

# Work Zone Intersection Safety

It is a challenge to maintain safety and mobility at intersections in a work zone. For drivers, pedestrians, and bicyclists unfamiliar with an intersection, a work zone can be a sudden, potentially dangerous, surprise. For motorists who regularly drive through an intersection, a work zone can be a frustrating nuisance because of how it adds to travel time. But the development and application of well-designed temporary traffic control plans can ensure safety for workers and mobility for all road users (motorist, bicyclists, and pedestrians, including persons with disabilities) in an intersection work zone.

## Overview

Over the past five years, there has been an average of 154 work zone intersection fatalities each year. This compares with an average of 1,011 work zone fatalities annually nation-wide over the same period.<sup>1</sup> The task of maintaining mobility and ensuring safety for pedestrians, bicyclists, workers, motorists, and transit operations is more demanding at intersections than on road segments. The realignment of travel lanes and the reduction of road capacity are often necessary to accomplish reconstruction



**Figure 1: Work zone signage**

or rehabilitation, such as pavement replacement, pavement patching, street widening, utility work, and reapplying pavement markings. At signalized intersections, the temporary loss of vehicle-detection or pedestrian-actuation capabilities may necessitate a change to pre-timed operations that are less efficient and responsive to changes in traffic demands. All of these can cause delays and pose a threat to safety.

## Work Zone Intersection Safety Goals

Motorists entering and traveling through work zones must be provided with adequate time and distance to make decisions and stop when required. Traffic congestion in intersections should be mitigated to the greatest extent possible. If long queues are expected or are occurring because of a work zone, additional advance traffic control devices may be necessary to provide users with information about lane choice or alternate routes before they become trapped in a queue. Pedestrians and bicyclists may ignore signs and walk against traffic signals if they are forced to wait too long to be accommodated in a work zone. This increases their vulnerability to vehicles whose drivers may also be frustrated.

Managing traffic during construction is necessary to minimize traffic delays, maintain or improve motorist and worker safety, complete roadwork in a timely manner, and maintain

1. NHTSA: Fatality Analysis Reporting System: 2003-2007



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access for businesses and residents. Work zone traffic management strategies should be identified based on the project constraints, construction phasing/staging plan, type of work zone, and anticipated work zone impacts. Once these strategies are implemented, they need to be consistently monitored to ensure they are effective in managing work zone impacts. Examples of possible performance measures for monitoring work zone traffic management strategies include volume, travel time, queue length, delay, number of incidents, incident response and clearance times, contractor incidents, community complaints, user costs, and cumulative impacts from adjacent construction activities.

## Temporary Traffic Control Zones

Temporary traffic control zones in the vicinity of intersections might block movements and interfere with normal road user flows. Such conflicts frequently occur at more complex signalized intersections that have such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, signal detectors for actuated control, and accessible pedestrian signals and detectors. The effect of the work zones upon signal operation should be considered, and modifications such as signal phasing for ensuring adequate capacity, maintaining or adjusting signal detectors, and ensuring the appropriate visibility of signal heads should be made as appropriate.

## Work Zone Safety and Mobility Rule

All state and local governments that receive federal-aid funding are required to comply with the provisions of the Work Zone Safety and Mobility Rule. The Rule updates and broadens the former regulation at 23 CFR 630 Subpart J to address more of the current issues affecting work zone safety and mobility. The changes to the regulation encourage broader consideration of the safety and mobility impacts of work zones across project development, and the implementation

of strategies that help manage these impacts during project delivery. This is particularly important at intersections.

The Rule incorporates the following main components:

- Development and implementation of an overall, agency-level work zone safety and mobility policy to institutionalize work zone processes and procedures.
- Development of agency-level processes and procedures to support policy implementation, including procedures for work zone impacts assessment, analyzing work zone data, training, and process reviews.
- Development of procedures to assess and manage work zone impacts of individual projects.

For each of these components the Rule includes provisions and guidance intended to help transportation agencies address work zone considerations starting early in planning, and progressing through project design, implementation, and performance assessment.

The Rule requires agencies to use work zone data at both the project and process-levels to manage and improve work zone safety and mobility. At the project-level, the Rule requires agencies to use field observations, available work zone crash data, and operational information so that timely action is taken at the project level to correct safety or mobility issues in the field. At the process-level, the Rule requires agencies to analyze work zone crash and operational data from multiple projects to improve agency processes and procedures, and in-turn continually pursue the improvement of overall work zone safety and mobility. Further information is available through the FHWA work zone mobility and safety program website, [http://ops.fhwa.dot.gov/wz/resources/final\\_rule.htm](http://ops.fhwa.dot.gov/wz/resources/final_rule.htm).

## MUTCD, Part 6, Temporary Traffic Control (TTC)

*The Manual on Uniform Traffic Control Devices (MUTCD)* contains the basic principles of design and use of traffic control devices for all streets and highways open to public travel, regardless of type, class, or the public agency having jurisdiction. Title 23 of the U.S. Code of Regulations provides that the MUTCD shall be recognized as the national standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel.

The 2003 edition of the MUTCD was most recently revised December 2007 and contains information related to work zones in Part 6, titled “Temporary Traffic Control.” Part 6 contains the signs and “typical applications” or TAs that provide detailed schematics for a variety of street and highway work situations commonly encountered by road users. The MUTCD includes language about the mounting height and protrusion of signs into pedestrian facilities, provision of continuous detectable channelization, and other requirements related to the Americans with Disabilities Act (ADA).

Section 6G.13 of the MUTCD provides specific standards, guidance, options, and support<sup>2</sup> specific to work within a traveled way within an intersection:

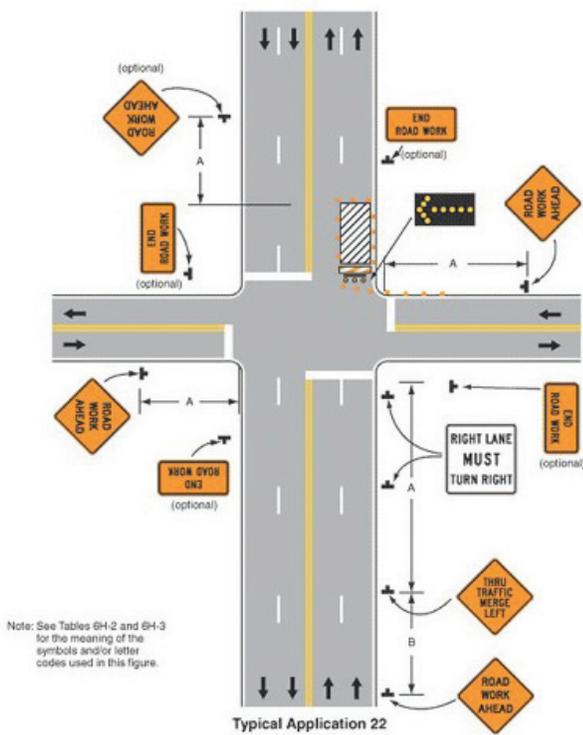
2. Definitions included in the MUTCD that may be of benefit throughout this Issue Brief include:

**Standard:** The word shall is used in this context. Standards are required and there are no exceptions.

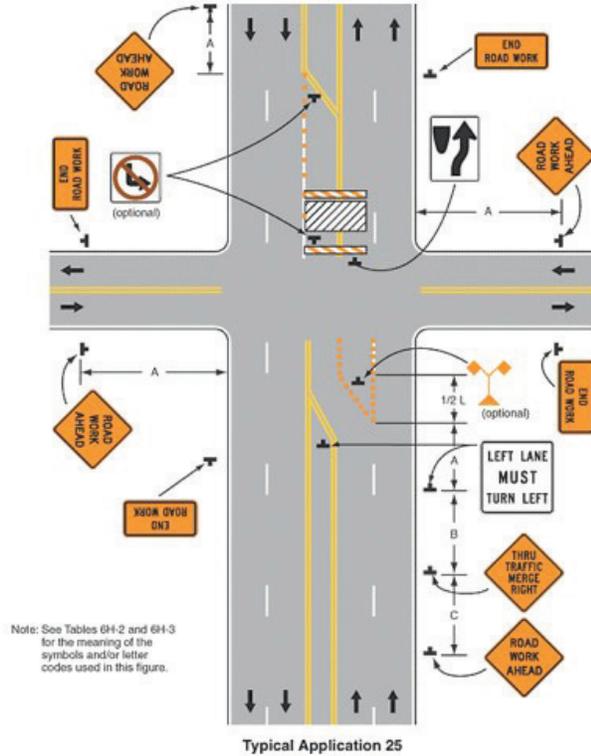
**Guidance:** The word, should is used in this context. Guidance connotes a recommendation, the use of engineering judgment and/or the conduct of a study.

**Option:** The word may is used in this context. Options are permissive.

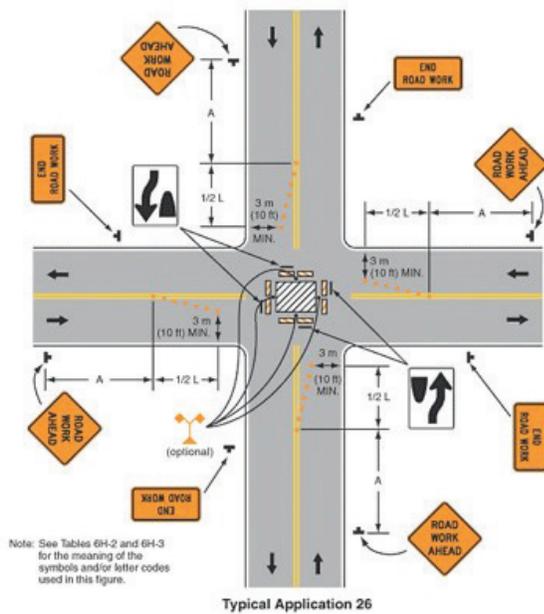
**Support:** Support statements are informational.



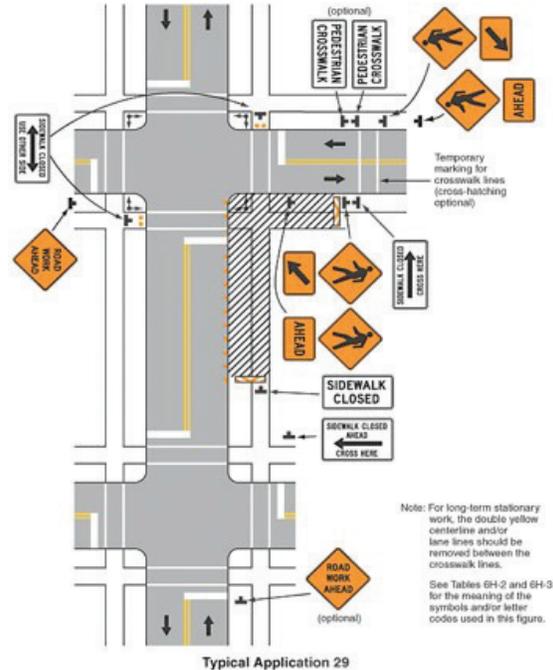
**Figure 2: MUTCD figure 6H-22 Right Lane Closure on Far Side of Intersection (TA-22)**



**Figure 3: MUTCD figure 6H-25 Multiple Lane Closures at Intersection (TA-25)**



**Figure 4: MUTCD figure 6H-26 Closure in Center of Intersection (TA-26)**



**Figure 5: MUTCD figure 6H-29 Crosswalk Closures and Pedestrian Detours (TA-29)**

## Standards

When work will occur near an intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.

## Guidance

- When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection.
- For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. For urban intersections on arterial streets, where the posted speed limit (the off-peak 85th-percentile speed prior to the work starting, or if the anticipated speed exceeds 40 mph) additional warning signs should be used in the advance warning area.
- Pedestrian crossings near temporary traffic control sites should be separated from the worksite by appropriate barriers that maintain accessibility and detectability for pedestrians with disabilities.

## Options

- When near-side work spaces are used, an exclusive turn lane may be used for through vehicular traffic.
- If there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to an exclusive turn lane.
- Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as KEEP LEFT) may be placed within the transition area.

## Support

- Near-side work spaces, as depicted in typical application TA-21 are handled as a midblock lane closure.
- Far-side work spaces, as depicted in typical applications TA-22 through TA-25 involve additional treatment

because road users typically enter the activity area by straight-through and left- or right-turning movements.

- Typical applications TA 26 and TA 27 provide guidance on applicable procedures for work performed within the intersection.

Work spaces often extend into more than one portion of the intersection. For example, work in one quadrant often creates a near-side work space on one street and a far-side work space on the cross street.

The TAs for intersections are classified according to the location of the work space with respect to the intersection area (as defined by the extension of the curb or edge lines). The three classifications are near side, far side, and in the intersection. The MUTCD provides the following typical TAs for intersections:

- **TA 21: Lane Closure on Near-Side of Intersection.**
- **TA 22: Right Lane Closure, Far Side of Intersection.\***
- **TA 23: Left Lane Closure on Far Side of Intersection.**
- **TA 24: Half Road Closure on Far Side of Intersection.**
- **TA 25: Multiple Lane Closures at Intersection.\***
- **TA 26: Closure in Center of Intersection. \***
- **TA 27: Closure at Side of Intersection.**
- **TA 29: Crosswalk Closures and Pedestrian Detours.\***

The preceding page provides four TAs with different distinct characteristics (noted with an asterisk \* above) as a quick reference. All TAs are available in Section 6H.01 of the MUTCD located at <http://mutcd.fhwa.dot.gov/hlm/2003r1r2/part6/part6h1.htm>.

## Pedestrian Accommodations at Intersection Work Zones

Ensuring a high level of intersection work zone safety depends on proper pedestrian accommodation, worker safety and visibility, and proper traffic control. Additional considerations include the following:

- Access to temporary transit stops should be provided.
- Pedestrian signals should be deactivated for closed crosswalks.
- Nighttime lighting may be considered.
- Alternate route information should be communicated to pedestrians with visual disabilities through such means as audible devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable.
- Seniors and pedestrians with disabilities should be taken into account (lower walking speeds at signalized intersections, refuge island at wide intersections, flared curbs, oversized signs and signals, night lighting).
- Adequate pedestrian protection should be provided through such means as physical separation from the workspace and vehicular traffic, overhead protection, and so forth.
- Requirements of the American with Disabilities Act (ADA) of 1990 should be met (draft guidelines on how to meet these requirements in work zones have been published by the United States Access Board [[www.access-board.gov/prowac/index.htm](http://www.access-board.gov/prowac/index.htm)]).
- Location/access to businesses and residences should be considered.
- Adequate and safe detour or diversion due to sidewalk closure or blockage should be taken into account.
- Impact on existing pedestrian flow should be taken into account.
- Impact on pedestrian generators (e.g., schools, senior centers, and transit stops) should be considered.

- Pedestrian information needs should be met through such means as advance, transition, work area, and exit information.

## Worker Safety at Intersections

Worker safety should be an overarching consideration for anyone involved in the planning, design, or implementation of an intersection work zone. The combination of heavier traffic and a greater reliance on night work results in increased risks for highway workers. As a rule of thumb, flaggers or highway workers should not control intersections controlled by traffic signals or STOP signs. Police officers generally receive training for this job. Other methods that can be used to minimize and control risks for workers are as follows:

- **High-visibility apparel.** All workers exposed to traffic should wear high-visibility safety apparel labeled as ANSI 107-2004 and classified as either Class 2 or 3 for risk exposure. The U.S. Department of Transportation (USDOT) implemented an interim final rule (November 2008) on worker visibility that requires the Federal Highway Administration (FHWA) to issue regulations to decrease the likelihood of worker injury and to maintain the free flow of vehicular traffic. The rule requires all workers whose duties place them on or in close proximity to a federal-aid highway to wear high-visibility garments. This includes incident responders as well as volunteer workers. The rule includes some exceptions for law enforcement officers.
- **Worker training.** All workers should be trained on how to work next to motor vehicle traffic in a way that minimizes their vulnerability.
- **Positive separation.** Temporary traffic barriers should be placed along the work space based on various factors such as distance between workers and traffic, traffic speed and volume, time of day, and duration and type of operation.
- **Worker safety planning.** Safety in

a temporary traffic control zone is the joint responsibility of the contractor, transportation agency, and the driver. Planning, implementation, and oversight of worker safety should be the responsibility of a competent Occupational Safety Health Administration (OSHA) safety specialist, and should adequately address the requirements of OSHA and the MUTCD.

- **Activity area planning.** Planning the internal work activity area to minimize backing-up maneuvers of construction vehicles should be considered to minimize exposure to risk.
- **Speed control.** Compliance with posted speed limits, mainly through regulatory speed zoning, funneling, lane reduction, or the use of uniformed law enforcement officers or flaggers, should be considered.

## Improving Temporary Traffic Control at Intersections

When the normal function of the intersection is suspended due to roadwork, temporary traffic control planning provides for the continuity of movement of motor vehicles, bicycles, pedestrian traffic (including accessible passage), transit operations, and access (and accessibility) to utilities. Nighttime roadwork also continues to increase and the safety issues relating to traffic control are a major concern.

The following strategies can improve traffic safety and mobility in work zones:

- **Enhanced traffic control devices.** Where possible use drums, vertical panels, or Type II barricades in tapers instead of cones. These devices provide more target area than cones.
- **Visibility of work vehicles.** High visibility of work vehicles at intersections, especially at night, may reduce the risk of crashes.
- **Controlling speed and increasing driver awareness.** Although designing work zones to maintain normal speeds is desirable, restric-

tions may be necessitated by such factors as lane-width reductions, severe alignment changes, or workers exposed to high-speed traffic.

- **Providing good, glare-free illumination.** For night work at intersections, properly aimed and adjusted work lights can provide good illumination without causing glare problems.
- **Regularly checking the work site to ensure that the placement and operation of traffic control devices continue to conform to applicable plans.** The condition of devices should also be checked regularly to ensure that they continue to perform as intended. Cones or drums knocked out of alignment by an errant driver or a work vehicle, for example, could result in vehicles being channeled into oncoming traffic.
- **Performing modifications as necessary** based on changing road conditions or work staging and progress.
- **Providing accessible pathways** for pedestrian movement within the work zone in conformance with the ADA.

## Resources

### Work Zone Best Practices Guidebook

The best practices guidebook is a vehicle to promote the sharing of practices within the highway community that reduce construction and maintenance impacts on mobility and safety. The practices may be approaches, procedures, or technologies that are “state of the practice” in work zone mobility and safety management.

**The National Work Zone Safety Information Clearinghouse** provides a wealth of information that can be useful for ensuring that work zones at intersections are designed and implemented as safely as possible. <http://www.workzonesafety.org>

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

**2003 MUTCD**

<http://mutcd.fhwa.dot.gov>

**Proposed changes for the 2009 MUTCD**

[http://mutcd.fhwa.dot.gov/resources/proposed\\_amend/index.htm](http://mutcd.fhwa.dot.gov/resources/proposed_amend/index.htm)

**FHWA Work Zone Mobility and Safety Program**

<http://ops.fhwa.dot.gov/wz/index.asp>