure 15
Percentage of Distracted In or On Vehicle Fatal Crashes by Type of Distraction: 2020

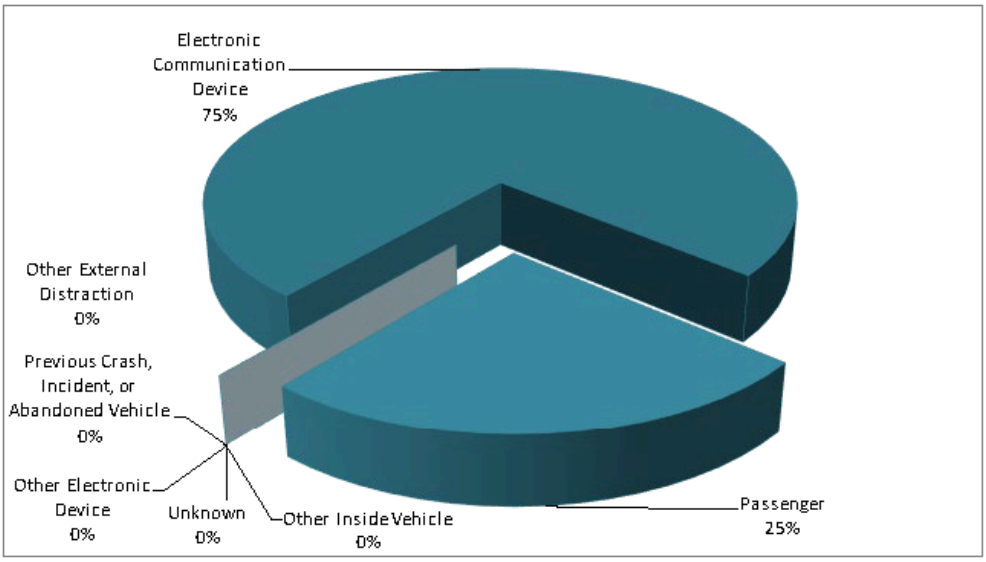
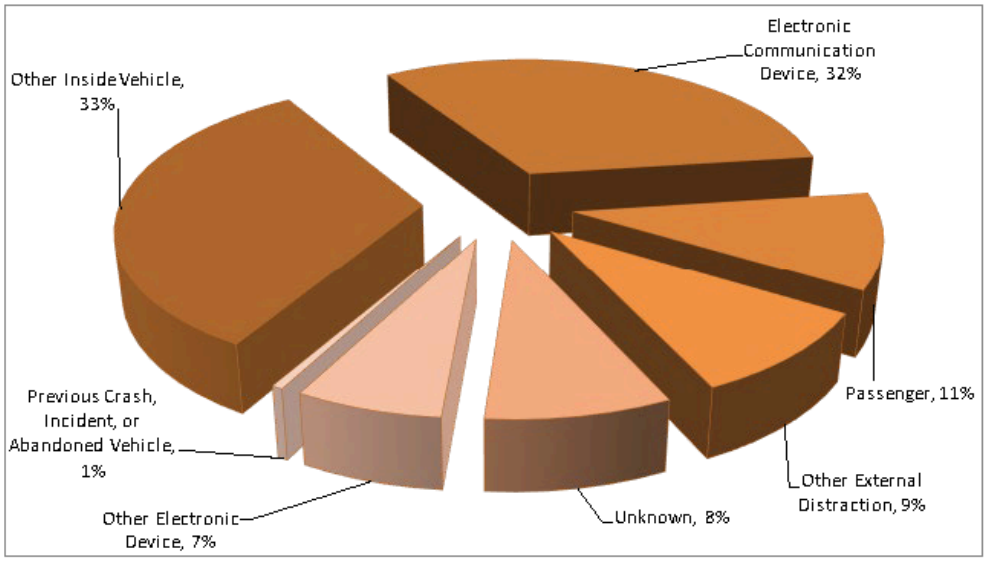


Figure 16
Percentage of Distracted In or On Vehicle Total Crashes by Type of Distraction: 2020



Motor Vehicle Crashes in Work Zones

Table 46
Crashes in Work Zones: 2016-2020

	2016	2017	2018	2019	2020	Change 2019-2020	Avg. Change 2016-2019
Work Zone Crashes	324	453	630	590	753	27.6%	24.2%
Fatalities	0	9	10	7	5	-28.6%	281.1%
Suspected Serious Injury	19	16	34	18	26	44.4%	16.6%
Suspected Minor Injury	59	73	100	66	99	50.0%	8.9%
Possible Injuries	96	166	197	203	277	36.5%	31.5%
% All Crashes	1.3%	1.8%	2.6%	2.2%	3.3%	53.0%	23.3%
Workers Injured	0	1	1	1	0	-100.0%	33.3%

Workers on the roadway are especially vulnerable since their attention is focused on the task at hand rather than on the traffic passing by. While most crashes occurring in work zones do not involve a worker, there have been a few crashes that have involved workers.

A worker was struck while setting up a flashing arrow-board trailer in Ada County in 2017. A flagger was struck in 2018 in Canyon County. A worker was struck while standing next to traffic cones in a lane closure in 2019.

Single-vehicle crashes comprised 15% of the crashes in work zones in 2020. Overturn (22%) was the predominant most harmful event in single-vehicle crashes in work zones followed by Other Object – Not Fixed (14%), Concrete Traffic Barrier (10%), Animal-Wild (8%), Embankment (8%), Other Fixed Object (5%), and Traffic Sign Support (5%).

The majority of work zone crashes involve multiple vehicles and Rear End (65%) was the predominant most harmful event for multiple-vehicle crashes in work zones followed by Side-Swipe - Same Direction (15%), Angle Turning (6%), and Angle (3%).

Table 47 shows work zone crashes by road type.

Table 47
Work Zone Crashes by Roadway Type: 2020

	Fatal Crashes		Injury Crashes		Property Damage Crashes		All Crashes	
Interstate								
Urban	0	0.0%	109	42.1%	200	40.8%	309	41.0%
Rural	3	75.0%	38	14.7%	97	19.8%	138	18.3%
U.S. or State Highway								
Urban	0	0.0%	33	12.7%	52	10.6%	85	11.3%
Rural	1	25.0%	25	9.7%	24	4.9%	50	6.6%
Local								
Urban	0	0.0%	50	19.3%	108	22.0%	158	21.0%
Rural	0	0.0%	4	1.5%	9	1.8%	13	1.7%
Total	**4**	**0.5%**	**259**	**34.4%**	**490**	**65.1%**	**753**	

Table 48 shows the severity of crashes by transportation district. Transportation district boundaries can be found in Appendix A.

Table 48
Crashes in Work Zones by Transportation District: 2020

	Fatal Crashes	Injury Crashes	Property Damage Crashes	Total Crashes
District 1	0	15	41	56
District 2	1	9	14	24
District 3	2	188	303	493
District 4	1	29	71	101
District 5	0	9	33	42
District 6	0	9	28	37
Statewide	**4**	**259**	**490**	**753**

In 2020, the economic cost of crashes in work zones was nearly $97 million dollars. This represents 3% of the total cost of Idaho crashes (as shown in Table 4).

Chapter 13
ITD Forms

ITD 0025 Standard Construction Diary Instructions

Follow the instructions below when completing an ITD 0025.

1. Erroneous entries should be lined through and correctly re-entered.
2. When estimated and final quantities are reported in the diary, they should be listed in the upper portion.
3. Firm quantity calculations entered on the diaries must be checked and initialed by the checker. Checking estimated quantity calculations is considered optional.
4. Quantity entries should have tick marks indicating they have been posted to the ledger.
5. When equipment is reported in the diary: list type and size of equipment that is working and list type and size of equipment that is idle for repairs or on-site and not working.
6. When personnel are reported in the diary: list the number of personnel in each classification and list prime contractors and subcontractors separately.
7. In the Notes section make note of:
    a. Work in progress.
    b. Any unusual conditions.
    c. Changes, extra work and time charges, and their justification.
    d. Unsatisfactory or questionable materials, workmanship, or conditions and corrective action taken.
    e. Dimensional checks.
    f. Any situation that indicates noncompliance with the Plans Specifications, Special Provisions, or prescribed policies and procedures.
    g. Any controversial matters.
    h. Work of survey crews.
    i. Work of inspectors.
    j. Instructions or decisions received or made.
    k. Instructions given to the Contractor.
    l. Important conversations with the Contractor.
    m. Verbal agreements with the Contractor.
    n. Any complaints from the Contractor.
    o. All work stoppages and reasons why.
    p. Rate of progress and reasons for any unsatisfactory progress.

q. Accidents and hazardous working conditions. Action taken when hazardous working conditions were noticed.
r. Official visitor(s) to the project.
s. Any communication from a higher authority.
t. Quality of work.
u. Documentation required for construction items. Refer to Specifications, the Contract Administration Manual, and MTR's for requirements.
v. Information regarding conditions of signing and traffic control (should normally be contained in the diary of the person assigned as traffic control inspector).

8. Note weather conditions – include maximum and minimum temperatures when applicable.
9. Note time the Contractor commences and stops work each day

ITD 0025 (Rev. 3-05)
Supply # 27-008200-1

Standard Construction Diary

Key Number	Date	Inspector's Name (Initial if Filling Out Electronically)

Page _____ of _____

Notes

Weather Conditions and Temperatures	Time Contractor Started Work	Time Contractor Stopped Work

Contractor	Chargeable Days ☐ Yes ☐ No	Date and Day of Week

Inspector's Signature	Reviewer's Signature

Project Number	Project Location	Key Number	Diary Number

Distribution: Original for Project File Copy to Remain in Book

ITD 0631 (Rev. 8-06)

Traffic Control Maintenance (TCM)

Present to ITD Traffic Control Representative no later than the first working day following the week/period ending date indicated below.
If the ITD Traffic Control representative (TCR) has a different quantity than listed below, the ITD TCR will line through the quantity in question, enter a proposed quantity, and initial next to it. The basis of the difference will be documented in the Remarks section below. If the Contractor's TCR agrees with the quantity proposed by ITD, the Contractor's representative will initial the revised quantity.

Sheet _____ of _____

Key Number	Project Number	Project Name	Week/Period Ending Date

Item Number	Funding Code	Reported By	Report Number	Contractor TC Rep Printed Name	ITD Rep Printed Name

By initialing, the Contractor traffic control representative certifies that the quantity shown below is true and correct and that the work was performed in conformance with the contract documents and the approved traffic control plan(s).

Date mm/dd	**Maintenance Staff Name(s)**	**Work Description**	**Hours Worked**	**Contractor Rep (Initial Daily)**	**ITD Rep (Initial Daily)**
Sun					
Mon					
Tues					
Wed					
Thurs					
Fri					
Sat					

Field Checked By: _____

Sheet Total

Remarks:

Resident's Office Personnel Only

Total Checked By	Total Posted By	Posting Checked By

Distribution: White – Residence Office Yellow – Inspector Pink – Traffic Control Supervisor

Traffic Accident Field Report

ITD 0645 (Rev. 10-12)
itd.idaho.gov

District	Accident Occurred In	Report Date
	Contract Construction Area: Yes ☐ No ☐ Maintenance Construction Area: Yes ☐ No ☐	

Names of Those Involved (if available)	Address	Phone	License Number

Company Name If Commercial Vehicle: _____

Describe Accident (Detailed and Factual Only)

Names of Witnesses (if available)	Address	Phone

Accident Date	Time	Route	Mile Post	County	Photographs Taken
	☐ a.m. ☐ p.m.				Yes ☐ No ☐

Describe Any Damage to State Property

Roadway Condition at Scene	Existing Signing/Warning Devices in Vicinity of Accident

Supervisor's Name	Investigating Department
	☐ ISP ☐ County ☐ City

Additional Information

Reported By

Note: Attach a copy of the investigating officer's report, if applicable.

Distribution: Original – District/Section Copy – Safety and Risk Management

Construction Inspection Report

ITD 1406 (Rev. 10-16)
itd.idaho.gov

Phase ☐ Intermediate ☐ Final ☐

Key Number	Project Number	District/LHTAC	Location

Resident Engineer	Inspection Made By	Date

In Company With	Contractor Name

Traffic Interference or Delays	Signing	Condition of Detours

FHWA Project of Interest? ☐ Yes ☐ No

Distribution: Resident Engineer Inspecting Engineer Construction/Materials Engineer
District Engineer

Other _____

ITD 2687 (Rev. 6-04)

Temporary Traffic Control Checklist

Reference Sections 616, 626, 712 of the ITD Standard Specifications for Highway Construction Manual

☐ Construction ☐ Maintenance ☐ Other			District Number
Project Number	Date Traffic Plan Approved	Date Inspected	Time Inspected
Inspected By (Print)	Title		

Signing – Permanent Supports

Item	Yes	No	N/A	Comments
In place according to approved TTCP	☐	☐	☐	
Missing	☐	☐	☐	
Replaced	☐	☐	☐	
Damaged/Dirty	☐	☐	☐	
Replaced/Cleaned	☐	☐	☐	
Flags in place (If used)	☐	☐	☐	
Replaced	☐	☐	☐	
Flashing units working (If used)	☐	☐	☐	
Repaired	☐	☐	☐	
Flashing units dirty (If used)	☐	☐	☐	
Cleaned	☐	☐	☐	
Inappropriate signs covered/removed	☐	☐	☐	
Uncovered when apply to work situation	☐	☐	☐	
Signing change approved (If deemed an improvement)	☐	☐	☐	
Signs obstructed from motorists' view	☐	☐	☐	
Obstruction moved or sign relocated	☐	☐	☐	
Retro-reflectivity (Class A or B)	☐	☐	☐	
Replaced	☐	☐	☐	

Signing – Temporary Supports

Sign Type (Roll Up, Wood, Aluminum, Composite)				
Portable Support Type				
Item	**Yes**	**No**	**N/A**	**Comments**
In place according to approved TTCP	☐	☐	☐	
NCHRP-350 Approved (Requires WZ Crash Test Letter Reproduced in Full)	☐	☐	☐	Specify WZ Letter Number
Missing	☐	☐	☐	
Replaced	☐	☐	☐	
Damaged/Dirty	☐	☐	☐	
Replaced/Cleaned	☐	☐	☐	
Flags in place (if used)	☐	☐	☐	
Replaced	☐	☐	☐	
Flashing units working (if used)	☐	☐	☐	
Repaired	☐	☐	☐	

Item	Yes	No	N/A	Comments
Flashing units dirty (if used)	☐	☐	☐	
Cleaned	☐	☐	☐	
Signs removed when not in force for 1 hour or more	☐	☐	☐	
Uncovered when apply to work situation	☐	☐	☐	
Signing change approved if deemed an improvement	☐	☐	☐	
Signs obstructed from motorists' view	☐	☐	☐	
Obstruction moved or sign relocated	☐	☐	☐	
Retro-reflectivity (Type III or Higher Sheeting)	☐	☐	☐	
Replaced	☐	☐	☐	

Barricades

Identify the work area or obstruction
Specify Barricade Type (I, II, III)

Item	Yes	No	N/A	Comments
Signs Attached (List Sign Number or Legend)	☐	☐	☐	
Lights Attached	☐	☐	☐	
Stripe Orientation Correct (Rt. or Lt. or Closure)	☐	☐	☐	
Clean and undamaged (Includes Retro-reflective tape)	☐	☐	☐	
Cleaned, repaired or replaced (Show date and time)	☐	☐	☐	
Flashing units attached per NCHRP-350	☐	☐	☐	
Flashing units working	☐	☐	☐	
Repaired/Replaced	☐	☐	☐	
Taper speed wide if used in taper	☐	☐	☐	
Taper corrected	☐	☐	☐	
NCHRP-350 Approved (Requires WZ Crash Test Letter Reproduced in Full)	☐	☐	☐	Specify WZ Letter Number

Porta Rail

Specify Type (Concrete, Water Filled, Sand Filled)
Length of Individual Sections
End Treatment Type

Item	Yes	No	N/A	Comments
Delineation attached (Specify type and attachment)	☐	☐	☐	
NCHRP-350 Approved (Required for all new installations)	☐	☐	☐	

Drums – Closed Top

Weighted Base (Specify Type and Weight)	☐	☐	☐	
Retro-reflectivity (Required both Day and Night Use) See MUTCD Part 6F for Specification (Org. & White)	☐	☐	☐	
Clean and undamaged (Includes Retro-reflective tape)	☐	☐	☐	
Cleaned, repaired or replaced (Show date and time)	☐	☐	☐	
Taper speed wide if used in taper	☐	☐	☐	
Taper corrected	☐	☐	☐	
Signs/flashers mounted on barrels are visible to traffic	☐	☐	☐	
Signs/flashers modified to be visible to traffic	☐	☐	☐	

Item	Yes	No	N/A	Comments
Clean	☐	☐	☐	
Cleaned	☐	☐	☐	
NCHRP-350 Approved (Required for all new installations)	☐	☐	☐	

Arrow Panels

Arrow Panel Properly placed according to TTCP	☐	☐	☐	
Sequential board lights all working	☐	☐	☐	
Burned out lights replaced	☐	☐	☐	
Sequential arrow correct direction for situation	☐	☐	☐	
Steady burn lights working	☐	☐	☐	
Burned out lights replaced	☐	☐	☐	
Daytime Visibility (Specify distance)	☐	☐	☐	
Nighttime Visibility (Specify distance)	☐	☐	☐	

Portable Changeable Message Panels

PCMS Power Source (Specify Type: Battery, diesel, gas, combo)

Item	Yes	No	N/A	Comments
Message Board Properly placed according to TTCP	☐	☐	☐	
All lights working	☐	☐	☐	
Burned out lights replaced	☐	☐	☐	
Message correct for situation	☐	☐	☐	
Daytime Visibility (Specify distance)	☐	☐	☐	
Nighttime Visibility (Specify distance)	☐	☐	☐	

Weather Conditions
Road Conditions
Other Comments

Inspector's Signature	Date
Photocopy for Distribution as Advisable ☐	☐

Chapter 14

Multi-State Limited Reciprocity March 1, 2006

Traffic Control Supervisor Certification

Participating states may have additional training requirements in excess of the minimums established by this agreement. When crossing State lines it shall be the Traffic Control Supervisor's responsibility to determine if any additional training is required.

It was agreed to at this meeting that the following requirements are to be considered as "Minimum Requirements" for the Traffic Control Supervisor (TCS) Certification Course:

- The TCS instructor applicant must be a certified TCS by a recognized State Transportation agency.
- TCS instructors must be certified by an organization approved by a State Transportation Agency.
- Instructors must be approved by the State Transportation Agency.
- State oversight committees will be formed to ensure the certification of TCS instructors and to approve course curriculum, student requirements, audio/visual teaching aids, student book, and instructor book used to conduct the training.
- Minimum class length shall be 16 hours.
- Maximum class size shall be 35 students per classroom instructor.
- TCS students shall have a current flagger card, 2,000 hours of verifiable field or design of Temporary Traffic Control Zones as defined in the 2003 MUTCD work zone traffic control experience, and two letters from employers or reputable persons familiar with their experience.
- Minimum passing grade on the final approved exam shall be 80%.
- Providers shall maintain an easily accessible database of TCS students to verify participation in the training.
- TCS shall be recertified at least every 4 years and attend at least 8 hours training and pass the recertification exam.
- TCS cards shall indicate date issued and date of expiration, government-issued photo ID required (or photo on issued TCS card), the State card is issued in, name of training organization, instructor's name and student's name.

- **<u>Minimum Requirements for TCS Training Program:</u>**
    - Materials based on the Federal Manual on Uniform Traffic Control Devices adopted by each state.
    - Purpose/Role/Duties of the TCS
    - Fundamentals of traffic control
    - Traffic control devices installing, removing, and familiarization
    - Human factors
    - Traffic control standards/manuals and specification (may vary by organization)
    - Reading, developing, evaluating and managing Traffic Control Plans
    - Pedestrian, worker, and motorist safety
    - Implementation, designing Traffic Control Plans workshop
    - Legal liability and supporting documentation
    - Emergency situations
- **TCS reciprocity to work in another State that signed this Multi-State TCS Agreement:**
    - A person certified as a TCS must comply with additional reciprocal requirements to work as a TCS in another state or province (instructor to notify students in class they may be required to pay for and attend additional instruction and pass that organization's exam).
    - When additional instruction is successfully completed, the student will be issued a TCS card by that state/province.
    - Instructors are not authorized to cross state/provincial lines unless they have been approved by that state/province to conduct training.
    - A termination clause will be included to allow the removal of any instructor found to be in non-compliance with the reciprocity agreement.
    - The state/province shall have final say in any dispute arising from the teaching/instructing curriculum in that state/province.
- **TCS instructor issues:**
    - Instructors are not authorized to cross State lines unless they have been approved by that State to conduct training.
    - A termination clause will be included to allow the removal of any instructor found to be in noncompliance with the reciprocity agreement.
    - The State shall have final say in any dispute arising from the teaching/instructing curriculum in that State.

THIS AGREEMENT ESTABLISHES THE MINIMUM REQUIREMENTS FOR A DOT TRAFFIC CONTROL SUPERVISOR PROGRAM BY THE PARTIES OF THE AGREEMENT.

_____ _____

Doug Tindall, Deputy Director for Highways Date
Department of Transportation
State of Oregon

_____ _____

Greg Laragan, Assistant Chief Engineer Date
Operations
Idaho Transportation Department
State of Idaho

_____ _____

Jim Currie Date
Deputy Director
Montana Department of Transportation
State of Montana

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Traffic Control Supervisor Requirements:

1. A current state approved flagging card. Approved states are: Idaho, Montana, Oregon and Washington.

2. Two signed letters* (or one letter with two signatures) verifying 2,000 hours of work in traffic control related tasks. These can be achieved over multiple years. Letters can be submitted from any of the following who can verify the knowledge and experience of the TCS candidate:
    - Employers (past and/or present),
    - Subcontractors,
    - DOT Inspectors, or
    - Other Traffic Control Supervisors

    *Note: Any of the letters provided may be submitted to the State upon request.

    Experience may include work in the following areas:
    - Experience as a construction inspector, including inspection of traffic control.
    - Traffic control work on a survey crew.
    - Designing or reviewing traffic control plans.
    - Other specific traffic control experience (set-up and take-down).
    - Some flagging experience.

    These letters should include:
    - Brief history of individuals working experience,
    - Project(s) they have worked on, and
    - Approximate number of cumulative hours work as a Flagger/Work Zone Worker.

    Letter Format:
    - Must be typed and on letterhead. (If letterhead is not available a company business card will be acceptable).
    - Must provide contact information for the authors
3. Individuals must also complete the training and pass the exam with a score of 80% or better.

Please submit all required paperwork to:
flagger@esc.org

Be aware that the Evergreen Safety Council cannot issue your TCS card or certificate until we have received all required information as outlined above.

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Participant Information Sheet

Idaho Traffic Control Supervisor

1. Please indicate if you are attending the class to be a Traffic Control Supervisor (TCS) or for information only.
   - ☐ A TCS
   - ☐ Informational
2. The following information will be used to issue and send you your Certification Card and Certificate.

PLEASE PRINT LEGIBLY

Class Date:_____ Instructor Name:_____

Class Location:_____

F.Name:_____MI:____L. Name:_____Suffix:_____

Last 6 of DL #_____Work Phone: (_____)_____

Email:_____Cell Phone: (_____)_____

Company Name:_____

Address:_____

City: _____State: _____ Zip:_____

3. Occasionally ESC receives requests from companies wanting names of Certified Traffic Control Supervisors in their area that may be interested in working. If you check "authorize to release information", we will provide these companies with your name, phone number and city.

   Authorization to release information Do not release my iInformation

TRAINING AGENCY USE ONLY:	
1. Completed Work Zone TCS Course	Date:
2. TCS Exam Score	
3. Two References Of Acceptable Experience:	Ltr1 Ltr2 Prior TCS Card
4. Current Flagging Card (Expire Date):	
TCS Certification #:	Expire Date:

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Course Evaluation

Idaho Transportation Traffic Control Supervisor Training

Instructor:_____Class Date:_____

Type of training: ☐ New Certification ☐ Recertification

We value student feedback about our courses. Your responses and comments are used to improve the quality of our instruction and course materials.

Section 1: Student information

Do you have prior experience as a Traffic Control Supervisor (TCS)?	☐ YES	☐ NO
Have you ever been certified as a TCS in Idaho?	☐ YES	☐ NO
If you had the option of taking this course online, would you prefer that option?	☐ YES	☐ NO
Why or why not?		
What county do you live in?		

Section 2: Course Evaluation

After completing this course, how prepared do you feel to:	**Not at all**	**Somewhat**	**Very**
Work safely as an Idaho TCS	☐	☐	☐
Have the knowledge necessary to follow state and federal work zone rules.	☐	☐	☐

Please rate these aspects of the course:	**Poor**	**Fair**	**Good**	**Excellent**
Organization	☐	☐	☐	☐
Clarity of content	☐	☐	☐	☐
Usefulness of the content	☐	☐	☐	☐
Discussions and activities	☐	☐	☐	☐
Comments/suggestions:				

Please rate the quality of the course materials:	**Poor**	**Fair**	**Good**	**Excellent**
Handbook	☐	☐	☐	☐
PowerPoint	☐	☐	☐	☐
Exam	☐	☐	☐	☐
Comments/suggestions:				

Please rate the quality of the instructor	**Poor**	**Fair**	**Good**	**Excellent**
Presentation skills	☐	☐	☐	☐
Knowledgeable	☐	☐	☐	☐
Helpfulness	☐	☐	☐	☐
Comments/suggestions:				