Work Zone General Information

A. Introduction

This section provides information on establishing temporary traffic control in work zones, addressing the safe and efficient accommodation of all road users: motorists, bicyclists, pedestrians, and those with special needs. The information presented is based on standards and guidance in the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD). References to the MUTCD sign designations in this chapter are shown in parentheses, e.g. (W20-1).

Not all the recommendations in this chapter will apply to every circumstance faced by local agencies, and each unique situation may not be addressed. Modifications of the typical applications may be required to adapt to specific field conditions. Therefore, use engineering judgment, seeking the advice of experienced professionals and supervisors in difficult and complex interpretations. This information can be used as a reference for temporary traffic control in work zones on all city or county roadways. However, always check contract documents and local agency requirements for any pertinent modifications.

B. Importance of Quality Traffic Control

The value of proper traffic control through work zones cannot be overemphasized. Three major reasons for providing quality temporary traffic control can be identified:

1. **Safety:** Many crashes occur each year in Iowa work zones, resulting in death and injuries to motorists and workers. Appropriate levels of traffic control will help lessen the occurrence of work zone crashes.

2. **Liability:** Improper use of temporary traffic control, deficiency of devices, or negligence may result in legal claims against a contractor, agency, or even individual workers. Complying with accepted standards and guidance could help avoid and reduce possible legal actions.

3. **Responsibility:** Providing temporary traffic control in compliance with established practices is a requirement of the public trust; it's simply the right thing to do!

The MUTCD is incorporated into the Code of Federal Regulations and is recognized as the national standard for traffic control devices on all roads open to public travel in the nation. In addition, Iowa has adopted the MUTCD as the state standard (Iowa Code section 321.252 and Administrative Rule 761 - Chapter 130). Local agencies are required to adhere to the MUTCD requirements in Iowa Code Section 321.255. Always remember the MUTCD standard statements, "The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction," and "temporary traffic control plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users." Even though the authority for placing temporary traffic control is sometimes granted to others (contractors, utilities, etc.), the responsibility for requiring properly signed work zones remains with the agency that has jurisdiction over that road or street.

C. Applicable Standards and References

The MUTCD presents minimum standards only. Iowa has adopted the MUTCD as the official standard for traffic control, but many applications and practices in Iowa exceed national standards. The user should check for recent revisions of the MUTCD and state and local policies before selecting an appropriate application.

1. **National Requirements:** Other important federal requirements and guidance are available in Federal Highway Administration's (FHWA) *Standard Highway Signs* manual and the National Committee on Uniform Traffic Laws and Ordinances' *Uniform Vehicle Code*. Worker and flagger apparel recommendations and requirements from the American National Standards Institute (ANSI) have been adopted into the MUTCD. Information about worker and flagger apparel can be found through the International Safety Equipment Association (ISEA). Complying with the *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way*, also known as the Public Right-of-Way Accessibility Guidelines or PROWAG, is especially important when accommodating pedestrians. The US Access Board is an excellent source for background and supplemental accessibility information (www.access-board.gov). The Institute of Transportation Engineers' Traffic Control Devices Handbook also provides valuable supplemental guidance.

2. **State Requirements:** When working on or near any road or street right-of-way where Iowa Department of Transportation (Iowa DOT) has jurisdiction, Iowa DOT requirements take precedence over this chapter.

3. **Local Requirements:** Cities and counties may adopt ordinances and policies that apply to temporary traffic control - provided these meet or exceed the standards presented in the MUTCD. Verify local requirements before establishing any temporary traffic control on local roads and streets.

D. Work Duration

Work duration is a major factor in determining the number and types of devices used in TTC zones. The duration of a TTC zone is defined relative to the length of time a work operation occupies a spot location. The five categories of work duration and their time at a location are:

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

Work Zone Set Up

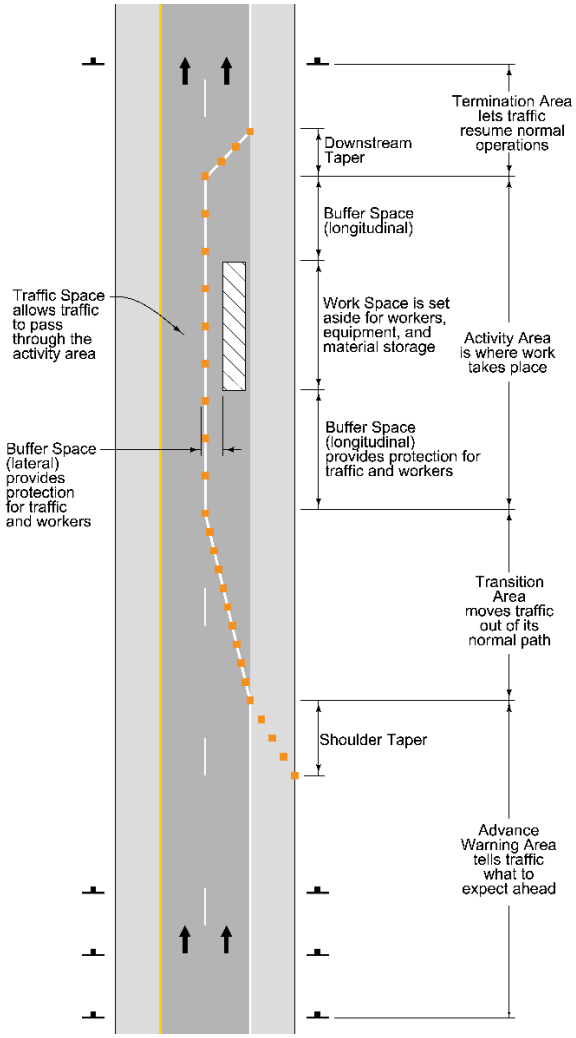
A. Major Elements

A typical work zone, designated with signs and various other traffic control devices, is defined as extending from the first advance warning sign or vehicle with amber, high-intensity, rotating, flashing, oscillating, or strobe light to an END ROAD WORK (G20-2) sign or other device beyond which traffic returns to normal paths.

Most work zones involving major traffic obstructions can be divided into four major areas:

- advance warning
- transition
- activity
- termination

Figure 13B-2.01: Work Zone Temporary Traffic Control - Major Elements



1. **Advance Warning Area:** Advance warning is crucial to safety, and every work zone should include this important feature. Without effective warning, road users cannot be expected to react properly. The advance warning area is that section of roadway where road users are informed about the activity ahead. Depending on the type of road, traffic volumes and speeds, and degree of obstruction, advance warning might consist of a
   - vehicle with amber, high-intensity, rotating, flashing, oscillating, or strobe light,
   - single sign, or
   - series of signs.

   Vehicle hazard lights may be used to supplement amber, high-intensity, rotating, flashing, oscillating, or strobe lights (hereinafter called vehicle warning lights), but they shall not be used alone. Flags may be used to call attention to the advanced warning signs

   When a series of signs is required, information is presented in this order:
   a. General information, such as ROAD WORK AHEAD (W20-1)
   b. Description of activity or obstruction, such as RIGHT LANE CLOSED AHEAD (W20-5R) or ONE LANE ROAD AHEAD (W20-4)
   c. Specific action, such as BE PREPARED TO STOP (W20-7b) or FLAGGER AHEAD (W20-7a)

2. **Transition Area:** In a transition area, traffic is directed from the normal, intended path to a new course, such as from one lane to another. To accomplish this, the MUTCD requires channelizing. Channelization, or redirection of traffic, is usually accomplished with tapers.

3. **Tapers:** Part 6 of the MUTCD discusses tapers in detail. Several types of tapers are available for work zones, depending on circumstances:
   - Merging tapers are used for lane closures on multi-lane roadways.
   - Shifting tapers divert traffic to alternate paths without closing lanes.
   - Shoulder tapers can be used to delineate shoulder closures.

   The recommended minimum length of all these taper types depends on the speed of approaching traffic and the width of the lane being closed. Lengths of merging tapers for various speeds are shown in Table 13B-2.01. Speed limit refers to the legally established and signed speed limit.

   Two other taper types do not depend on traffic speed or lane width:
   - one lane, two-way taper (used mostly for flagging or self-regulating)
   - downstream (termination) taper

   One hundred feet is the maximum recommended length for a one-lane, two-way taper, but a length of 50 feet can benefit flagging operations. Refer to the Iowa DOT's *Flagger's Handbook* for more details. At least 100 feet for each closed lane is recommended for a termination taper length. For merging taper lengths on multi-lane roadways, see Table 13B-2.01.

Table 13B-2.01: Merging Taper Lengths for Lane Closure*			
Speed Limit (mph)	**Taper Length (L) (ft)**	**Number of Devices**	**Spacing of Devices (ft)**
20	80	5	20
25	125	6	25
30	180	7	30
35	245	8	35
40	320	9	40
45	540	13	45
50	600	13	50
55	660	13	55

* This table does not apply to one lane, two-way (flagger) tapers.

4. **Channelizing Devices:** Several channelizing devices are available for use in tapers, including cones, verticals panels, drums, and barricades.

5. **Activity Area:** The activity area of many work zones can be divided into three main parts:

   a. **Buffer Space:** Buffer spaces are recommended wherever workers are exposed to high-speed moving traffic. Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.

      1) **Longitudinal buffer spaces** are a safety protection for workers and road users. They give drivers space to recover in emergency situations. Like many other work zone dimensions, longitudinal buffer space is based largely on the traffic speed. Table 13B-2.02 includes buffer lengths for various traffic speeds and are applicable to all temporary traffic control situations. The length of the longitudinal buffer space used may need to be modified based on site conditions.

Table 13B-2.02: Longitudinal Buffer Space

Speed (mph)	Length (ft)
20-35	0-200
40	0-300
45	0-400
50	400
55	600

      2) **Lateral buffer spaces** are especially effective in high-speed and heavy traffic situations where maximum possible separation of workers from moving vehicles is desired. Flaggers are often beneficial in these circumstances as well.

   b. **Work Space:** The work space is that area closed to traffic where maintenance and construction activities are accomplished. This area can be occupied by equipment, materials, and workers and should be made as secure and safe as possible.

   c. **Traffic Space:** Motor vehicles and other road users occupy the traffic space, also known as the open lane. Workers and equipment should respect this area and not intrude or otherwise hamper free movement of traffic in the open lane.

4. **Termination Area**: The termination area begins at the end of the work space and extends to the END ROAD WORK (G20-2) sign, if posted. This sign is optional, but is recommended by the MUTCD. A downstream or termination taper (50 to 100 feet) may be installed in this area for traffic guidance.

Temporary Traffic Control Devices

Traffic control devices are any signs, signals, markings, or other items used to guide, warn, and regulate traffic. Traffic control devices are the major means of communication for road users; thus it is most important that design, condition, and placement be proper at all times. All devices used in work zones shall comply with the provisions of the MUTCD. In addition, sign design must comply with the *Standard Highway Signs* manual. Do not install temporary traffic control devices until work is ready to begin. The MUTCD requires all temporary traffic control devices to be promptly removed or covered when no longer needed. Signs are the most common type of work zone traffic control device, categorized into three types:

- regulatory
- warning
- guide

The MUTCD requires all signs to be retroreflective or illuminated when used at night. Roadway lights are not sufficient as illumination sources. Supplemental nighttime warning lights may be required in pedestrian or recreational areas.

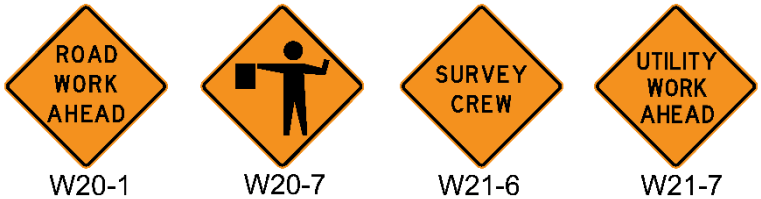
A. Regulatory Signs

Regulatory signs inform users about traffic laws and regulations. Because these signs impose legal obligations, they must be used properly and only with prior official authorization by the local agency. Regulatory signs are generally rectangular with a black legend and border on a white background. Exceptions include the STOP, YIELD, DO NOT ENTER, WRONG WAY, and ONE WAY signs. STOP (R1-1), ROAD CLOSED (R11-2), and SPEED LIMIT (R2-1) are all regulatory signs. Specific requirements for road closures are discussed in detail later in this chapter.

R1-1 R11-2 R2-1

B. Warning Signs

Warning signs draw attention to conditions on or near the roadway that may not be readily apparent. These signs are generally diamond-shaped with an orange background and black lettering or symbols; although other colors are allowed for a few specific signs. Examples of common warning signs are the FLAGGER (W20-7a) and the ROAD WORK AHEAD (W20-1) sign. Advisory speeds on warning plaques are not enforceable; use for guidance only.



W20-1 W20-7 W21-6 W21-7

C. Guide Signs

Guide signs advise drivers and pedestrians about navigating through the work zone. These signs are normally orange with black lettering. An example of a guide sign is END ROAD WORK (G20-2).

G20-2

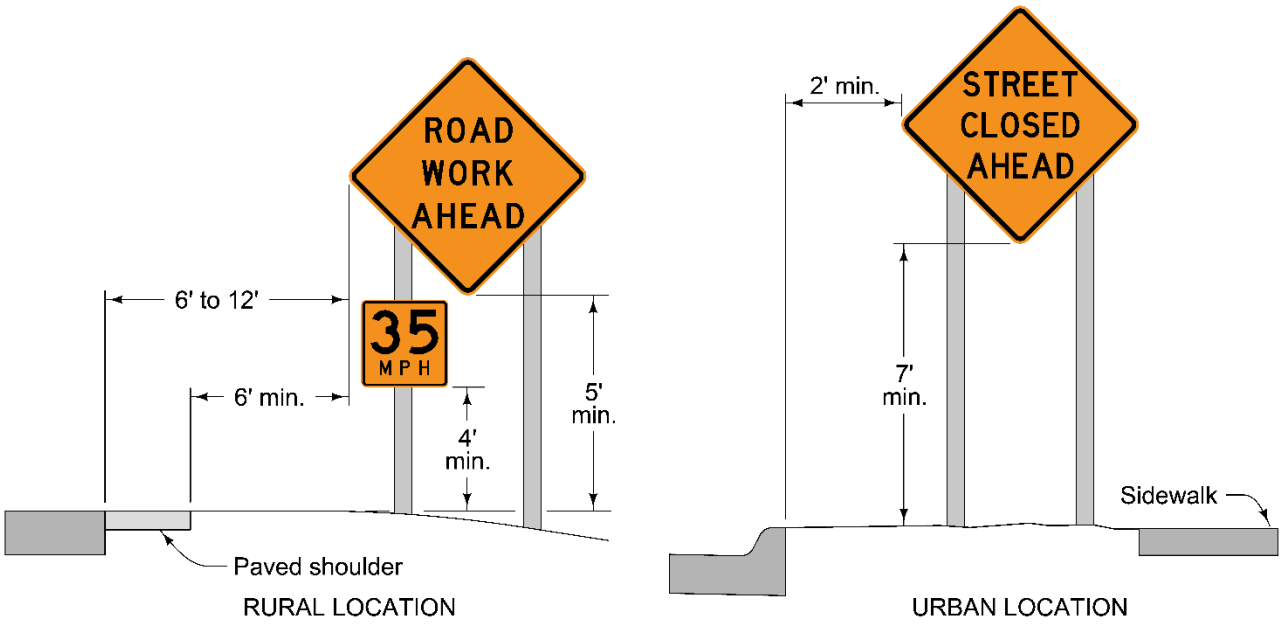
D. Sign Dimensions

Sign size and legend are critical for road user recognition and understanding. Based on traffic speed, use the following guidelines when deciding sign dimensions. For best performance, use larger signs, even in low-speed areas.

- **High speed roadway (35 mph and above):** Advance warning signs shall be at least 48 inches by 48 inches. In general, uppercase lettering should be at least 7 inches high.
- **Moderately low traffic volumes and speeds (25 to 35 mph):** The MUTCD allows 36 inches by 36 inches, with an uppercase lettering size of 5 inches.
- **Low speed local roads and streets (25 mph or below):** Smaller advance warning signs, 30 inches by 30 inches, may be allowed, with sign messages short and symbols clear in meaning.

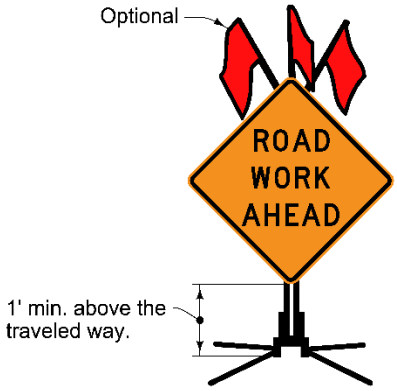
E. Sign Installation

Consider the position of signs relative to the roadway and the spacing between the signs when installing temporary traffic control. The MUTCD requires that long-term stationary work zones (more than three consecutive days in one location) use post-mounted advance warning signs. Minimum dimensions for post-mounted signs are shown on the figure below.



Supplemental plaques may be mounted 1 foot lower than the primary sign. If installed within the clear zone, sign supports shall be crashworthy or shielded. Signs should not be positioned on sidewalks or bicycle facilities in urban areas, and any signs with less than a 7 foot mounting height should not project more than 4 inches into pedestrian facilities.

Portable sign mounting is used for work zone applications lasting less than 3 days. The supports shall be crashworthy.



Several designs have been approved, but any used in the clear zone shall be crashworthy per the test and evaluation criteria of National Cooperative Highway Research Program (NCHRP) Report 350 or Manual on Assessing Safety Hardware (MASH). Fabric, roll-up, portable signs are popular because they are lightweight and easy to install. However, some designs are too flexible in windy conditions, degrading visibility. Flexible base portable signs that do not provide necessary stability in windy situations shall be adequately supported, or work activities must be terminated. Both the requirements for crashworthiness and adequate visibility shall be met with all work zone signs. Other installation methods for work zone signs include vehicle and barricade mounting. Do not allow post-mounted signs to encroach on sidewalks, shared use paths, or bike lanes or place portable signs on them unless those facilities are officially closed.

Vehicle-mounted signs should be high enough for adequate visibility for approaching vehicles, suggested at least 4 feet above the ground surface.

Barricade mounted signs shall be at least 1 foot above the traveled way. In addition, signs on Type III barricades should not cover more than 50% of the top two rails and not more than 33% of all three rails.

F. Spacing of Signs

Appropriate spacing is crucial for road users' reaction to work zone signs. Spacing depends on several factors, including speed of traffic, type of roadway, locations of intersections or major driveways, vertical and horizontal roadway alignment, and physical obstructions in the work area. If road users don't seem to be recognizing the signs, consider increasing the sign spacing and/or size and adding flags or warning lights.

The MUTCD contains guidance for minimum spacing of signs in Section 6C.04. A basic "rule of thumb" for warning sign placement is 4 to 8 times the speed limit in urban areas and 8 to 12 times the speed limit in rural locations. Table 3 illustrates these minimum guidelines. The positions of the signs should be adjusted for available sight distance.

Table 13B-2.01: Distance Between Signs

Speed Limit (mph)	Spacing (ft)
25	100
35	250
45	350
55	500

G. Channelizing Devices

Channelizing devices warn about work zone conditions and guide road users through or around the work area. Several types of channelizing devices are available, including cones, vertical panels, channelizers, tubular markers, drums, and barricades - with new types continually being developed and approved. Promptly repair, clean, or replace any devices that are damaged, dirty, or deficient in retroreflectivity.

1. **Ballast:** Ballast is often required to maintain position and stability of channelizing devices, and proper placement and type of ballast is important. Follow these guidelines:
   - Never place ballast on top of channelizing devices; keep ballast on the lower part of the device.
   - Use sandbags or weighted bases, and do not use items such as rocks, broken concrete, etc., for ballasting.

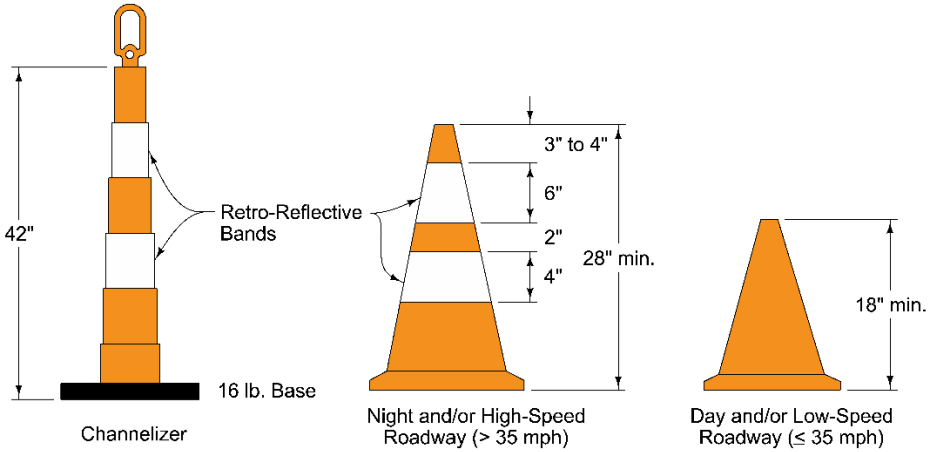
2. **Spacing of Devices:** Like signs, spacing of channelizing devices in work zone applications depends primarily on traffic speed. A rule of thumb suggested by the MUTCD for maximum spacing is the speed limit when used in merging or shifting taper applications and twice the speed limit for tangent applications. Closer spacing should be considered where drivers might need more guidance, such as in horizontal curves or in low-speed applications.

Table 13B-2.02: Channelizing Device Spacing

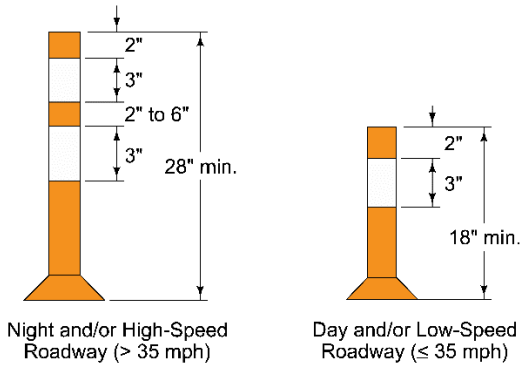
Speed Limit (mph)	Taper (ft)	Buffer (ft)	Work Space (ft)
25	25	50	50
30	30	60	60
35	35	70	70
40	40	80	80
45	45	90	90
50	50	100	100
55	55	110	110

3. Types of Devices:

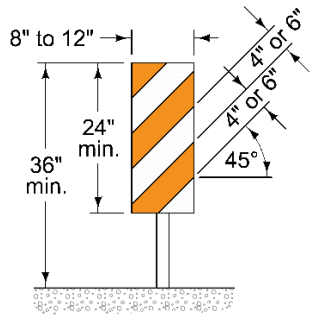
a. Cones: Cones are required to be predominantly orange in color. Retroreflective striping is required for night use. To maintain proper position, ballasting as described earlier may be employed, or cones can be nested to increase weight and stability.



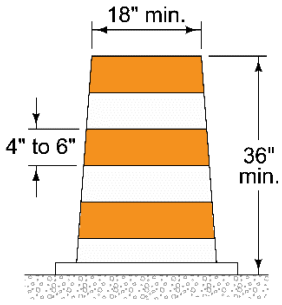
b. Tubular Markers: Tubular markers have similar requirements as cones - predominantly orange, crashworthy, and retroreflective if used at night. Because of the narrow width (2 inch minimum), tubular markers are especially useful in restricted work areas. These devices must be securely ballasted or attached to the road surface to prevent movement.



c. Vertical Panels: Vertical panels provide greater visibility for road users than some other channelizing devices and can still be used in narrow work zone applications. Panels shall also have alternating retroreflective orange and white stripes, 4 or 6 inches wide, sloping downward at an angel of 45 degrees in the direction vehicular traffic is to pass. If warning lights are used with vertical panels, they must be securely fastened to prevent dislodging if struck by an errant vehicle. Proper ballasting should be used to maintain stability.

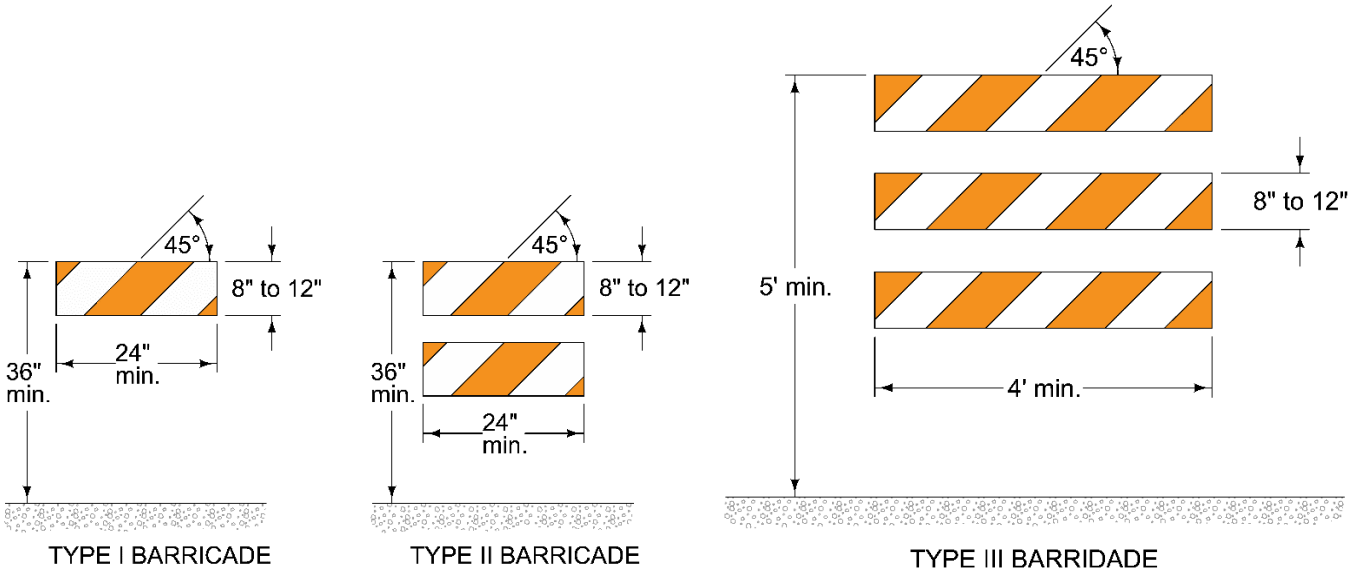


d. Drums: Drums are very effective traffic control devices, especially for long-term applications. These devices shall be made with lightweight, deformable materials and alternating 4 to 6 inch wide orange and white retroreflective stripes. Drums made of metal are not allowed, and tops shall be securely fastened to prevent accumulation of debris. Using ballast on top of drums is not acceptable.



e. Barricades: Barricades for work zone applications are available in three types: I, II, and III, differentiated primarily by the number of boards used. Barricades may be used individually or in groups to mark a specific condition. They may also be used in a channelization series, in either taper or tangent applications.

Type I barricades are generally used on conventional roads or city streets. Type I or Type II barricades are intended for work areas where traffic flow is maintained. Type II or Type III barricades are recommended on higher volume roadways. Type III barricades should be used to close or partially close a street or road. For complete closures, Type III barricades can be extended across the entire roadway or street or supplemented with fencing.



Using ballast, rocks, or broken concrete on top of barricades for stabilization is not allowed. Barricade rails shall feature alternating retroreflective orange and white stripes, 4 to 6 inches wide, sloping downward at a 45 degree angle in the direction traffic is expected to pass. As with vertical panels, properly placing the barricades is very important. If traffic is allowed to pass Type III barricades, retroreflective striping at the appropriate slope is required on both sides.

f. Miscellaneous Devices for Channelizing: The MUTCD describes several other devices that can be used in channelization of vehicular and pedestrian traffic in work zones.

1) Arrow Boards: As described in MUTCD Section 6F.61, arrow boards are signs with lighted elements capable of flashing or sequential displays. They are intended to be used with signs or other traffic control devices. The panels are rectangular and non-reflective black with yellow lights. The types of arrow boards used for temporary traffic control are:

- Type A: Suitable for low-speed urban streets
- Type B: Used on intermediate speed roadways or for maintenance and mobile operations
- Type C: Used for high-speed and high-volume applications

Table 13B-2.03: Minimum Requirements by Board Type

Board Type	Board Size	Legibility Distance	Number of Elements
A	48 x 24 inches	1/2 mile	12
B	60 x 30 inches	3/4 mile	13
C	96 x 48 inches	1 mile	15

Arrow boards can be mounted in various ways, but they should be mounted at least 7 feet above the ground, except on vehicle-mounted arrow boards, which should be as high as practical. Amber, high-intensity, rotating, flashing, oscillating, or strobe lights are required when panels are mounted on vehicles. Boards shall be able to dim 50% for night operations.

A caution mode is only allowed for two-lane or shoulder applications. The MUTCD does not allow a single arrow board to close more than one lane at a time.

Examples of the advance warning arrow board displays are below. Note right arrow is shown; left is similar.

Flashing Arrow (Merge Right)

Sequential Arrow (Merge Right)

Sequential Chevron (Merge Right)

Flashing Double Arrow (Merge Right or Left)

Flashing Caution Flashing Caution Alternating Diamond Caution

2) **Portable Changeable Message Sign (PCMS):** These devices have become more common in work zones on high-volume and high-speed roadways. A PCMS has a message panel, control system, power source, and transporting unit. Requirements and guidance for using these devices is presented in MUTCD Section 6F.60, and these provisions should be closely reviewed before using a PCMS. Effectiveness of a PCMS depends on how well drivers perceive and react to this device. Therefore, message visibility, length, clarity, and location to work activities are all critical for getting the most benefit from these devices. Current PCMS designs are not crashworthy, so place the devices off the roadway or behind a barrier.
3) **Shadow Vehicles:** Shadow vehicles, equipped with two amber, high-intensity, rotating, flashing, oscillating, or strobe lights mounted on the rear of the vehicle, can be used to warn traffic of the operation ahead. The distance between the work vehicle and the shadow vehicle may vary according to terrain, type of work, or other factors. Whenever adequate stopping sight distance exists, the shadow vehicle should maintain the minimum distance to the work vehicle and proceed at the same speed. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance. The work and shadow vehicle should pull over periodically to allow traffic to pass. When an adequate shoulder is present, the shadow vehicle should use it for travel. If the work and shadow vehicle cannot pull over to allow traffic to pass, a DO NOT PASS (R4-1) sign may be placed on the shadow vehicle.

Inspection and Documentation of Temporary Traffic Control

A. Documenting Inspections

Monitoring work zone traffic control should be a priority for all transportation agencies. Observations cannot be substantiated unless properly recorded. Inspections and documentation should always be current and accurate. Entries should be brief and factual (no opinions). Never erase mistakes; always cross out errors and make corrections (eraser marks in a diary may raise credibility concerns). Consider taking a video or photographs of the traffic control immediately after it's installed. The TTC Zone Checklist below can be used to help with this documentation process.

Temporary Traffic Control (TTC) Zone Checklist

Project: _____ Inspector's Name: _____

Date: _____ Time of Day: _____

Overall appearance of TTC Zone: _____

A. DRIVE THRU
- Maneuvers easy to follow?
- Adequate warnings of hazards?
- Signing clear?
- Traffic control devices sufficiently visible?
- Consistent with traffic control plan?
- Comments: _____

B. SIGNS
- Need to be removed/repositioned/covered?
- Need to be cleaned/replaced?
- Need additional signs?
- Existing signs need to be covered?
- Sign supports crashworthy?
- Adequate retroreflectivity?
- Correct size?
- Correct spacing?
- Consistent with traffic control plan?
- Comments: _____

C. CHANNELIZING DEVICES
- Adequate taper length?
- Device spacing?
- Need for additional devices?
- In need of repair/cleaning/replacement?
- Adequate retroreflectivity?
- Consistent with traffic control plan?
- Comments: _____

D. ARROW BOARDS
- All elements burning?
- Placement?
- Alignment?
- Capable of dimming?
- Consistent with traffic control plan?
- Comments: _____

E. PAVEMENT MARKINGS
- Conflicting markings?
- Retroreflective?
- Proper width and length?
- Comments: _____

F. FLAGGING
- High visibility clothing?
- Positioned appropriately?
- Proper equipment?
- Professional behavior?
- Comments: _____

- Corrective action required? _____
- Urgent?_____
- Within 3 days?_____
- Within_____days?

Comments: _____
_____
_____
_____
_____

Signed: _____

B. Documenting Crashes in the Work Zone

When establishing any documentation procedure for work zone crashes, ensure supervisory and legal staff are aware of these records. Special documentation for work zone crashes should consider using this guidance:

- Develop and follow standard procedures.
- Establish and maintain a relationship with local law enforcement.
- Record all pertinent information, but only facts - not opinions.
- Use standard forms, if available.
- Supplement with photos and police reports.
- Describe any resultant revisions in temporary traffic control.
- Analyze any crash data at the completion of the project.

Other Work Zone Considerations

A. Flagging in Work Zones

Flagging is commonly considered one of the most dangerous jobs in temporary traffic control. Visibility and recognition by drivers are very important for safe and efficient flagger operations. Iowa has adopted even more stringent standards for flagging activities; these are described in the Iowa DOT's *Flagger's Handbook* and should be carefully reviewed before beginning any flagging activities.

B. High-Visibility Safety Apparel

All workers within the right-of-way who are exposed either to traffic (vehicles using the road/street for purposes of travel) or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107 publication entitled "American National Standards for High-Visibility Safety Apparel and Headwear" or equivalent revisions.

C. Nighttime Operations

MUTCD Section 6G.19 offers guidance and advice for temporary traffic control measures for nighttime operations. Traffic volumes are reduced at night, but the number of impaired drivers may increase. Impaired drivers and reduced visibility mean that additional steps need to be taken to ensure safe and efficient working conditions. Work areas should be lighted to provide adequate visibility for work tasks and road users. Lighting shall not produce a disabling glare condition for approaching road users, flaggers, or workers. MUTCD Section 6F.82 describes specific requirements for lighting during night hours. Size and type of luminaries, mounting height, pole location, and positioning are all specified. The performance of the lighting should be observed immediately after implementation and then periodically during use. For flagging at night, comply with the Iowa DOT's Flagger's Handbook.

D. Accommodation of Pedestrians and Bicyclists

The MUTCD requires all road users to be controlled throughout work zones, including motorists, bicyclists, and pedestrians. When urban streets are being improved, needs of pedestrians and bicyclists should receive as much attention as the needs of motorists.

1. **Pedestrians**: The Americans with Disabilities Act of 1990 requires suitable access for persons with disabilities, even in work areas. Temporary traffic control for pedestrians should consider the special needs of disabled pedestrians, including those with visual disabilities. MUTCD Sections 6D.01 and 6D.02 provides guidance for planning temporary traffic control for pedestrians:
   - Pedestrians should not be led into conflicts with vehicles or work zone equipment.
   - A safe and convenient path should be provided for pedestrians, closely replicating existing sidewalks.

Pedestrians shall be notified in advance if sidewalks will be closed. The MUTCD requires standard signs to be supplemented with alternative warnings such as audible messages or instructions to aid visually impaired pedestrians, if such a need is identified. In addition, a firm, stable, and slip resistant surface should be provided throughout the entire length of any temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be an obstacle to wheelchair use.

To avoid conflicts with work zone activities, pedestrian travel may need to be diverted. Moving work equipment across designated pedestrian paths should be avoided or at least minimized. Temporary traffic barriers should be considered for safe separation when vehicular and pedestrian paths are relocated close together in long-term work areas. Mesh fencing, caution tape, rope, or chain strung between traffic control devices will not comply with standards in PROWAG and should not be used.

For additional guidance, refer to MUTCD Chapter 6D, SUDAS Design Manual Chapter 12, and the Field Guide for Pedestrian Accommodation in Work Zones (FHWA Grant DTFH61-13-H-00025).

2. **Bicyclists**: Proper planning for bicyclists through and along work zones is as important as planning for motor vehicle traffic, especially in urban and suburban areas. According to the MUTCD, if the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared use path shall be provided. On low volume roads or short work zones, standard traffic control practices are usually adequate. It is important to remove temporary signing, debris, and other obstructions from the edge of the roadway, bike lane, or shared use path after each day's work.

   If a bike facility detour involves significant out of direction or distance travel, bicyclists will prefer to ride through the work zone. It is preferable to allow bicyclists to proceed as close to their original route as possible. On longer projects, a temporary bike lane or a wide travel lane may be needed. Advance work zone signs should not obstruct the bicyclist's path. Signs should be placed on the shoulder or planting strip rather than in the bike lane or on the shared use path. For additional guidance, refer to the AASHTO Guide for the Development of Bicycle Facilities, 4th Edition.

E. Road and Street Closures

Roadway improvements can generally be accomplished more efficiently and safely when vehicular traffic is detoured from the work area. However, access for local property owners and commercial interests must be maintained in many situations. Even though a street or road section is closed by official action, the agency must still consider appropriate temporary traffic control measures in that area even if only for local public traffic. Properly using specific regulatory signs is required.

Traffic control for closures can be considered in two different applications: outside the work area and inside the actual closed street or road section. MUTCD Part 6 includes specific requirements and guidance for temporary traffic control associated with closures.

When safety fence is needed, provide orange plastic mesh containing ultraviolet stabilizers with a height of 48 inches ± 2 inches. Maximum aperture opening of a nominal 4.5 square inches. Connect to posts or drums to keep the safety fence upright and tight. In lieu of safety fence, Type III barricades may be placed continuously across the pavement, including shoulders if present.

While the messages on the following signs may seem similar, each must be used appropriately:

- ROAD (STREET) CLOSED (R11-2),
- LOCAL TRAFFIC ONLY signs (R11-3a), and
- ROAD CLOSED TO THRU TRAFFIC (R11-4).

MUTCD Section 6F.08 states that the ROAD (STREET) CLOSED (R11-2) sign shall not be used where road users are allowed to pass. When local access (vehicular or pedestrian) is allowed in closed street or road sections, be sure to maintain an appropriate level of temporary traffic control, including

- warning signs
- barricades and other channelizing devices at drop-offs, and
- fencing of excavations

References

- MUTCD, 2009
- Standard Highway Signs Manual, FHWA
- American National Standards for High-Visibility Safety Apparel and Headwear, International Safety Equipment Association
- PROWAG, US Access Board
- Flagger Handbook, Iowa DOT
- 2016 Temporary Traffic Control Handbook, Wiegand; Richards
- Field Guide, Pedestrian Accommodation in Work Zones, FHWA (DTFH61-13-H-00025)