MDOT
Michigan Department of Transportation

Maintenance Work Zone Traffic Control Guidelines

For Ferris State University

Maintenance Division
April 2007

Engineering Manual Preamble

This manual provides guidance to administrative, engineering, and technical staff. Engineering practice requires that professionals use a combination of technical skills and judgment in decision making. Engineering judgment is necessary to allow decisions to account for unique site-specific conditions and considerations to provide high quality products, within budget, and to protect the public health, safety, and welfare. This manual provides the general operational guidelines; however, it is understood that adaptation, adjustments, and deviations are sometimes necessary. Innovation is a key foundational element to advance the state of engineering practice and develop more effective and efficient engineering solutions and materials. As such, it is essential that our engineering manuals provide a vehicle to promote, pilot, or implement technologies or practices that provide efficiencies and quality products, while maintaining the safety, health, and welfare of the public. It is expected when making significant or impactful deviations from the technical information from these guidance materials, that reasonable consultations with experts, technical committees, and/or policy setting bodies occur prior to actions within the timeframes allowed. It is also expected that these consultations will eliminate any potential conflicts of interest, perceived or otherwise. MDOT Leadership is committed to a culture of innovation to optimize engineering solutions.

The National Society of Professional Engineers Code of Ethics for Engineering is founded on six fundamental canons. Those canons are provided below.

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform Services only in areas of their competence.
3. Issue public statement only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, reasonably, ethically and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

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This document was prepared at the request of Ferris State University by Michigan Department of Transportation Grand Region as a guidance document for work zone traffic management operations on the Ferris State campus. This document is a combination of existing resources and was prepared as a guide based on the campus roadway geometrics needs for work zones. This document is only a portion of the guidance available. Additional guidance is available in the Michigan Manual on Uniform Traffic Control Devices Part 6 and other MDOT work zone documents. Those consulting this document are encouraged to utilize the full version of the referenced documents in their entirety for a full and complete understanding of safe traffic management operations. Those utilizing this information are making there own decision on how to execute a work zone. This document is only a recommendation for how to execute work zones based on existing federal and state guidance documents. This document was assembled in 2025.

Introduction

Temporary signing is a very important part of any maintenance operation. The purpose of this guidance document is to provide guidance for the placement of temporary signing in maintenance work zones.

If in the use of these guidelines you have questions or come across items that should be included or need modification contact the Region Support Unit of the Maintenance Division at 517-322-3300.

Traffic Control Plans

Traffic control plans typical to most maintenance operations are shown in Appendix A. These standard plans should be used as guidelines for the layout of traffic control devices within work zones. Certain job and traffic conditions may warrant modification of these plans or the use of traffic control measures not shown within these guidelines. If there is a need to modify one of these guides, please contact your local TSC or Region traffic representative for assistance.

General Signing Guidelines

All traffic control devices in work zones must be crashworthy. The requirements and criteria can be found in the National Cooperative Highway Research Program (NCHRP), Report 350.

It is required that Part 6 of the MMUTCD be followed to ensure that the signs used in work zones meet current standards.

For closures in non-pedestrian areas a five (5) foot minimum bottom height is required and driven posts are suggested for long term closures. In pedestrian areas a seven (7) foot minimum bottom height is required.

For visibility, signs should be placed within six (6) to twelve (12) feet of the edge of the traveled lane or no closer than two (2) feet to the back of curb.

Existing permanent signing in the work zone which conflicts with temporary signs shall be covered during the work operation. Sign covers shall be removed when the work operation ceases. Signs should be covered so that the reflective material is not damaged. One example of how to cover a sign is given on page A46.

Temporary signing shall be covered or removed when the work operation ceases (this is the source of most signing complaints). If a work zone is left unattended for any reason, all reduced speed signs, less than 60 mph, shall be removed, covered or laid down with legs off, unless it is determined that a lower speed limit must remain in place to maintain work zone safety/integrity.

It is recommended that drums be used in long-term stationary and intermediate-term stationary work zones, instead of cones. Cones and drums should not be inter-mixed within the work zones.

END ROAD WORK (G20-2) signs shall be used in all cases if the duration of a work zone is long-term stationary and intermediate-term stationary.

It is important that the work zone be driven on a daily basis to ensure that the motorist will not be confused by the signing sequence, drums or cones and that all lighted arrows are aimed correctly.

Warning Signs

- The minimum size of all diamond shaped warning signs is 48" x 48".
- Reflectorized signing is required.
- All warning signs may be equipped with an orange or day-glo flag mounted above the sign.
- Type A warning lights will not be required with the use of roll-up signs.
- The **"advance signing sequence"** consists of three signs; ROAD WORK AHEAD (W20-1), INJURE/KILL WORKER (R5-18b) and TRAFFIC FINES DOUBLED (R5-18). Refer to pages A48 & A49 for proper signing sequence.

Sign Spacing – "D" Distances

The spacing between signs is based upon the permanently posted roadway speed. The sign spacing distances are minimums and may be adjusted to meet changing roadway and traffic conditions.

Table 1. Sign Spacing ("D" Distances)

Speed* (mph)	**"D" Distance** (ft.)	**Speed*** (mph)	**"D" Distance** (ft.)
25	250	50	500
30	300	55	550
35	350	60	600
40	400	65	650
45	450	70	700

*Posted speed prior to work zone

Tapers – "L" Lengths

Whenever tapers are to be used near interchange ramps, crossroads, curves, or other influencing factors, it may be necessary to adjust the length of tapers, or extend the tangent section of the lane closure so the taper can be established in advance of these factors. Recommended minimum values for taper lengths, "L", are shown in Table 2.

Table 2. Taper Lengths

Taper Length, L (ft)		**Posted Speed Limit,** mph (Prior to Work Zone)									
		25	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**
Offset / Lane Width (ft)	**8**	83	120	163	213	360	400	440	480	520	560
	9	94	135	184	240	405	450	495	540	585	630
	10	104	150	204	267	450	500	550	600	650	700
	11	115	165	225	293	495	550	605	660	715	770
	12	125	180	245	320	540	600	660	720	780	840
	13	135	195	266	347	585	650	715	780	845	910
	14	146	210	286	374	630	700	770	840	910	980
	15	157	225	307	400	675	750	825	900	975	1050

Cone and Drum Spacing for Channelization

Spacing of channelizing devices, in feet, along the taper should not exceed the posted speed in miles per hour and twice the posted speed in the parallel area (e.g., a 45 mph posted speed road should normally have devices spaced no greater than 45 ft apart along the taper and 90 ft in the parallel section). Cones or drums on a tangent, to keep traffic out of the closed lane, should be spaced in accordance with the extent and type of activity, the speed limit of the roadway, and the vertical and horizontal alignment of the roadway.

Buffer Space

Buffer Space is a feature that separates traffic flow from the work activity. No equipment, materials or vehicles shall be stored in the buffer space. The shadow vehicle, if used, must be placed beyond the longitudinal buffer space.

Table 3. Buffer Space Length for Posted Speeds

Speed* (mph)	**Buffer Length** (ft)	**Speed*** (mph)	**Buffer Length** (ft)
20	33	50	279
25	50	55	329
30	83	60	411
35	132	65	476
40	181	70	542
45	230		

*Posted speed prior to work zone

Shadow Vehicle

A shadow vehicle should be used for lane closures on all roadways which have 45 mph or greater posted speeds and two or more lanes in each direction.

A shadow vehicle may be used in other work zones as deemed necessary. Factors to be considered in determining need include the following:

- Time of day of the closure
- Seasonal variations in traffic volume
- Length of lane closure and anticipated duration
- Traffic speeds
- Frequency of traffic stopping/turning movements

The shadow vehicle should be a loaded truck having 23,000 GVWR or greater with the brakes set, front wheels turned away from traffic and parked at the beginning of the roll-ahead space.

The roll-ahead space is the space between the shadow vehicle and the work area. This additional space is needed only when a shadow vehicle is used.

Table 4. Guidelines for Roll-Ahead Distances for Shadow Vehicles

Type of Activity	Prevailing Speed (Posted Speed Prior to Work Zone)	Weight of Shadow Vehicle	Roll-Ahead Distance (Distance From Front of Shadow Vehicle to Work Area)
Mobile	45 mph	**5 Tons**	100 ft
	50-55 mph		150 ft
	60-70 mph		175 ft
Stationary	40 or Less	**5.5 Tons**	25 ft
	45 mph	**12 Tons**	25 ft
	50-55 mph		25 ft
	60-70 mph		50 ft

Truck Mounted Attenuators (TMAs)

It is the department's goal that a TMA be used anytime a shadow vehicle is deemed necessary. See Appendix B for detailed information.

Arrow Panels

The Michigan Manual of Uniform Traffic Control Devices, states: "For stationary lane closure, the arrow panel should be located on the shoulder at the beginning of the merging taper. Where the shoulder is narrow, the arrow panel should be located in the closed lane."

Table 5. Arrow Display Types and Requirements

Panel Type	Minimum Size (in)	Min. Legibility Distance (miles)	Minimum Number of Lighted Elements
A	48 x 24	½	12
B	60 x 30	¾	13
C	96 x 48	1	15
D	None*	½	12

*Length of arrow equals 48in., width of arrowhead equals 24 in.

Type A arrow displays are appropriate for use on low-speed urban streets. Type B are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C arrow displays are intended to be used on high-speed, high-volume traffic control projects. Type D arrow panels are intended for use on authorized vehicles. A Type D arrow panel shall conform to the shape of the arrow.

An arrow display shall not be used on a two-lane, two-way roadway in the arrow mode. The panel shall display the caution mode (bar mode) when used on these roadways.

When maintaining a standard lane closure (page A30), a Type C arrow panel should be used. When maintaining a standard lane closure with traffic regulators (page A11), the arrow for the closed lane should be a Type C arrow. The arrow used for the active lane should be either a Type B or Type C.

See page (A1) for correct alignment of arrow bars.

Partial Lane Closures

Partial lane closures should be avoided. If any part of the lane is to be occupied, the whole lane should be closed. If the work within a closure moves more than two (2) miles from the original signing sequence, a new signing sequence should be set and the original set removed.

Mobile Operations

The following activities are considered to be mobile operations, any activities not included in Table 6 below should not use mobile traffic control.

Table 6. Mobile Maintenance Activities

Activity	Description	Work location
13200	Approach Sweeping	Intersections
13400	Expressway Patrol	Shoulder, and minor non-vehicular encroachment in traveled way
13500	Freeway Lighting	Shoulder and/or occupy a lane
13600	Curb Sweeping	Occupy lane, continuously mobile ≈ 5 mph
12200	Catch Basin Clean-out	Occupy lane
12400	Litter Pickup	Shoulder and outside shoulder
17200	Vegetation Control	Shoulder
11100	Routine Blading	Shoulder and minor non-vehicular encroachment in traveled way
11200	Gravel Shoulder Maintenance	Shoulder and minor non-vehicular encroachment in traveled way
11400	Shoulder Spot Seal Patching (kettle)	Shoulder, edge of metal
11400	Shoulder Bituminous Patching	Shoulder, edge of metal
10300	Patrol Patching	Drive on shoulder and minor non-vehicular encroachment in traveled way

Table 7 below should be used to help choose the appropriate mobile typical based on the location of work and its environment.

Table 7. Traffic Typical Applications for Mobile Operations

Location of Work	Traffic Volume (ADT)	Sight Distance (Horizontal, Vertical)	Typical
Outside Shoulder			
Freeway/Non-Freeway	All Volumes	n/a	MD – 01
Shoulder			
Non-Freeway	<10,000	Adequate Limited	MD – M11 MD – M12
	>10,000	n/a	MD – M12
Freeway	<10,000	Adequate Limited	MD – M11 MD – M12
	>10,000	n/a	MD – M12
Shoulder (Minor Non-Vehicular Encroachment in Traveled Way)*			
Non-Freeway	<10,000	Adequate Limited	MD – M11 MD – M12
	>10,000	n/a	MD – M12
Freeway	n/a	n/a	MD – M12
Roadway			
Two-Lane, Two-Way	<10,000	Adequate Limited	MD – M22 MD – M25
	>10,000	n/a	MD – M25
Multi-Lane w/ Shoulder	<50,000 >50,000	n/a n/a	MD – M23 MD – M24
Multi-Lane, Curbed	All Volumes	n/a	MD – M21

* Minor non-vehicular encroachment in the traveled way is to be brief and not to exceed one lane of traffic from the median or outside shoulders.

Maintenance operations which involve minor non-vehicular encroachment on lanes other than those immediately adjacent to the median or outside shoulder are not considered mobile operations.

Any operations that do not fall within these parameters should be reviewed by your traffic and safety representative.

Adequate Sight Distance: For mobile operations, it is a length of roadway that the driver can see that is greater than or equal to the stopping sight distance as a function of the posted speed limit. See table 8 below.

Limited Sight Distance: For mobile operations, it is a length of roadway that the driver can see that is shorter than the stopping sight distance as a function of the posted speed limit. See table 8 below.

Table 8. Stopping Sight Distance as a Function of Posted Speed Limit

Speed (mph)	25	30	35	40	45
Distance (ft)	200	250	305	360	425
Speed (mph)	**50**	**55**	**60**	**65**	**70**
Distance (ft)	495	570	645	730	820

Definitions

The following definitions are taken from the Michigan Manual of Uniform Traffic Control Devices.

Section 6G.02 Work Duration (MI)

Support:
Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

Standard:

The five categories of work duration and their time at a location shall be:

A. Long-term stationary is work that occupies a location more than 3 days.

B. 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.

C. Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.

D. Short duration is work that occupies a location up to 1 hour.

E. Mobile is work that moves intermittently or continuously.

Long-Term Stationary Work

Support:

At long-term stationary work zones, there is ample time to install and realize benefits from the full range of temporary traffic control procedures and devices that are available for use. Generally, larger channelizing devices, temporary roadways, and temporary traffic barriers are used.

Guidance:

Inappropriate markings in long-term stationary work zones should be removed and replaced with temporary markings.

Standard:

Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary work zones.

Intermediate-Term Stationary Work

Support:

In intermediate-term stationary work zones, it might not be feasible or practical to use procedures or devices that would be desirable for long-term stationary temporary traffic control zones, such as altered pavement markings, temporary traffic barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time. In other instances, there might be insufficient pay-back time to economically justify more elaborate temporary traffic control measures.

Standard:

Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary work zones.

Short-Term Stationary Work

Support:

Most maintenance and utility operations are short-term stationary work.

Short-Duration Work

As compared to stationary operations, mobile and short-duration operations are activities that might involve different treatments. Devices having greater mobility might be necessary such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the work zone is important.

Maintaining reasonably safe work and road user conditions is a paramount goal in carrying out mobile operations.

Guidance:

Safety in short-duration or mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.

Option:

Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of signs and channelizing devices for short-duration or mobile operations. These vehicles may be augmented with signs or arrow panels.

Support:

During short-duration work, it often takes longer to set up and remove the work zone than to perform the work. Workers face hazards in setting up and taking down the work zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.

Option:

Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as highintensity rotating, flashing, oscillating, or strobe lights on work vehicles.

Mobile Operations

Support:

Mobile operations often involve frequent short stops for activities such as litter cleanup, pothole patching, or utility operations, and are similar to short-duration operations.

Guidance:

Warning signs, high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle, flags, and/or channelizing devices should be used and moved periodically to keep them near the mobile work area.

Option:

Traffic regulators may be used for mobile operations that often involve frequent short stops.

Support:

Mobile operations also include work activities where workers and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.

Guidance:

When mobile operations are being performed, a shadow vehicle equipped with an arrow panel or a sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high. Where feasible, warning signs should be placed along the roadway and moved periodically as work progresses.

Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours.

If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow panels should be used.

Option:

For mobile operations that move at speeds less than 5 km/h (3 mph), mobile signs or stationary signing that is periodically retrieved and repositioned in the advance warning area may be used.

At higher speeds, vehicles may be used as components of the work zones for mobile operations. Appropriately colored and marked vehicles with signs, flags, high-intensity rotating, flashing, oscillating, or strobe lights, truck-mounted attenuators, and arrow panels or portable changeable message signs may follow a train of moving work vehicles.

For some continuously moving operations, such as street sweeping and snow removal, a single work vehicle with appropriate warning devices on the vehicle may be used to provide warning to approaching road users.

Standard:

Mobile operations that move at speeds greater than 30 km/h (20 mph), such as pavement marking operations, shall have appropriate devices on the equipment (that is, high-intensity rotating, flashing, oscillating, or strobe lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.

Work Zone Defined

The following definitions are taken from the MICHIGAN VEHICLE CODE Act 300 of 1949.

257.79d "Work zone" defined.

Sec. 79d.

"Work zone" means a portion of a street or highway that meets any of the following:

(a) Is between a "work zone begins" sign and an "end road work" sign.

(b) For construction, maintenance, or utility work activities conducted by a work crew and more than 1 moving vehicle, is between a "begin work convoy" sign and an "end work convoy" sign.

(c) For construction, maintenance, surveying, or utility work activities conducted by a work crew and 1 moving or stationary vehicle exhibiting a rotating beacon or strobe light, is between the following points:

(i) A point that is 150 feet behind the rear of the vehicle or that is the point from which the beacon or strobe light is first visible on the street or highway behind the vehicle, whichever is closer to the vehicle.

(ii) A point that is 150 feet in front of the front of the vehicle or that is the point from which the beacon or strobe light is first visible on the street or highway in front of the vehicle, whichever is closer to the vehicle.

For Your Safety

High-visibility safety apparel makes the wearer more visible to traffic under any conditions.

High-visibility safety apparel is personal protective safety clothing that is intended to provide conspicuity [make the wearer more visible] during both daytime and nighttime usage, and that meets the Performance Class 2 or 3 requirements of American National Standards Institute (ANSI)/ International Safety Equipment Association (ISEA) 107-2004. [1]

All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic, or to construction equipment within the work area shall wear high-visibility safety apparel. Workers affected by this requirement include, but are not limited to:

- Highway construction and maintenance crews, including flaggers
- Inspectors
- Engineering personnel
- Survey crews
- Utility crews
- Responders

When Should High-Visibility Safety Apparel Be Replaced?

High-visibility safety apparel should be replaced when it becomes faded, torn, dirty, soiled, worn, or defaced, or if it is not visible at 1,000 feet day or night. The typical useful service life of high-visibility safety apparel depends on the type of work an individual performs while wearing the apparel.

If you think your safety apparel is questionable, you should replace it.

Apparel that is worn on a daily basis has a service life expectancy of approximately 6 months, although apparel that is not worn on a daily basis may have a useful service life of up to 3 years.

[1] Federal Highway Administration worker visibility final rule

How Do I Replace My High-Visibility Safety Apparel?

When apparel is ready for replacement, notify your safety compliance officer or supervisor and request replacement apparel. Ensure that they know the kind of work you are doing (repaving, maintenance work, nighttime work, etc.) so that they will know which type of apparel to provide to you. Once you have received your new apparel, cut your old apparel in half so that it can't be reused and then dispose of it properly.

Purchasing agents should consider the following when buying new apparel:

- Working conditions (time of day,temperature, etc.).
- Class of apparel needed (Performance Class 2, or 3; Class 1 is unacceptable for any highway work. See brochure entitled: Worker Visibility Be Seen. Be Safe. New Requirements for High Visibility Garments- Contact ATSSA for more information.)
- Compliance with ANSI/ISEA 107-2004 and 207-2006.
- State and local standards and guidelines
- MUTCD section 6E, which gives the appropriate colors for the apparel.

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ATSSA SAFER ROADS SAVE LIVES
American Traffic Safety Services Association

U.S. Department of Transportation
Federal Highway Administration

High-Visibility Safety Apparel In Highway Work Zones

When does my high-visibility apparel no longer protect me and need to be replaced?

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U.S. Department of Transportation
Federal Highway Administration

— May 2008 —

Acceptable

New high-visibility safety apparel is characterized by having vivid color contrast and high reflectivity.

Marginal

Characteristics: Good reflectivity although the vest has some soiling and light fading.

Unacceptable

Characteristics: little or no reflectivity, and soiled and faded material.

Acceptable

Apparel that is used but is in like-new condition is characterized as having excellent color contrast, excellent reflectivity, and is not faded or soiled.

Marginal *

Characteristics: Good reflectivity but has some soiling and light fading of material. *Note: This picture was taken with a flash and simulates nighttime conditions.

Unacceptable

Characteristics: Poor color contrast, low or no reflectivity, significant fading or soiling, and deteriorated reflective strips.

Pictures provided by Michigan Department of Transportation and Washington Department of Transportation

Factors that may cause the apparel to wear out more quickly, depending on the amount of use, include:

- Higher elevations due to increased ultra-violet rays
- Hot climates
- Work done while wearing apparel (some jobs are more dirty or strenuous and could be more likely to lead to soiling or tears)
- Care of the high visibility apparel: how you wash and store your apparel (refer to the label inside the apparel for proper care instructions)

Michigan

Traffic Regulator's Instruction Manual

June 2010 Edition

Traffic Regulator Training Video:
https://www.youtube.com/watch?v=DSqVJDQfymg&t=1s

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For the Supervisor

INTRODUCTION

To you, the Traffic Regulator:

This handbook has been prepared to assist you in understanding how to properly control traffic through construction, maintenance, and utility work areas. As a Traffic Regulator, your duties are to protect project personnel and provide safe, courteous, and authoritative directions to motorists seeking passage through the work zone.

All Traffic Regulators must review the training requirements described in the current edition of the Michigan Manual on Uniform Traffic Control Devices Part 6, Chapter 6E, prior to performing work.

The role of a Traffic Regulator is crucial to the success of a well-run traffic operation. Study this handbook so that your conduct as a Traffic Regulator is professional and second nature.

Traffic regulating is a full-time job. Careless use of the sign or distraction from duty could cause serious injury to your self, other workers, or the motoring public. By performing your duty diligently, you can do your part to prevent traffic incidents in your work area.

RULES OF CONDUCT

All Traffic Regulators shall be properly trained, equipped, attired, and able to satisfactorily demonstrate the following abilities:

- Receive and communicate specific instructions clearly, firmly, and courteously.
- Move quickly 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 the work zone in frequently changing situations.
- Understand and apply safe traffic control practices, sometimes in stressful and emergency situations.
- Recognize dangerous traffic situations and warn workers and other regulators in sufficient time to avoid injury.
- Do not mingle with the work crew, traveling public or other people.
- Determine an escape path that is free of obstructions.
- Be constantly alert of your surroundings, particularly for vehicles approaching from each direction.

- Never turn your back to approaching traffic.

- Always coordinate breaks with the primary Traffic Regulator or supervisor.
- Do not abandon your Traffic Regulator station until a replacement arrives and is ready to regulate traffic.
- Ensure periodic breaks or rest periods are scheduled and coordinated throughout a work shift.
- Sitting on an approved stool is **prohibited** if traffic is visibly approaching or moving by the Traffic Regulator station.
- Shall not use cell phones, headphones, TVs, portable DVD players, MP3 players, or other devices that distract attention or hinder the ability to maintain clear communication with others.

- Always maintain communication with other Traffic Regulators through two-way radios, or visual signals if spaced close enough to each other.
- Be constantly aware of your surroundings so as to properly handle traffic emergencies, along with changes in the work zone.
- Prepare and apply appropriate preventive measures for regulating long durations and/or in adverse weather conditions, such as extreme heat and cold.
- Stay with the arrow board and sign sequence until you are instructed to move.

- If a motorist disregards your directions:
    - Alert the crew.
    - Record the vehicle description and license.
    - Do not leave your station.

- ✓ **Be alert.**
- ✓ **Be professional.**
- ✓ **Be courteous.**
- ✓ **Be confident.**
- ✓ **Remain calm.**
- ✓ **Pay attention to your job.**
- ✓ **Limit discussions with motorists.**

EQUIPMENT AND CLOTHING

Paddle Requirements: *(Stop/Slow and Stop/Stop)*

- 18 in. x 18 in. minimum width; octagonal shape.
- Light semi-rigid material mounted to rigid staff so legend and sign face are not obscured.
- **STOP** face must be red with white letters and border with sign sheeting meeting the requirements of the owner agency or contract documents.
- **SLOW** face must be orange with black letters and borders with sign sheeting meeting the requirements of the owner agency or contract documents.

- Letters must be at least six inches high.
- Staff must be a minimum of six feet in length to the bottom of the sign, and if the staff extends into the sign face, be the **same** color as the sign face.
- Flashing lights may be used on the face in accordance with the MMUTCD.

Two-Way Radio System Requirements:

- Sufficient power to send and receive clear signals over the length of the intended traffic regulating operations.
- Able to send and receive messages that can be heard by all Traffic Regulators, primary and intermediate, at the same time.
- Have a backup communication system readily available.

STOP/SLOW Paddle Stand:

- NCHRP 350 or Mash-08 crash worthy approved.
- Must be approved for use by the Engineer prior to use on MDOT projects.
- Must be able to quickly remove paddle from stand.
- Stand may not have other devices attached to it.
- Use of a cone or barrel to stand paddle is prohibited.

Personal Protective Equipment:

- For daytime and nighttime activity, Traffic Regulators shall wear clean safety apparel meeting the requirements of ISEA “American National Standard for High-Visibility Apparel” and labeled as meeting the ANSI 107-2004standard performance for Class 2 risk exposure.

- The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined in the standard.
- The retro-reflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 ft.
- The retro-reflective safety apparel shall be designed to clearly identify the wearer as a person.
- For nighttime activity, safety 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 3 risk exposure should be considered for Traffic Regulator wear (instead of the Class 2 safety apparel as described above).

- Wear head, eye, and foot protection as prescribed in MIOSHA Construction Safety Standards Part 6, Personal Protective Equipment, R 408.40601 et seq and Part 22, Signals, Signs, Tags, and Barricades, R 408.42201 et seq.
- To improve visibility of hand movements, wear bright orange gloves. If worn at night, they should have retro-reflectivity for night visibility.

Flashlight:

- In addition to usual regulating equipment, a flashlight with a required red glow cone can be used **only** during hours of darkness to help get the attention of motorists from a distance.

Clothing:

- Full-length pants and shirt
- Abbreviated or suggestive clothing such as tank tops, shorts, skirts, halter tops, etc., are not appropriate.

Step:

- To help reduce fatigue when standing, a short step may be used to evaluate one foot (i.e., a 3 to 6 inch-high block of wood or other material).

Stool:

- May not be used in any portion of the open or closed traffic lane.
- 30 inches minimum height
- No arm or back supports
- Communication equipment may be attached.
- Do not attach **STOP/SLOW** or **STOP/STOP** paddle to the stool.

Miscellaneous Warning Devices:

You may be issued the following:

- Shrill whistle
- Marine air-horn

Lighting During Hours of Darkness:

- Traffic Regulator stations are required to be illuminated for night work with a minimum of ten (10) foot candelas. The light source shall not glare into traffic from either direction.

Red Flags are allowed for Emergency Purposes Only:

- Minimum 24 inch square.
- Securely fastened to a staff that is a minimum of 3 feet in length.
- Free edge shall be weighted so that flag hangs vertically even in heavy winds.
- Required to be retro-reflective for all operations and times of day.
- Orange flags are prohibited from use during any traffic regulating operation.

TRAFFIC CONTROL LAYOUT

- Maximum recommended distance(s) between channelizing devices in the tangent section should be equal in feet to twice the lowest posted construction speed limit in miles per hour.
- Temporary signing is to be in accordance with contract requirements or the current edition of the MMUTCD.
- Place temporary signs and longitudinal buffer spaces according to the current edition of the MMUTCD, Part 6, or as required in contract documents.
- Adjustments to temporary sign spacing and longitudinal buffer space may be permitted or required by the Engineer to improve visibility and stopping sight distances that may be reduced by existing conditions.
- The maximum distance between Traffic Regulators shall be no more than 2 miles or as directed by the Engineer or contract documents.
- Distances more than 2 miles or as described in the contract documents require written approval from the Engineer prior to proceeding.

STATION AND POSITION

Traffic Regulator Station:

- The station should be located 100 to 200 feet in advance of the workers.
- The station should include an audible warning device such as horn or whistle, to warn the workers of approaching danger by errant vehicles.
- It is located so an errant vehicle has additional space to stop without entering the work area.

Traffic Regulator Position:

- Stand on the shoulder adjacent to the travel lane that is being controlled and out of the path of approaching traffic.
- Stand a minimum of 10 feet in advance of the lighted arrow panel for best visibility to approaching traffic.
- After stopping the first vehicle, the Traffic Regulator may need to stand in the controlled lane in front of the stopped vehicle in order to keep the **STOP** sign visible to approaching traffic.
- **Do not cross into the open lane of traffic.**

PRIMARY TRAFFIC REGULATORS

- Primary Traffic Regulators are stationed at each end of the closure with the responsibility of controlling the movement of traffic into and out of the work zone or incident area.
- One of the primary Traffic Regulators should be designated as the lead Traffic Regulator.
- The lead Traffic Regulator may be responsible for leading the coordination of Traffic Regulator assignments, breaks, replacements and setup.
- The lead Traffic Regulator is typically the Traffic Regulator who is in control of the lane that has the location of the construction work.

CONTROL OF TRAFFIC

To Stop Traffic

Standing stationary on the shoulder adjacent to the travel lane that is being controlled, face traffic and aim the **STOP** paddle face toward approaching traffic in the arm closest to traffic extended horizontally away from the body. The free arm shall be held with palm of the hand open above shoulder level facing approaching traffic:

- Try to make direct eye contact with the driver of the first stopped vehicle in order to maintain their attention.
- Communicate to other Traffic Regulators once the first vehicle is stopped in a controlled position.
- If approaching vehicle doesn't appear to be stopping, point at the motorist to get their attention, then provide the hand signal to stop along with the **STOP** face of the paddle.
- If the **STOP/SLOW** paddle is equipped with flashing lights:
    - Use the flash sparingly to attract the attention of motorists while they still are a distance away from your station.
- Make clear and precise signals that can be easily understood.
- **Do not wave the paddle.**

To Release Stopped Traffic:

- Visually determine that all traffic and work operations are clear in the travel lane.
- Confirm with the other Traffic Regulator(s) that their traffic is stopped.
- Standing stationary on the shoulder adjacent to the travel lane that is being controlled, face the traffic to be released, aim the **SLOW** paddle face at the released traffic in the right arm extended horizontally away from the body. Motion left to right with the free arm for traffic to proceed.

To Alert or Slow Traffic:

- Standing stationary on the shoulder adjacent to the travel lane, face approaching traffic and aim the **SLOW** paddle face toward approaching traffic in the arm adjacent to traffic extended horizontally away from the body. Motion with the free arm up and down with palm down.
- The use of slow paddles to control the speed of traffic in non-traffic regulating operations (i.e. multilane/freeway paving) is prohibited.

SUMMARY

- ✓ **Be visible.**
- ✓ **Wear all required safety equipment.**
- ✓ **Stay with the signs.**
- ✓ **Stand alone.**
- ✓ **Remain alert.**
- ✓ **Have an escape route.**
- ✓ **Record vehicle description and license plate number of any driver who disobeys your instructions and threatens safety of the work.**
- ✓ **Be brief and courteous.**
- ✓ **Remain in your position until relieved.**
- ✓ **Be professional.**

FOR THE SUPERVISOR

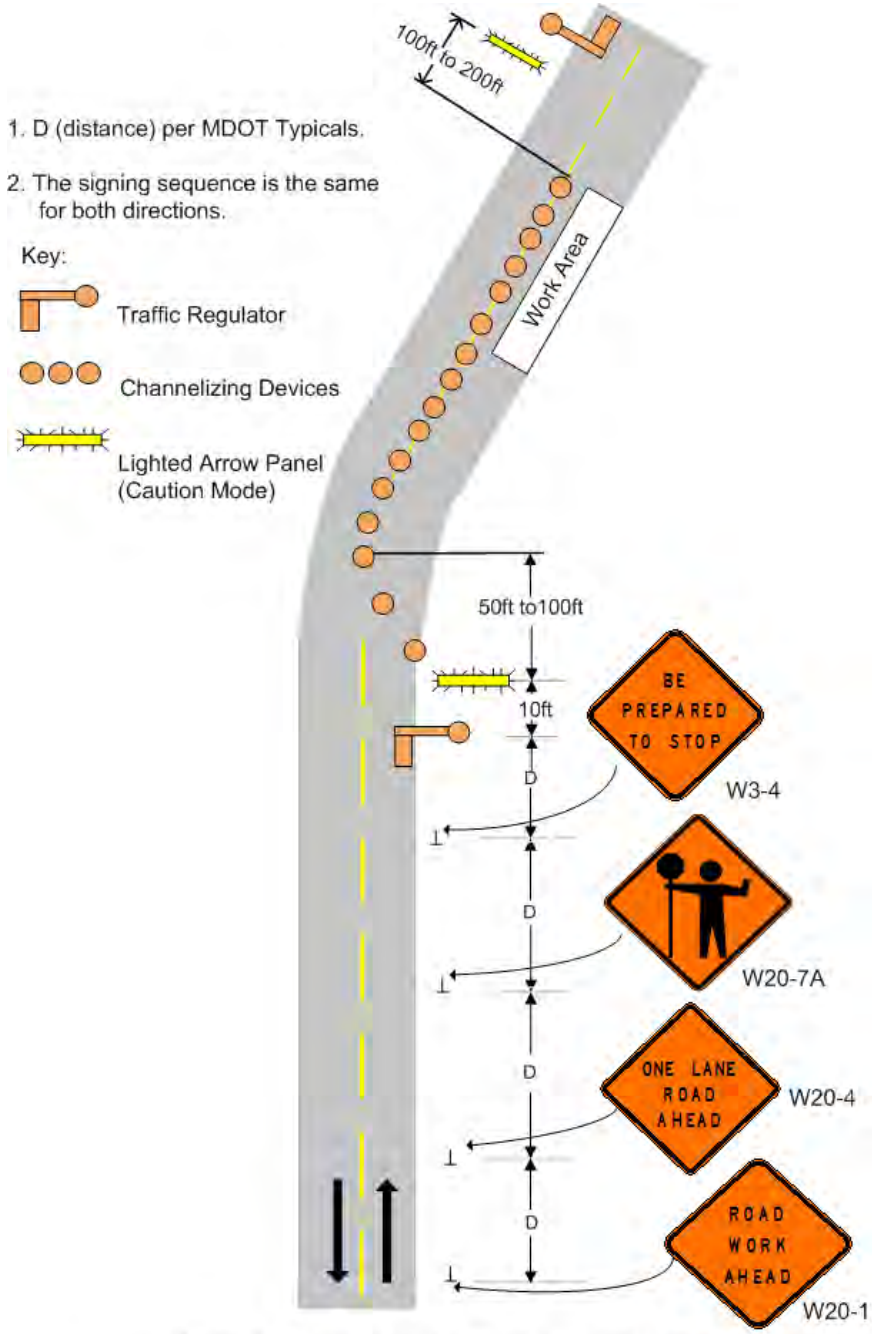
INTRODUCTION

- Ensure the Traffic Regulator has been issued necessary instructions and training prior to starting work.
- Ensure the Traffic Regulator is provided with the required clothing and equipment.
- Update the Traffic Regulators on any emergencies that may occur within the zone.
- Instruct the Traffic Regulator to stay with the signing sequence and arrow panel.
- Make certain that the required signs, channelizing devices, Traffic Regulators, and equipment are in place before operations begin.
- Ensure precautionary measures to safeguard the public and employees are in place.
- Ensure that all traffic control is properly maintained during the progress of work.
- Ensure that the Traffic Regulator station is properly positioned for driver visibility.
- Properly remove or cover all traffic control when it is no longer in use.
- Drive through the project to determine the effectiveness of the work zone traffic control.
- Immediately correct any hazardous situations.
- If the operation is complex, seek the advice of a qualified person.
- Discipline or replace a Traffic Regulator who is not in compliance.
- Relieve or rotate the Traffic Regulator at predetermined intervals.

- When two or more Traffic Regulators are required, designate one of them as lead Traffic Regulator.
- Report serious violations to the local police department.
- Document your actions.

TRAFFIC CONTROL LAYOUT

- Taper lengths shall be 50 feet minimum to 100 feet maximum. 100 feet maximum is the recommended length, with shorter lengths allowed if there are space restrictions.
- Maximum recommended distance(s) between channelizing devices in the taper area(s) should not exceed 15 feet.
- Park vehicles as far off the roadway as possible inside the work zone or a minimum of 50 feet beyond the lighted arrow panel into the taper area. Do not park vehicles or equipment at the Traffic Regulator station, on sidewalks, or other pedestrian pathways.
- Stay with the arrow board and sign sequence.
- The arrow panel and sign sequence are required to move with the Traffic Regulator for identification purposes.



Suggested applications of traffic control devices on a 2-lane highway where one lane is closed utilizing a Traffic Regulator.

STATION AND POSITION

Traffic Regulators Station:

- Can be clearly seen by approaching traffic as recommended by the stopping sight distance **Table 6E-1** in the current MMUTCD.

Stopping Sight Distance

Posted Speed (mph)	Distance (feet)
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730

- Increase the distance for downgrades or other conditions that affect stopping distance.
- Obtaining sufficient sight distance may require extending the beginning or end of a lane closure in advance or beyond existing features such as hills and curves, in advance of the Traffic Regulator station.
- Stand a minimum of 10 feet in advance of the lighted arrow panel for best visibility to approaching traffic.
- Provides a sufficient escape path and is free of obstructions.
- For projects requiring a lighted arrow panel in CAUTION mode, it should be positioned at the beginning of the taper for the full lane closure.

SINGLE TRAFFIC REGULATORS

Spot Locations - Single Traffic Regulator:

A single Traffic Regulator can only be used if all of the following points are met.

1. The work area is short (i.e., guardrail ending work, minor shoulder repair).
2. The work area is on a straight section of road with good visibility from both approaches.
3. Traffic volumes are less than 400 vehicles per day
4. Traffic speeds are low (less than 45 mph).

Single Traffic Regulator:

- Is positioned on the shoulder directly opposite from the work area and a pre-determined escape path.
- Uses channelizing devices for increased visibility and motorist awareness. Place one at each intended stopping point.
- An oversized **STOP/SLOW** paddle is recommended.
- May need to move a short distance towards the end of the work zone while stopping approaching vehicles.
- If traffic fails to understand the single Traffic Regulator, a standard Traffic Regulator operation shall be used.

INTERMEDIATE TRAFFIC REGULATORS

Intermediate Traffic Regulators are stationed at intersecting roads and/or significant traffic generators (shopping centers, mobile home parks, etc.) with the responsibility of controlling the movement of traffic entering from these points within the work zone or incident area.

Intermediate Traffic Regulators:

To control cross road traffic:

- Are required to use a **STOP/STOP** paddle.
- Are required to be in radio or visual contact with the other Intermediate Traffic Regulators to coordinate the safe entry of intermediate traffic within the work zone.
- Are not allowed to stop the mainline flow of traffic.
- Release traffic in either direction after mainline flow of traffic passes the intermediate station.
- After releasing traffic, clearly describe the last vehicle added to the traffic flow in each direction to other Traffic Regulators.
- Should be positioned at a location near the intersection where traffic in all directions can be observed and approaching traffic can be stopped safely at the intended stopping point.

INGRESS / EGRESS OPERATIONS

(Applicable to MDOT projects)

When no other contractor access is available and short stoppages for ingress/egress of contractor operations are required to be performed through active traffic, the following must be satisfied to permit use:

1. Non-freeway **only**.
2. Maximum duration of two minutes.
3. Posted speed is less than 45 mph.
4. Must be approved by the Engineer prior to use.

Ingress / Egress Traffic Regulator Operations

- No more than three stoppages per hour unless approved by the Engineer. Additional stoppages per hour without prior approval will require a full traffic regulating signing sequence.

- For ingress / egress of construction equipment and materials only.

- Provide one regulator for every two lanes required to stop. If controlling two lanes of traffic, wait for first vehicle to stop in the first lane and then proceed into the controlled lane to stop the second lane.

- Provide one **ROAD WORK AHEAD** sign for each approaching traffic direction.

HAUL ROAD CROSSINGS

If a truck is crossing the highway or making a left turn onto the highway:

- Traffic is stopped in both directions by two Traffic Regulators.
- A **STOP/STOP** paddle is required for use by both Traffic Regulators.
- To release traffic, Traffic Regulators should turn the **STOP/STOP** paddle a quarter-turn away from traffic and use the appropriate hand signals.

If the truck is making a right turn onto the highway:

- Traffic stopped in one direction by one Traffic Regulator.
- **STOP/STOP** paddle used by Traffic Regulator.
- To release traffic, Traffic Regulators should turn the **STOP/STOP** paddle a quarter-turn away from traffic and use the appropriate hand signals.
- In both instances, the **BE PREPARED TO STOP** sign replaces **ONE LANE ROAD AHEAD** sign for each direction being controlled.

The Traffic Regulators are required to be:

- Positioned on the road shoulder out of the path of on coming traffic at each side of the crossing.
- Clearly visible to each other.
- Have a pre-determined escape path free of obstructions.

NIGHT WORK

Operations during Hours of Darkness:

- Traffic Regulator stations and work area are required to be illuminated with appropriate lighting. Lighting should not create a glare for the Traffic Regulators or motorists.
- Required levels of lighting are a minimum of ten (10) foot candelas (MIOSHA Construction Safety Standard, Part 1, General Rules, Rule 133 (1)).
- Safety apparel meeting current ANSI standards for Class 3 risk exposure is recommended.
- **STOP/SLOW** paddle required to have retro-reflective sheeting, which shall meet the sign sheeting requirements in the agency or contract documents.
- A flashlight with a red glow cone may be used to get the attention of motorists. The proper method is to slowly wave the light back and forth slowly across the front of the legs with free hand.

PILOT VEHICLES

- Pilot vehicles are used in conjunction with Traffic Regulators to help control traffic passing through the work zone.
- The goal of using pilot vehicles is to provide information to the motorists on where and what speed to drive through the work zone.
- Must be coordinated with Traffic Regulator operations or other controls being used at the end of the one lane section.
- The pilot vehicle is required to have an operating amber beacon or strobe light and the name of the contractor or contracting agency prominently displayed.

- Per Part 6 of MMUTCD, the **PILOT CAR FOLLOW ME** sign shall be mounted in a conspicuous position on the rear of the pilot vehicle.

Procedures for Pilot Vehicles:

- The Traffic Regulator holds traffic in a stopped position. The driver of the pilot vehicle positions the vehicle on the shoulder opposite the Traffic Regulator or, if the shoulder width is limited, at the beginning of the stopped queue of vehicles.
- The Traffic Regulator checks with other regulators to make sure all traffic has been cleared.
- Once the Traffic Regulator confirms from other regulators that traffic has been cleared, Traffic Regulator releases the pilot vehicle, turns the **STOP/SLOW** paddle to **SLOW** and directs remaining traffic in the queue to follow.
- Clearly communicate with other regulators when the last vehicle has been released.

Keys for the Pilot Vehicle Operator:

- Must be aware of the size and composition of the vehicle queue that will follow the vehicle through the work zone. Semi-trucks, or vehicles with trailers, will likely have different acceleration/deceleration speeds and widths than the pilot vehicle.
- Driving a consistent speed. This is the key component in helping to keep the queue of vehicles safely spaced together and avoiding undesirable speed increases from motorists trying to catch up to the vehicle queue or falling behind and not understanding the expectations of where and how fast to drive through the work zone.

EMERGENCY VEHICLE PROCEDURES

- Always be alert for emergency vehicles and crews.
- Immediately contact other Traffic Regulators and work crews and coordinate stoppage of all traffic entering and traveling through the work zone.
- Allow emergency vehicle(s) to proceed through the work zone.
- Continue to keep traffic out of the work zone until the needs of the emergency vehicle(s) has cleared the work zone.
- All other Traffic Regulators should immediately stop all traffic movements to allow the emergency vehicle(s) to pass through the work zone.

SPECIAL TRAFFIC REGULATING SITUATIONS

Signalized Intersections – Altering signal operations are separately arranged or included in the contract documents.

For operations that impact an intersection for greater than 20 minutes:

- Prior to starting work:
    - o Place traffic control devices per appropriate maintaining traffic typical.
    - o Provide Traffic Regulators at all intersection legs.
    - o Turn signal off and bag the entire signal.

For operations that impact intersection for 20 minutes or less (short duration) where the signal will be operated in manual mode:

- Prior to starting work, the agency designated representative adjusts the signal to the appropriate mode.
- Do not start regulating traffic until signal has been modified to avoid conflicting signs.
- Continue regulating traffic until signal is returned to normal operation.
- A Traffic Regulator is required for each direction of traffic being controlled.

For operations that impact an intersection for 20 minute for less (short duration) where the signal can be placed into flash mode:

- Prior to starting work, the agency designated representative will place the signal into flash mode.
    - Place traffic control devices per appropriate maintaining traffic typical.
    - Provide Traffic Regulators at all intersection approach legs.
    - Place the traffic signal in flash mode
- If an agency designated representative is not available:
    - Place traffic control devices per appropriate maintaining traffic typical.
    - Provide Traffic Regulators on all approach legs.
    - Conduct Traffic Regulator operations while the signal is in stop and go operations. **Do not attempt to stop traffic under a green indication until the intersection is under control.**

Non-Signalized Intersections:

- A Traffic Regulator is required for each side road approach of traffic being controlled.
- **Stop** and **Yield** signs are not required to be covered.

DEFINITION OF TERMS

Traffic Regulator Definitions

Activity Area: The section of highway or street where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

Advance Warning Area: The section of highway or street where motorists are in formed about the upcoming work zone or incident area.

ANSI: American National Standards Institute (www.ansi.org)

Channelizing Device: A plastic drum, cone, tubular marker, or vertical panel that is used to guide and warn motorists of conditions created by work activities in or near the roadway.

D Distance: Distance between temporary advance signing and beginning of remaining temporary signing sequence based on posted speed prior to the work area.

Escape Path: A pre-determined route free of obstructions that enables the Traffic Regulator to maneuver away from the errant vehicles or equipment.

Haul Road Crossing: A specific location within a work zone that is used to move equipment into and/or out of the work area.

Highway or Street: The entire width between the boundary lines of every way publicly maintained when any part thereof is open to the use of the public for purposes of vehicular travel (per the Michigan Vehicle Code).

Hours of Darkness: The time from sunset to sunrise upon a straight, level, unlighted highway under normal atmospheric conditions and at any other time when there is not sufficient light to render clearly discernible persons and vehicles on the highway at the appropriate stopping sight distance, where light levels fall below ten (10) foot candelas. The required levels of lighting during hours of darkness are a minimum of ten (10) foot candelas.

Intermediate Traffic Regulator: The Traffic Regulator who is responsible for controlling traffic at intersecting roads or significant traffic generators.

ISEA: International Safety Equipment Association (http://www.safetyequipment.org/)

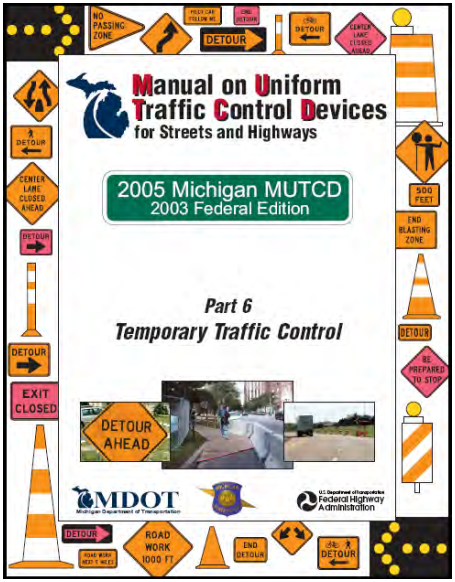
Lead Traffic Regulator: The Traffic Regulator who is responsible for the control of all Traffic Regulators who control traffic traveling through the work zone. The Lead Traffic Regulator is stationed at the traffic lane that is closed for work where traffic is required to be stopped and shifted to the opposing lane for travel through the work zone.

Lighted Arrow Panel: A traffic control device that 1) helps to advise motorists approaching a work zone and 2) highlights the location of the Traffic Regulator at the earliest opportunity.

Longitudinal Buffer Space (B Distance*): Distance between the start of the full lane closure and work area. * See MMUTCD for tables.

MASH-08: American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH). This document is an update of the NCHRP Report 350 crash testing and evaluation criteria.

Michigan Manual on Uniform Traffic control Devices (MMUTCD): The prescribed standards of design, construction, and application of traffic control devices for use upon highways within Michigan.



Michigan Vehicle Code: Act 300 of 1949, An Act to provide for the registration, titling, sale, transfer, and regulation of certain vehicles operated upon the public highways of this state or any other place open to the general public or generally accessible to motor vehicles and distressed vehicles.

NCHRP 350: National Cooperative Highway Research Program, Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*. This report is recommended to highway design engineers, bridge engineers, safety engineers, maintenance engineers, researchers, hardware developers, and others concerned with safety features used in the highway environment. It contains recommended procedures for evaluating the safety performance of various highway safety features.

Obstruction: Anything that blocks the movement of a Traffic Regulator along an escape path.

Personal Protective Equipment (PPE): High-visibility safety apparel that clearly identifies the wearer and provides added protection to certain parts of the body. PPE includes vests as well as proper head, eye, and foot protection.

Pilot Vehicle: A designated vehicle used in coordination with Traffic Regulators to help control traffic through a construction zone.

Red Flag: A hand signaling device permitted for emergency situations only.

Stop/Slow Paddle: The primary hand signaling device used by a Traffic Regulator to control the flow of traffic.

Stop/Stop Paddle: The primary hand signaling device used by a Traffic Regulator to control the flow of traffic only at a haul road crossing when regulating two directions of travel.

Termination Area: The section of highway or street from the downstream end of the work area to the last traffic control device where motorists are returned to their normal path.

Traffic Regulator: An individual who is properly trained, equipped, and attired to protect the project personnel by providing safe, courteous, and authoritative directions to motorists seeking passage through a work zone.

Traffic Regulator Station: An area located off the traveled portion of the roadway that is clear of obstructions and provides sufficient clear distance for approaching traffic to see the Traffic Regulator and stop at an intended stopping point.

Transition Area: The section of highway or street where motorists are directed out of their normal travel path.

Stopping Sight Distance: The distance suggested in Table 6E-1 of Part 6 of the MMUTCD so sufficient visibility is provided for a motorist to stop at an intended stopping point.

Taper: A series of channelizing devices that are used to move traffic out of or into the normal path at the transitions.

Work Duration: The length of time a work operation occupies a spot location. There are five categories which include:

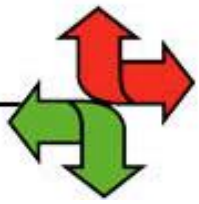
- **Long-term stationary**: Three days or more.
- **Intermediate-term Stationary**: More than one daylight period up to three days, or work during hours of darkness lasting more than one hour.
- **Short-term Stationary**: Daytime work for more than one hour with a single daylight period.
- **Short Duration**: Up to one hour.
- **Mobile**: Moves intermittently or continuously.

Work Zone: A portion of a street or highway that meets any of the following:

- Between a "**WORK ZONE BEGINS**" sign and an "**END ROAD WORK**" sign.
- Between a "**BEGIN WORK CONVOY**" sign and an "**END WORK CONVOY**" sign.

Within 150 feet of a vehicle with an operating strobe

Manual on Uniform Traffic Control Devices (MUTCD)



PART 6

GUIDANCE

CHAPTER 6B. TEMPORARY TRAFFIC CONTROL ELEMENTS

Section 6B.01 Temporary Traffic Control Plans

Support:

01 Each TTC zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road user mix (motorists, bicyclists, and pedestrians), road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. The goal of TTC in work zones is safety with minimum disruption to road users. The key factor in promoting TTC zone safety is proper judgment.

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

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

04 During TTC activities, commercial vehicles might need to follow a different route from passenger vehicles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous materials might need to follow a different route from other vehicles. The Hazardous Materials and National Network signs are included in Sections 2B.67 and 2B.68, respectively.

Guidance:

05 *A TTC plan should be developed for planned activities that will affect road users. A TTC plan should be developed for unplanned and emergency situations where practicable.*

06 *The TTC plan should start in the planning phase and continue through the design, construction, and restoration phases. The TTC plans and devices should follow the principles set forth in Part 6. The management of traffic incidents should follow the principles set forth in Chapter 6O.*

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

08 *Coordination should be made between adjacent or overlapping projects to check that duplicate signing is not used and to check compatibility of traffic control between adjacent or overlapping projects.*

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

10 *For any planned special event that will have an impact on the traffic on any street or highway, a TTC plan should be developed in conjunction with and be approved by the agency or agencies that have jurisdiction over the affected roadways.*

11 *Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC plan.*

Option:

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

13 Modifications of TTC plans may be necessary because of changed conditions or a determination of better methods of safely and efficiently handling road users.

Guidance:

14 *This alternate or modified plan should have the approval of the responsible highway agency or owner of site roadways open to public travel prior to implementation.*

15 *Provisions for effective continuity of transit service should be incorporated into the TTC planning process because often public transit buses cannot efficiently be detoured in the same manner as other vehicles (particularly for short-term maintenance projects). Where applicable, the TTC plan should provide for features such as accessible temporary bus stops, pull-outs, and satisfactory waiting areas for transit patrons, including persons with disabilities (see Section 8A.13 for additional light rail transit issues to consider for TTC).*

16 *Provisions for effective continuity of railroad service and acceptable access to abutting property owners and businesses should also be incorporated into the TTC planning process.*

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

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

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

Support:

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

21 Chapter 6P contains typical applications (TAs) of TTC zones that are organized according to duration, location, type of work, and highway type. Table 6P-1 is an index of these typical applications. These typical applications include the use of various TTC methods, but do not include a layout for every conceivable work situation.

22 Decisions regarding the selection of the most appropriate typical application to use as a guide for a specific TTC zone require an understanding of each situation. Although there are many ways of categorizing TTC zone applications, the typical applications illustrated in Chapter 6P are characterized by work duration, work location, work type, and highway type.

Guidance:

23 *Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.*

Option:

24 Other devices may be added to supplement the devices shown in the typical applications. The sign spacings and taper lengths may be increased to provide additional time or space for driver response.

25 Devices labeled as optional in the typical applications may be deleted.

Support:

26 Formulating specific plans for TTC at traffic incidents is difficult because of the variety of situations that can arise.

27 Well-designed TTC plans for planned special events will likely be developed from a combination of treatments from several of the typical applications.

Section 6B.02 Temporary Traffic Control Zones

Support:

01 A TTC zone is an area of a highway where road user conditions are changed because of a work zone, an incident zone, or a planned special event through the use of TTC devices, uniformed law enforcement officers, or other authorized personnel.

02 A work zone is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last TTC device.

03 An incident zone is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident (see Section 6O.01). It extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where road users return to the original lane alignment and are clear of the incident.

04 A planned special event often creates the need to establish altered traffic patterns to handle the increased traffic volumes generated by the event. The size of the TTC zone associated with a planned special event can be small, such as closing a street for a festival, or can extend throughout a municipality for larger events. The duration of the TTC zone is determined by the duration of the planned special event.

Section 6B.03 Components of Temporary Traffic Control Zones

Support:

01 A TTC zone is often divided into four areas as needed, based on engineering judgment: the advance warning area, the transition area, the activity area, and the termination area. Figure 6B-1 illustrates the four areas typically included in a TTC zone. These four areas are described in Sections 6B.04 through 6B.07.

Section 6B.04 Advance Warning Area

Support:

01 The advance warning area is the section of highway where road users are informed about the upcoming transition and activity areas or incident area.

Option:

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

Guidance:

03 *Typical distances for placement of advance warning signs on freeways and expressways should be longer because drivers are conditioned to uninterrupted flow. Therefore, the advance warning sign placement should extend on these facilities as far as ½ mile or more.*

04 *On urban streets, the effective placement of the nearest warning sign to the TTC zone, in feet, should range from 4 to 8 times the speed limit in mph, with the high end of the range being used when speeds are relatively high. When two or more advance warning signs are used on higher-speed streets, such as major arterials, the advance warning area should extend a greater distance (see Table 6B-1).*

Option:

05 When a single advance warning sign is used (in cases such as low-speed residential streets), the advance warning area may be as short as 100 feet.

Guidance:

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

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

Support:

08 The need to provide additional reaction time for a condition is one example of justification for increasing the sign spacing. Conversely, decreasing the sign spacing might be justified in order to place a sign immediately downstream of an intersection or major driveway such that traffic turning onto the roadway in the direction of the TTC zone will be warned of the upcoming condition.

Option:

09 Advance warning may be eliminated when the activity area is sufficiently removed from the road users' path so that it does not interfere with the normal flow.

Section 6B.05 Transition Area

Support:

01 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.

Standard:

02 **Except for mobile operations, when redirection of the road users' normal path is required, road users shall be directed from the normal path to a new path with appropriate channelizing devices, traffic control devices, and/or TTC methods.**

Option:

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

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

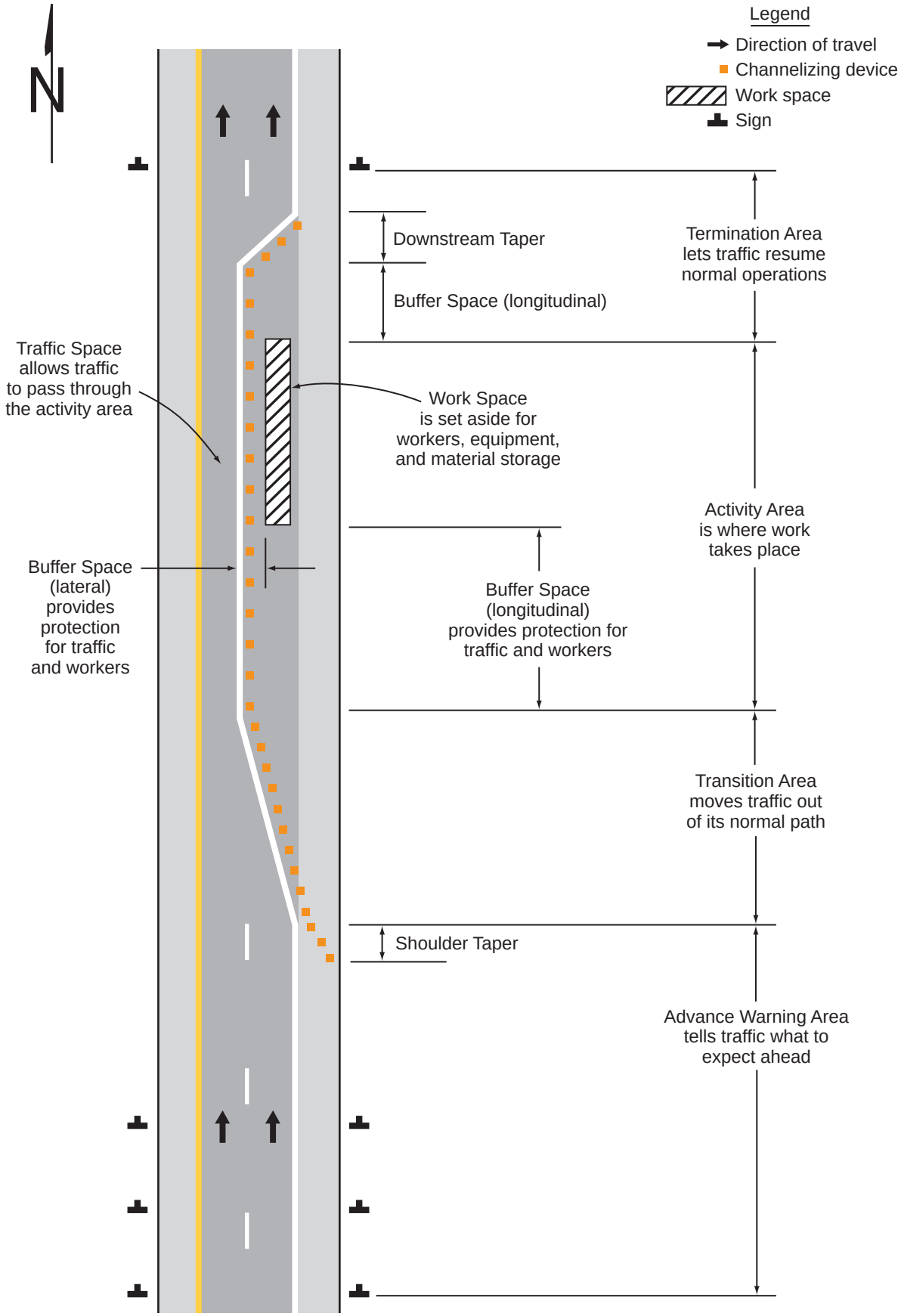


Table 6B-1. Recommended Advance Warning Sign Minimum Spacing

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 or owner of site roadways open to public travel.

** The column headings A, B, and C are the dimensions shown in Figures 6P-1 through 6P-54 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.)

Section 6B.06 Activity Area

Support:

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

02 The work space is that portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.

Option:

03 The work space may be stationary or may move as work progresses.

Guidance:

04 *Since there might be several work spaces (some even separated by several miles) within the project limits, each work space should be adequately signed to inform road users and reduce confusion.*

Support:

05 The traffic space is the portion of the highway in which road users are routed through the activity area.

06 The buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle.

Guidance:

07 *Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.*

Option:

08 Buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow. The activity area may contain one or more lateral or longitudinal buffer spaces.

09 A longitudinal buffer space may be placed in advance of a work space.

10 The longitudinal buffer space may also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in Figure 6B-2.

11 If a longitudinal buffer space is used, the values shown in Table 6B-2 may be used to determine the length of the longitudinal buffer space.

Support:

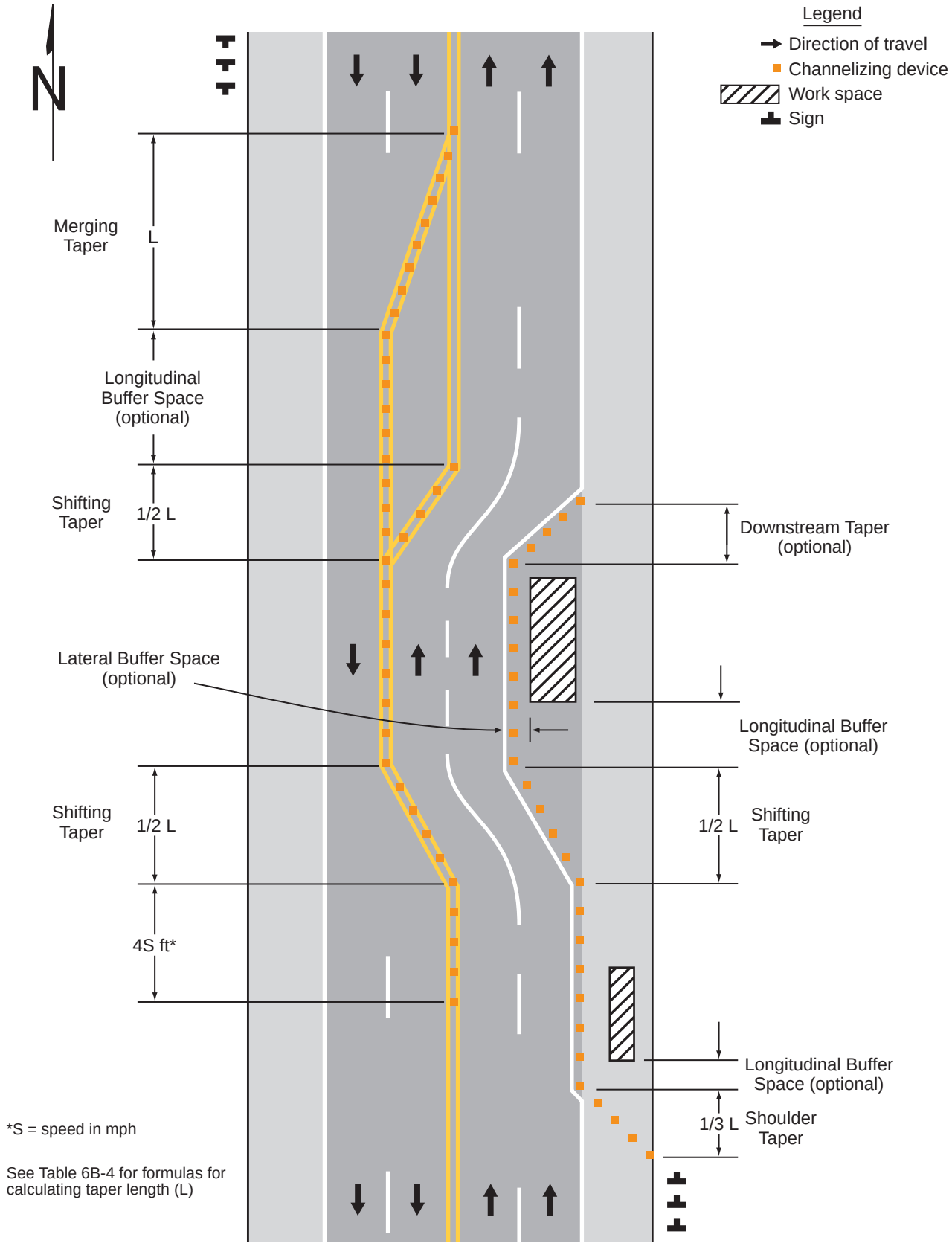
12 Typically, the buffer space is formed as a traffic island and defined by channelizing devices.

13 When a shadow vehicle, arrow board, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow board, or changeable message sign constitutes the buffer space.

Option:

14 The lateral buffer space may be used to separate the traffic space from the work space, as shown in Figures 6B-1 and 6B-2, or such areas as excavations or pavement-edge drop-offs. A lateral buffer space also may be used between two travel lanes, especially those carrying opposing flows.

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



Guidance:

15 *The width of a lateral buffer space should be determined by engineering judgment.*

Option:

16 When work occurs on a high-volume, highly-congested facility, a vehicle storage or staging space may be provided for incident response and emergency vehicles (for example, tow trucks and fire apparatus) so that these vehicles can respond quickly to road user incidents.

Table 6B-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

Section 6B.07 Termination Area

Support:

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

Option:

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

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

Section 6B.08 Tapers

Option:

01 Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted.

Support:

02 Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in Figure 6B-2.

03 Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The test concerning adequate lengths of tapers involves observation of driver performance after TTC plans are put into effect.

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

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

Note: Use Table 6B-4 to calculate L

Table 6B-4. Formulas for Determining Taper Length

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

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

Guidance:

04 *The appropriate taper length (L) should be determined using the criteria shown in Tables 6B-3 and 6B-4.*

Support:

05 A merging taper requires the longest distance because drivers are required to merge into common road space.

Guidance:

06 *A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into an adjacent lane before the downstream end of the transition.*

Support:

07 A shifting taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds.

Guidance:

08 *A shifting taper should have a length of approximately ½ L (see Tables 6B-3 and 6B-4).*

Support:

09 A shoulder taper might be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

Guidance:

10 *If used, shoulder tapers should have a length of approximately ⅓ L (see Tables 6B-3 and 6B-4). If a shoulder is used as a travel lane, either through practice or during a TTC activity, a normal merging or shifting taper should be used.*

Support:

11 A downstream taper might be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed.

Guidance:

12 *If used, a downstream taper should have a minimum length of 50 feet and a maximum length of 100 feet with devices placed at a spacing of approximately 20 feet.*

Support:

13 The one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a manner that a portion of the road is used alternately by traffic in each direction.

Guidance:

14 *A taper having a minimum length of 50 feet and a maximum length of 100 feet with channelizing devices at approximately 20-foot spacing should be used to guide traffic into the one-lane section, and a downstream taper should be used to guide traffic back into their original lane.*

Support:

15 An example of a one-lane, two-way traffic taper is shown in Figure 6B-3.

Section 6B.09 Detours and Diversions

Support:

01 A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone.

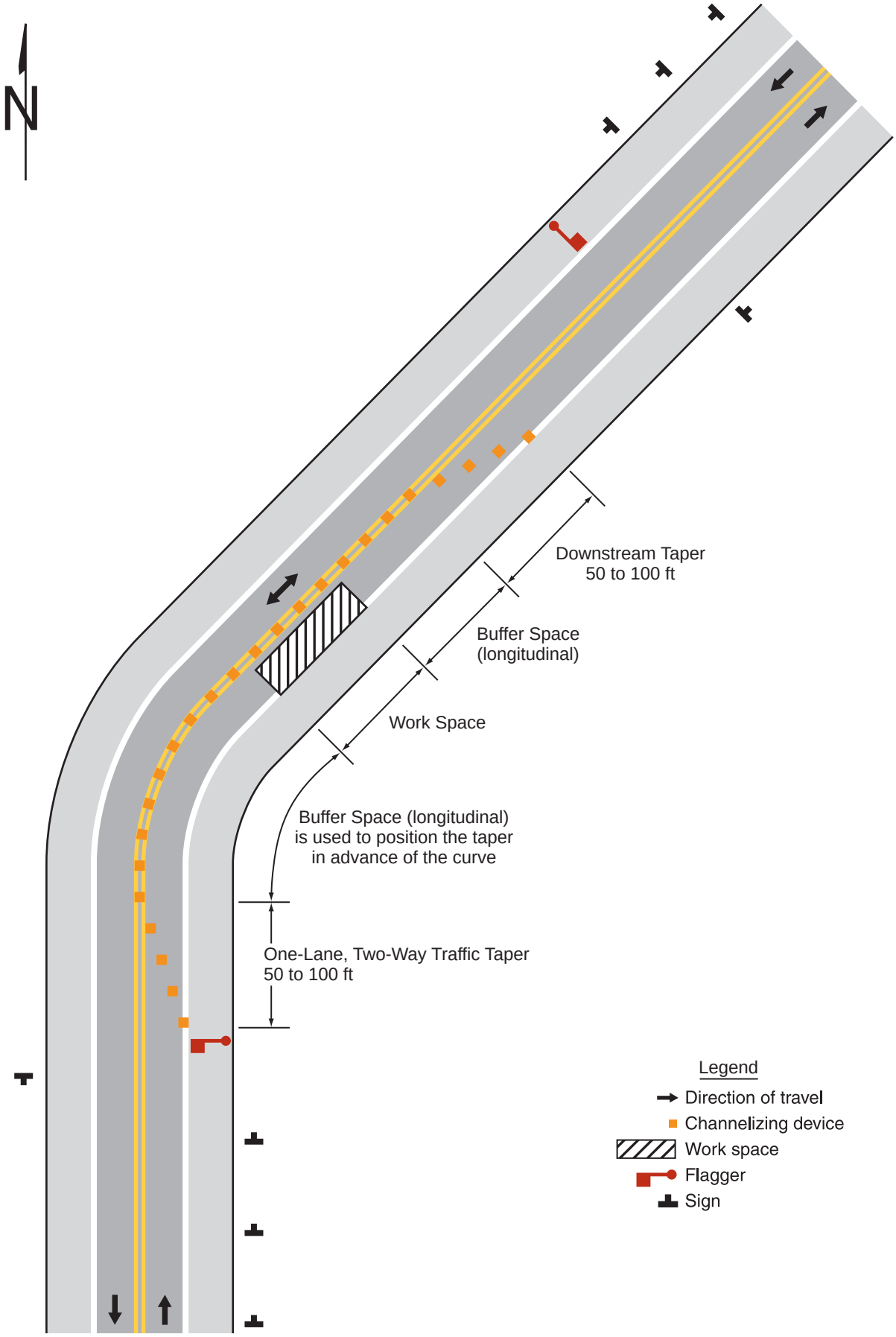
Guidance:

02 *Detours should be clearly signed over their entire length so that road users can easily use existing highways to return to the original highway.*

Support:

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

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



CHAPTER 6D. FLAGGER CONTROL

Section 6D.01 Qualifications for Flaggers

Guidance:

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

- *A. Ability to receive and communicate specific instructions clearly, firmly, and courteously;*
- *B. Ability to move and maneuver quickly in order to avoid danger from errant vehicles;*
- *C. Ability to control signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers approaching a TTC zone in frequently changing situations;*
- *D. Ability to understand and apply proper traffic control practices, sometimes in stressful or emergency situations; and*
- *E. Ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.*

Section 6D.02 STOP/SLOW Paddle for Hand-Signaling

Guidance:

01 *The STOP/SLOW paddle (see Figure 6D-1 and Table 6G-1) should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags.*

Standard:

02 **The STOP/SLOW paddle (R1-1 and W20-8) shall have an octagonal shape on a rigid handle. When used at night, the STOP/SLOW paddle shall be retroreflectorized.**

Option

03 A STOP/STOP or a SLOW/SLOW paddle may be used in certain situations (see Section 6D.05), provided the device meets the size and shape requirements for the STOP/SLOW paddle.

Guidance:

04 *The STOP/SLOW paddle should be fabricated from light semi-rigid material.*

Support:

05 The optimum method of displaying a STOP or SLOW message is to place the STOP/SLOW paddle on a rigid staff that is tall enough that when the end of the staff is resting on the ground, the message is high enough to be seen by approaching or stopped traffic.

Option:

06 The STOP/SLOW paddle may be modified to improve conspicuity by incorporating either white or red flashing lights on the STOP face, and either white or yellow flashing lights on the SLOW face. The flashing lights may be arranged in any of the following patterns:

- A. Two white or red lights, one centered vertically above and one centered vertically below the STOP legend; and/or two white or yellow lights, one centered vertically above and one centered vertically below the SLOW legend;
- B. Two white or red lights, one centered horizontally on each side of the STOP legend; and/or two white or yellow lights, one centered horizontally on each side of the SLOW legend;
- C. One white or red light centered below the STOP legend; and/or one white or yellow light centered below the SLOW legend;
- D. A series of eight or more small white or red lights no larger than ¼ inch in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the border of the STOP face; and/or a series of eight or more small white or yellow lights no larger than ¼ inch in diameter along the outer edge of the paddle, arranged in a diamond pattern along the border of the SLOW face; or
- E. A series of white lights forming the shapes of the letters in the legend.

Standard:

07 **If flashing lights are used on the STOP face of the paddle, their colors shall be all white or all red. If flashing lights are used on the SLOW face of the paddle, their colors shall be all white or all yellow.**

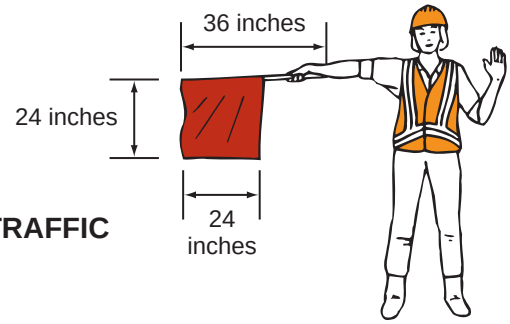
08 **If more than eight flashing lights are used, the lights shall be arranged such that they clearly convey the octagonal shape of the STOP face of the paddle and/or the diamond shape of the SLOW face of the paddle.**

09 **If flashing lights are used on the STOP/SLOW paddle, the flash rate shall be at least 50, but not more than 60, flashes per minute.**

Figure 6D-1. Use of Hand-Signaling Devices by Flaggers

PREFERRED METHOD
STOP/SLOW Paddle

EMERGENCY SITUATIONS ONLY
Red Flag



TO STOP TRAFFIC

TO LET
TRAFFIC PROCEED

TO ALERT AND
SLOW TRAFFIC

Section 6D.03 Flag for Hand-Signaling

Guidance:

01 *Use of flags should be limited to emergency situations.*

Standard:

02 **Flags, when used, shall be red or fluorescent orange-red in color, shall be a minimum of 24 inches square, and shall be securely fastened to a staff that is approximately 36 inches in length.**

Guidance:

03 *The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds.*

Standard:

04 **When used at nighttime, flags shall be retroreflectorized.**

Section 6D.04 Flashlight for Hand-Signaling

Option:

01 When flagging in an emergency situation at night in a non-illuminated flagger station, a flagger may use a flashlight with a red glow cone to supplement the STOP/SLOW paddle or flag.

Standard:

02 **When a flashlight is used for flagging in an emergency situation at night in a non-illuminated flagger station, the flagger shall hold the flashlight in the left hand, shall hold the paddle or flag in the right hand as shown in Figure 6D-1, and shall use the flashlight in the following manner to control approaching road users:**

- **A. To inform road users to stop, the flagger shall hold the flashlight with the left arm extended and pointed down toward the ground, and then shall slowly wave the flashlight in front of the body in a slow arc from left to right such that the arc reaches no farther than 45 degrees from vertical.**
- **B. To inform road users to proceed, the flagger shall point the flashlight at the vehicle's bumper, slowly aim the flashlight toward the open lane, then hold the flashlight in that position. The flagger shall not wave the flashlight.**
- **C. To alert or slow traffic, the flagger shall point the flashlight toward oncoming traffic and quickly wave the flashlight in a Figure eight motion.**

Section 6D.05 Flagger Procedures

Support:

01 The use of paddles and flags by flaggers is illustrated in Figure 6D-1.

Standard:

02 **Flaggers shall use a STOP/SLOW paddle, a flag, or an Automated Flagger Assistance Device (AFAD) (see Sections 6L.02 through 6L.04) to control road users approaching a TTC zone. The use of hand movements alone without a paddle, flag, or AFAD to control road users shall be prohibited when controlling traffic in a one-lane two-way operation except when the control is provided by emergency responders at incident scenes as described in Section 6O.01 or provided by uniformed law enforcement officers.**

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

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

Option:

04 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.

Standard:

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

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

CHAPTER 6C. PEDESTRIAN AND WORKER SAFETY

Section 6C.01 Pedestrian and Worker Safety – General

Standard:

01 **The various TTC provisions for pedestrian and worker safety set forth in Part 6 shall be applied by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.**

Section 6C.02 Pedestrian Considerations

Support:

01 A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, vision, or mobility. Pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6C.03.

Guidance:

02 *Prior to closing a sidewalk or other pedestrian facility, the maintaining agency should advise users of the future closure.*

Standard:

03 **If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided.**

Option:

04 If establishing or maintaining an alternate pedestrian route is not feasible during the project, an alternate means of providing for pedestrians may be used, such as adding free bus service around the project or assigning someone the responsibility to assist pedestrians with disabilities through the project limits.

05 If an existing pedestrian route is impacted by a short-duration or a short-term stationary work zone that is attended with project personnel, establishing an alternate pedestrian route may not be necessary if the work can be stopped and pedestrians can navigate the work zone. Pedestrians may be delayed for a short period of time for project personnel to move equipment and material to facilitate passage. Work zone personnel may also provide assistance to pedestrians as necessary.

Support:

06 Pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance or out-of-the-way travel to a destination.

Guidance:

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

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

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

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

Support:

10 Figures 6P-28 and 6P-29 show typical TTC device usage and techniques for pedestrian movement through work zones.

Guidance:

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

A. Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC plan.
B. Access to transit stops should be maintained.

C. *A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to pedestrians with disabilities. The geometry and alignment of the facility should meet the applicable requirements of the "U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990."*

D. *The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.*

E. *Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with vision disabilities by providing devices such as audible information devices or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have vision disabilities.*

F. *When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it. These detectable edgings should comply with the provisions of Section 6M.04.*

G. *Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.*

Support:

12 Where pedestrians in TTC zones are routed on temporary pedestrian pathways, providing information in non-visual formats (such as accessible pedestrian signals with audible tones and/or speech messages, and vibrotactile surfaces) aids pedestrians with vision disabilities so they can navigate the temporary pathway. Section 6C.03 contains additional information on accessibility considerations in TTC zones. Section 4K.01 contains information on accessible pedestrian signals.

Option:

13 Whenever it is feasible, the worksite may be closed off from pedestrian intrusion if doing so is determined to be preferable to channelizing pedestrians along the site with TTC devices.

Guidance:

14 *Fencing should not create sight distance restrictions for road users. Fences should not be constructed of materials that would be hazardous if impacted by vehicles. Wooden railing, fencing, and similar systems placed immediately adjacent to motor vehicle traffic should not be used as substitutes for crashworthy temporary traffic barriers.*

15 *Ballast for TTC devices should be kept to the minimum amount needed and should be mounted low to prevent penetration of the vehicle windshield.*

16 *Movement by work vehicles and equipment across designated pedestrian paths should be minimized and, when necessary, should be controlled by flaggers or other TTC. Staging or stopping of work vehicles or equipment along the side of pedestrian paths should be avoided, since it encourages movement of workers, equipment, and materials across the pedestrian path.*

17 *Access to the work space by workers and equipment across pedestrian walkways should be minimized because the access often creates unacceptable changes in grade, and rough or muddy terrain, and pedestrians will tend to avoid these areas by attempting non-intersection crossings where no curb ramps are available.*

Option:

18 A canopied walkway may be used to protect pedestrians from falling debris, and to provide a covered passage for pedestrians.

Guidance:

19 *Covered walkways should be sturdily constructed and adequately lighted for nighttime use.*

20 *When pedestrian and vehicle paths are rerouted to a closer proximity to each other, consideration should be given to separating them by a temporary traffic barrier.*

21 *If a temporary traffic barrier is used to shield pedestrians, it should be designed to accommodate site conditions.*

Support:

22 Depending on the possible vehicular speed and angle of impact, temporary traffic barriers might deflect upon impact by an errant vehicle. Guidance for locating and designing temporary traffic barriers can be found in Chapter 9 of the "Roadside Design Guide," 4th Edition, 2011, AASHTO.

Standard:

23 **Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are needed.**

Option:

24 Temporary traffic barriers or longitudinal channelizing devices may be used to discourage pedestrians from unauthorized movements into the work space. They may also be used to inhibit conflicts with vehicular traffic by minimizing the possibility of midblock crossings.

Support:

25 A major concern for pedestrians is building construction encroaching onto the contiguous sidewalks, which forces pedestrians off the curb into direct conflict with moving vehicles.

Guidance:

26 *If a significant potential exists for vehicle incursions into the pedestrian path, pedestrians should be rerouted or temporary traffic barriers should be installed.*

Support:

27 TTC devices, temporary traffic barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.

Guidance:

28 *Tape, rope, or plastic chain strung between devices should not be used as a control for pedestrian movements because they are not detectable and are therefore not accessible to and usable by individuals with disabilities.*

29 *In general, pedestrian routes should be preserved in urban and commercial suburban areas. Alternative routing should be discouraged.*

30 *The highway agency in charge of the TTC zone should regularly inspect the activity area so that effective pedestrian TTC is maintained.*

Section 6C.03 Accessibility Considerations

Support:

01 Additional information on the design and construction of accessible temporary facilities is found in the "Guidelines for Accessible Pedestrian Signals (NCHRP Web-Only Document 117B)," 2008 Edition (TRB) and the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.

02 Where pedestrians are detoured to a temporary traffic control signal, an accessible pedestrian signal (see Chapter 4K) provides information in non-visual formats (such as audible tones and/or speech messages, and vibrating surfaces) so that a pedestrian with vision disabilities can know when to cross the street along the alternate route.

Guidance:

03 *Adequate provisions should be made for pedestrians with disabilities. The extent of needs for such provisions should be determined through engineering judgment or by the individual responsible for each TTC zone situation.*

Standard:

04 **When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. A barrier that is detectable by a person with a vision disability traveling with the aid of a long cane shall be placed across the full width of the closed pedestrian facility.**

Support:

05 Maintaining a detectable, channelized pedestrian route is much more useful to pedestrians with vision disabilities than closing a walkway and providing audible directions to an alternate route involving additional crossings and a return to the original route. Braille is not useful in conveying such information because it is difficult to find. Audible instructions might be provided, but the extra distance and additional street crossings might add complexity to a trip.

Guidance:

06 *Because printed signs and surface delineation are not usable by pedestrians with vision disabilities, blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with vision disabilities by providing audible information devices, tactile and/or vibrating surface devices, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have vision disabilities.*

Support:

07 The most desirable way to provide information to pedestrians with vision disabilities that is equivalent to visual signing for notification of sidewalk closures is a speech message provided by an audible information device. Devices that provide speech messages in response to passive pedestrian actuation are the most desirable. Other devices that continuously emit a message, or that emit a message in response to use of a pushbutton, are also acceptable. Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with vision disabilities.

Guidance:

08 *If a pushbutton is used to provide equivalent TTC information to pedestrians with vision disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with vision disabilities that a special accommodation is available, and to help them locate the pushbutton.*

Section 6C.04 Worker Safety Considerations

Support:

01 Equally as important as the safety of road users traveling through the TTC zone is the safety of workers. TTC zones present temporary and constantly changing conditions that are unexpected by road users. This creates an even higher degree of vulnerability for workers on or near the roadway.

02 Maintaining TTC zones with road user flow inhibited as little as possible, and using TTC devices that get the road users' attention and provide positive direction are of particular importance. Likewise, equipment and vehicles moving within the activity area create a risk to workers on foot. When possible, the separation of moving equipment and construction vehicles from workers on foot provides the operators of these vehicles with a greater separation clearance and improved sight lines to minimize exposure to the hazards of moving vehicles and equipment.

Guidance:

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

- *A. Training—all workers should be trained on how to work next to motor vehicle traffic in ways that minimize their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.*
- *B. 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.*
- *C. Speed Management—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, and/or the use of speed safety cameras, uniformed law enforcement officers, or flaggers should be considered.*
- *D. Activity Area—operations entering and departing the work space, and within the work space, should be planned to minimize backing maneuvers by construction vehicles and equipment to minimize the risk of run-over and back-over crashes.*
- *E. Worker Safety Planning—a trained person designated by the employer should conduct a basic hazard assessment for the worksite and job classifications required in the activity area. This safety professional should determine whether engineering, administrative, or personal protection measures should be implemented. This plan should be in accordance with the Occupational Safety and Health Act of 1970, as amended, "General Duty Clause" Section 5(a)(1) - Public Law 91-596, 84 Stat. 1590, December 29, 1970, as amended, and with the requirement to assess worker risk exposures for each job site and job classification, as per 29 CFR 1926.20 (b)(2) of "Occupational Safety and Health Administration Regulations, General Safety and Health Provisions."*

Option:

04 The following are additional elements of TTC management that may be considered to improve worker safety:

- A. Shadow Vehicle—in the case of mobile and constantly moving operations, such as pothole patching and striping operations, a shadow vehicle, equipped with appropriate lights and warning signs, may be used to protect the workers from impacts by errant vehicles. The shadow vehicle may be equipped with a rear-mounted impact attenuator.
- B. Road Closure—if alternate routes are available to handle road users, the road may be closed temporarily to facilitate project completion and thus further reduce worker vulnerability.
- C. Law Enforcement Use—in highly vulnerable work situations, particularly those of relatively short-duration, law enforcement units may be stationed to heighten the awareness of passing vehicular traffic and to improve safety through the TTC zone.
- D. Lighting—for nighttime work, the TTC zone and approaches may be lighted.

E. Special Devices—these include rumble strips, changeable message signs, hazard identification beacons, flags, and warning lights. Intrusion warning devices may be used to alert workers to the approach of errant vehicles.

Support:

05 Judicious use of the special devices described in Item E in Paragraph 4 of this Section might be helpful for certain difficult TTC situations, but misuse or overuse of special devices or techniques might lessen their effectiveness.

Section 6C.05 High-Visibility Safety Apparel

Standard:

01 **For daytime and nighttime activity, all workers, including emergency responders, within the right-of-way who are within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2015 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear," or equivalent revisions, except as provided in Paragraph 4 of this Section. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.**

02 **The apparel background (outer) material color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors.**

03 **When uniformed law enforcement personnel are used to direct traffic, to investigate crashes, or to handle lane closures, obstructed roadways, and disasters, high-visibility safety apparel as described in this Section shall be worn by the law enforcement personnel.**

Option:

04 Emergency and incident responders and law enforcement personnel within the TTC zone may wear high-visibility safety apparel that meets the performance requirements of the ANSI/ISEA 207-2006 publication entitled "American National Standard for High-Visibility Public Safety Vests," or equivalent revisions, and labeled as ANSI 207-2006, in lieu of ANSI/ISEA 107-2015 apparel.

Standard:

05 **Except as provided in Paragraph 6 of this Section, firefighters or other emergency responders working within the right-of-way shall wear high-visibility safety apparel as described in this Section.**

Option:

06 Firefighters or other emergency responders working within the right-of-way and engaged in emergency operations that directly expose them to flame, fire, heat, and/or hazardous materials may wear retroreflective turn-out gear that is specified and regulated by other organizations, such as the National Fire Protection Association.

Guidance:

07 *For flagger wear during nighttime activity, high-visibility safety apparel that meets the Performance Class 3 requirements of the ANSI/ISEA 107–2015 publication entitled "American National Standard for High-Visibility Apparel and Headwear," or equivalent revision, and labeled as meeting the ANSI 107-2015 standard performance for Class 3 risk exposure should be worn.*

STANDARD DETAILS

SIGN MATERIAL SELECTION TABLE

	SIGN MATERIAL TYPE		
SIGN SIZE	TYPE I	TYPE II	TYPE III
≤ 36" X 36"		X	X
>36" X 36" ≤ 96" TO WIDE		X	
> 96" WIDE TO 144" WIDE	X	X	
> 144" WIDE	X		

TYPE I ALUMINUM EXTRUSION
TYPE II PLYWOOD
TYPE III ALUMINUM SHEET

ROUNDING OF CORNERS IS NOT REQUIRED FOR TYPE I OR II SIGNS.
VERTICAL JOINTS ARE NOT PERMITTED.
HORIZONTIAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE NOT PERMITTED.

POST SIZE REQUIREMENTS TABLE

	POST TYPE		
SIGN AREA (ft^2)	U-CHANNEL STEEL	SQUARE TUBULAR STEEL	WOOD
≤9	1 - 3 lb/ft*	1 - 2" 12 or 14 GA*	N/A
9 ≤ 20	2 - 3 lb/ft	2 - 2" 12 or 14 GA	1 - 4" X 6"*
> 20 ≤ 30	N/A	N/A	2 - 4" X 6"
> 30 ≤ 60	N/A	N/A	2 - 6" X 8"
> 60 ≤ 84	N/A	N/A	3 - 6" X 8"

*SIGNS 4 FEET AND GREATER IN WIDTH REQUIRE 2 POSTS.
SIGNS GREATER THAN 8 FEET IN WIDTH REQUIRE 2 OR 3 WOOD POSTS DEPENDING ON AREA OF SIGN.
A MAXIMUM OF 2 POSTS WITHIN A 7' PATH IS PERMITTED.

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: CON/ECH

CHECKED BY: AUG

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

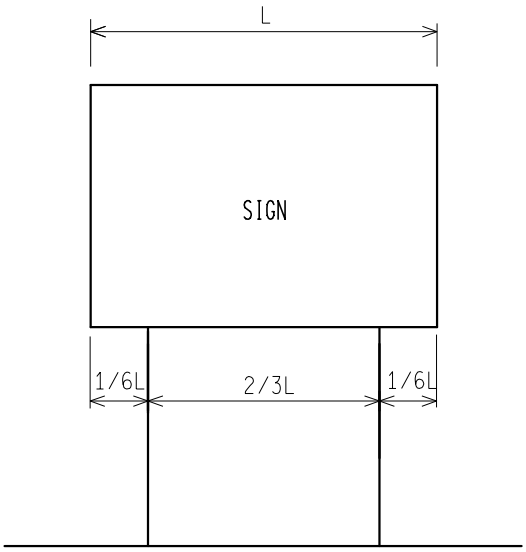
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

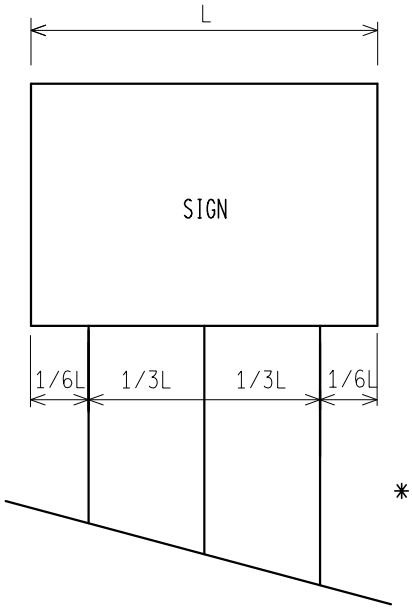
GROUND DRIVEN SIGN SUPPORTS FOR TEMP SIGNS

F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 1 OF 11

2 POST SIGN SUPPORT SPACING

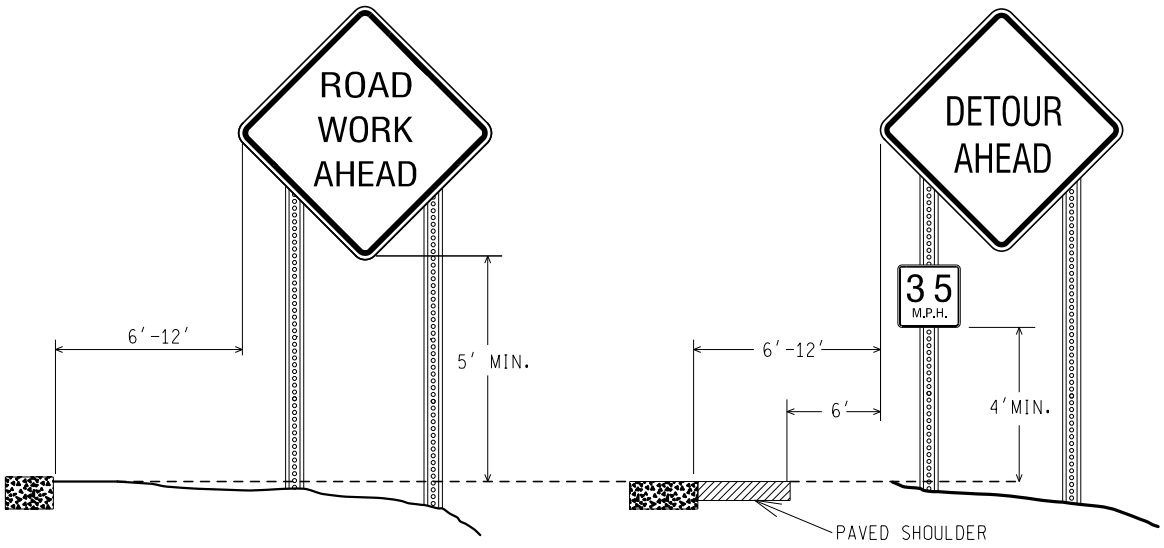


3 POST SIGN SUPPORT SPACING



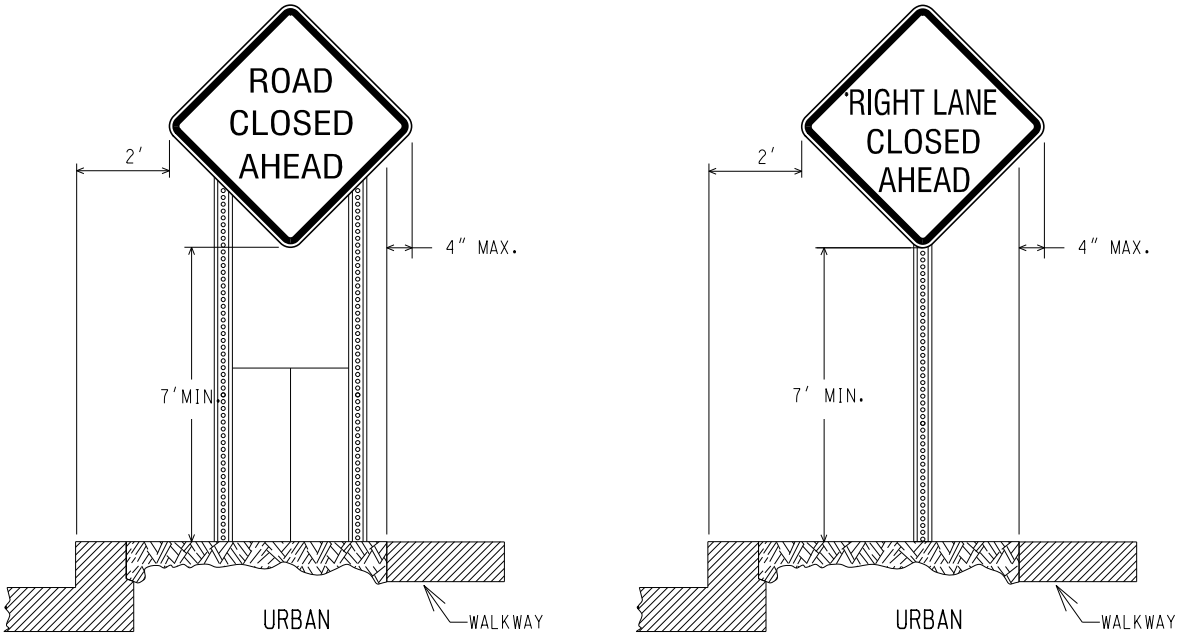
* FOR ALL 11' AND 12' LONG SIGNS ON 3 WOOD SUPPORTS, SPREAD POSTS SO AS TO HAVE A 8' MIN. TO 9' MAX. DISTANCE BETWEEN OUTSIDE POSTS.

NOT TO SCALE



RURAL

RURAL WITH ADVISORY
SPEED PLATE



(CURBED AREAS OR WHERE
WALKWAYS ARE PRESENT)

(CURBED AREAS OR WHERE
WALKWAYS ARE PRESENT)

BOTTOM HEIGHT AND OFFSET

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 3 OF 11

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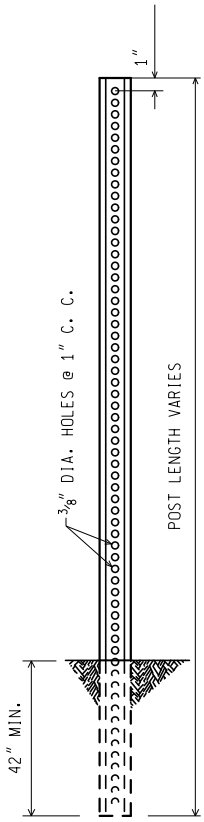

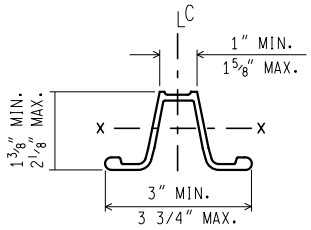

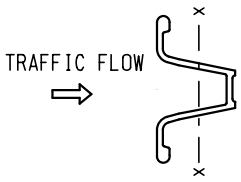

WEIGHT = 3 lbs/ft
SECT. MOD. X.-X. = 0.31 CUBIC INCHES MIN.

3 lb. U - CHANNEL STEEL POST
(NO SPLICE)

MOUNT SIGN ON OPEN FACE OF
U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 4 OF 11

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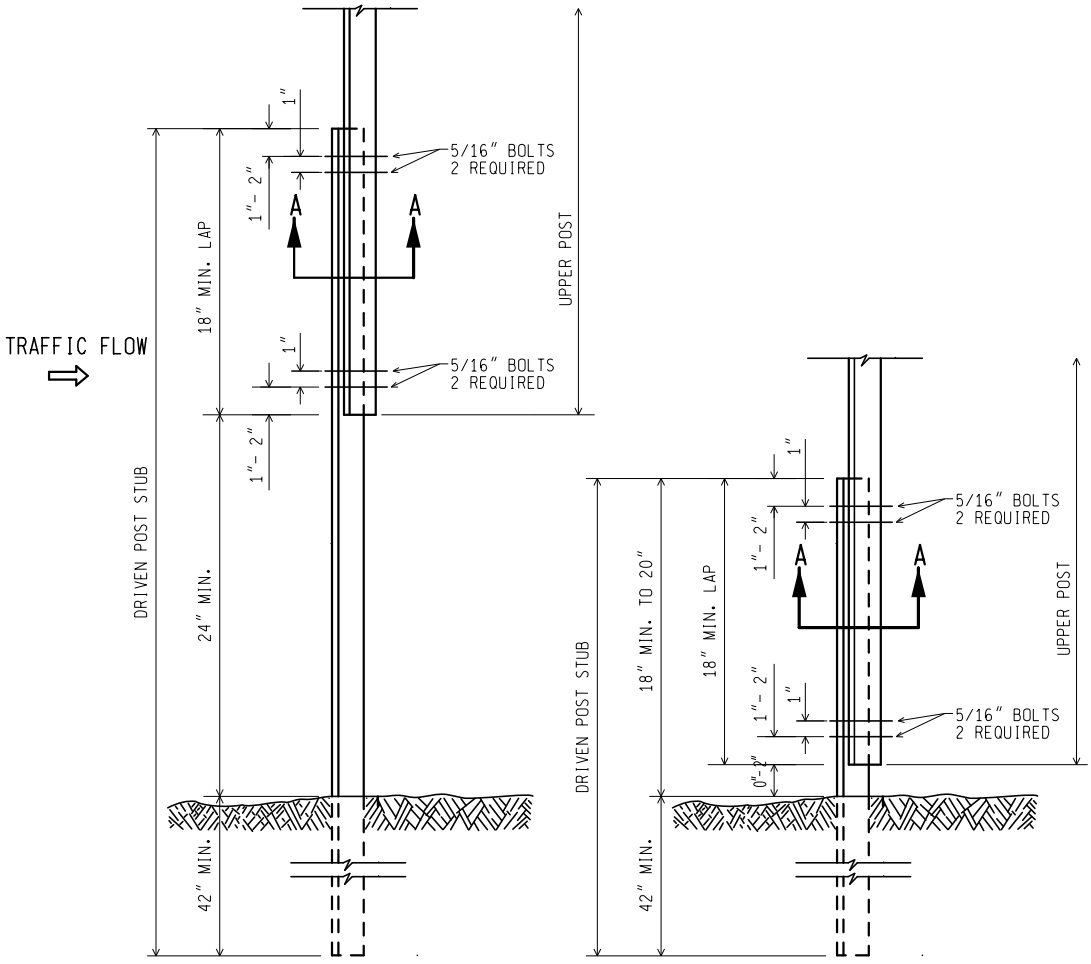

UPPER SPLICE

LOWER SPLICE

3 lb. U - CHANNEL STEEL POST
(WITH SPLICE)

MOUNT SIGN ON OPEN FACE OF
UPPER U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 5 OF 11

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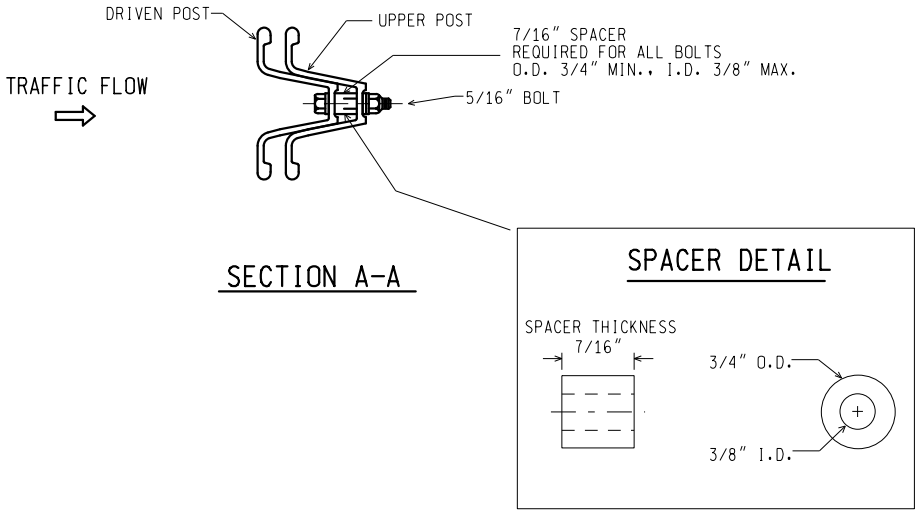


NOTES:

1. THE SPACER THICKNESS SHALL BE 1/16" LESS THAN THE GAP BETWEEN THE POST WHEN POSITIONED IN THE UNBOLTED CONFIGURATION.

2. THE EXTERIOR BOLT (CLOSEST TO LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN A PREPUNCHED HOLE 1" to 2" FROM THE END OF THE LAP.

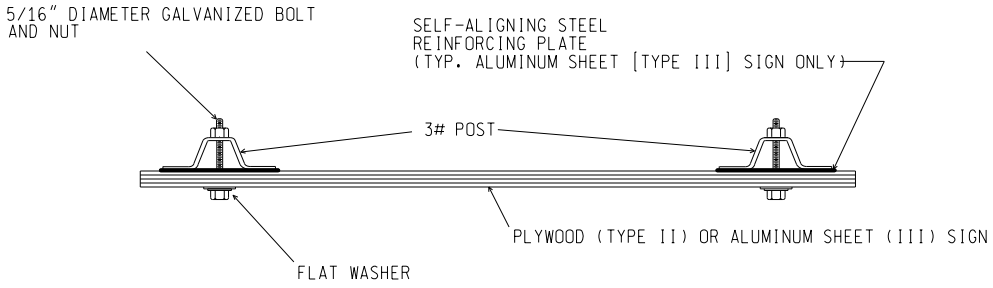
3. THE INTERIOR BOLT (FARTHEST FROM LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN THE NEXT PREPUNCHED HOLE.

4. THE DRIVEN POST SHALL ALWAYS BE MOUNTED IN FRONT OF THE UPPER POST WITH RESPECT TO THE ADJACENT ONCOMING TRAFFIC, REGARDLESS OF THE DIRECTION THE SIGN IS FACING.

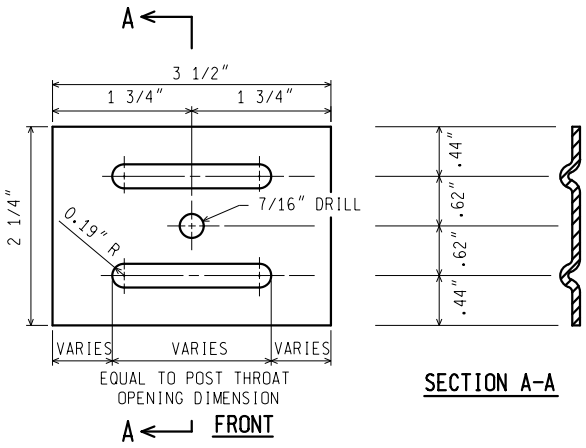
5. THE SPLICE LAP SHALL BE FASTENED BY FOUR-5/16" DIA. GALVANIZED A449 BOLTS (SAE J429 GRADE 5) OR GALVANIZED A325 BOLTS.

3 lb. U - CHANNEL STEEL POST
(WITH SPLICE)

NOT TO SCALE



SIGN TO 3 lb. POST CONNECTION



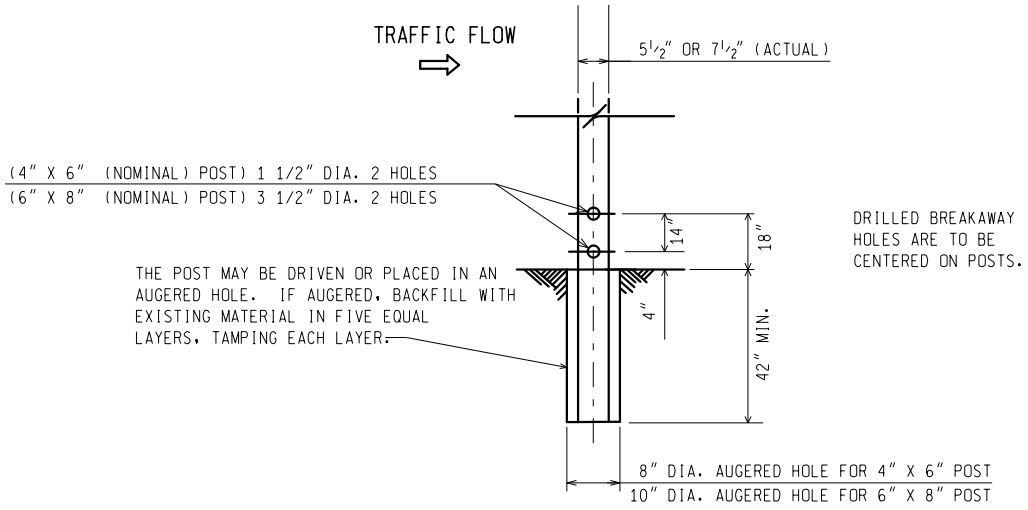
NOTES: (FOR STEEL SIGN REINF' PLATE)

1. MATERIAL: 12 GAUGE CARBON STEEL.
2. TOLERANCE ON ALL DIMENSIONS ± 0.0625"
3. FINISH-AFTER STAMPING AND PUNCHING, GALVANIZE ACCORDING TO CURRENT SPECIFICATIONS FOR ZINC (HOT GALVANIZE) COATINGS ON PRODUCTS FABRICATED FROM PLATES OR STRIPS

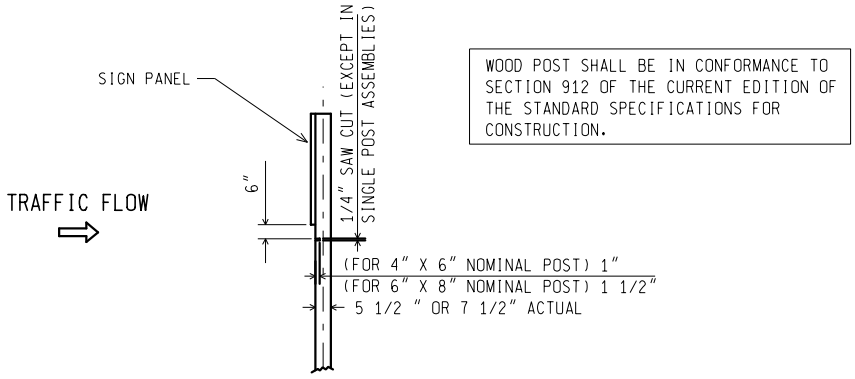
STEEL SIGN REINFORCING PLATE
REQUIRED FOR TYPE III SIGNS ONLY

3 lb. U - CHANNEL STEEL POST SIGN CONNECTION

NOT TO SCALE



WOOD POST BREAKAWAY HOLES/ DIRECT EMBEDMENT DETAILS



SAW CUT DETAIL (MULTIPLE POST INSTALLATIONS)

WOOD POST DETAILS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 8 OF 11

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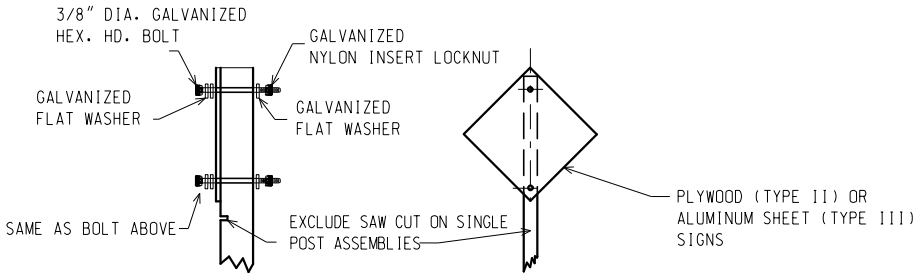
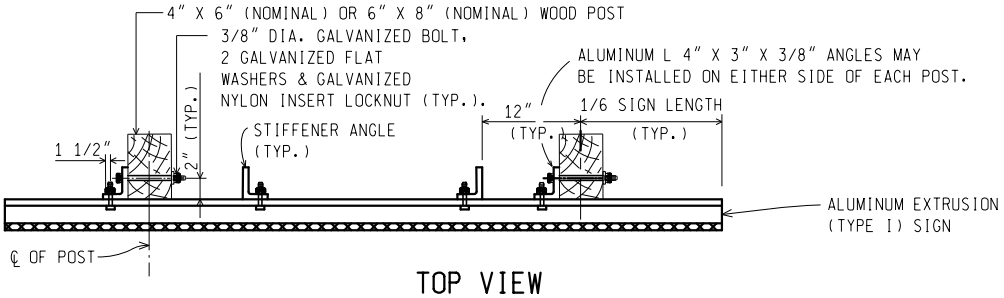
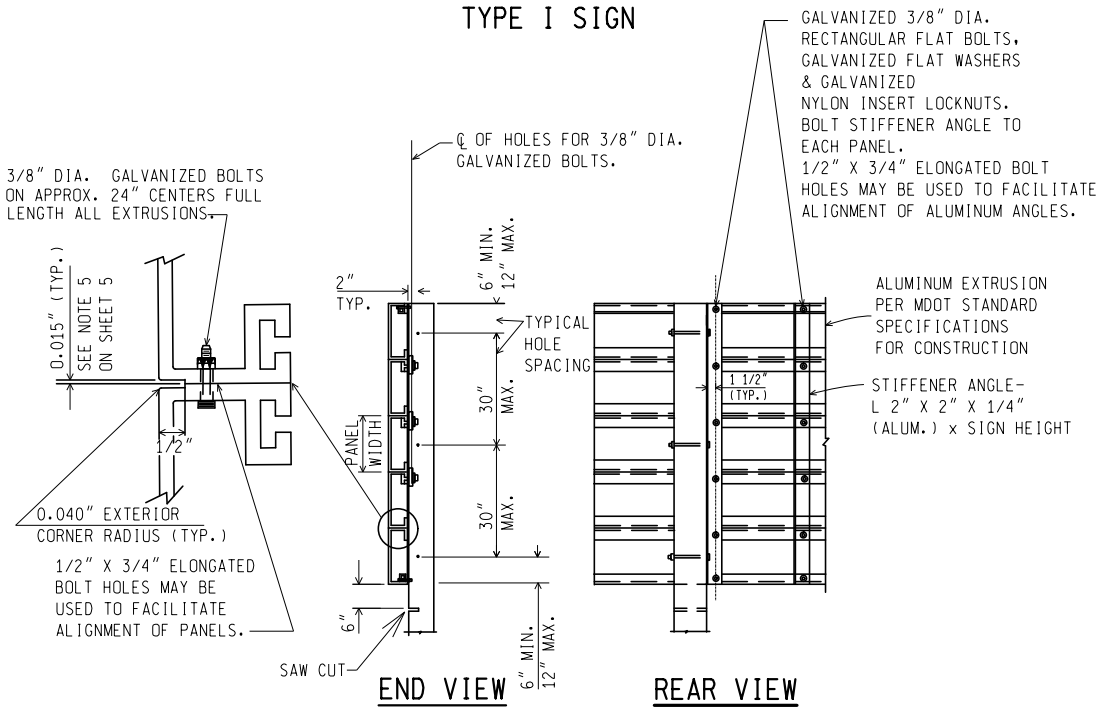


TYPE II AND TYPE III SIGNS



TOP VIEW
TYPE I SIGN



END VIEW
REAR VIEW

TYPE I SIGN - ERECTION DETAILS

WOOD POST CONNECTIONS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 9 OF 11

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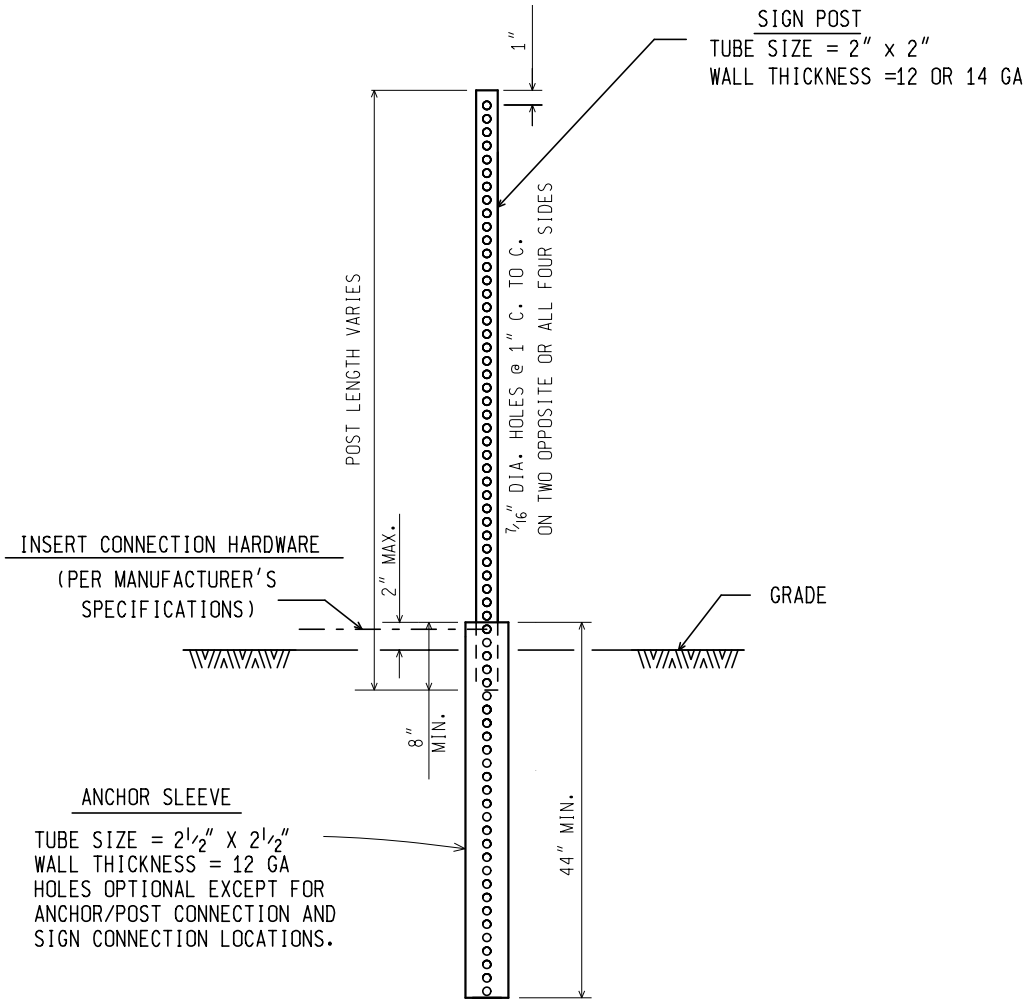


SQUARE TUBULAR STEEL POST

NOT TO SCALE

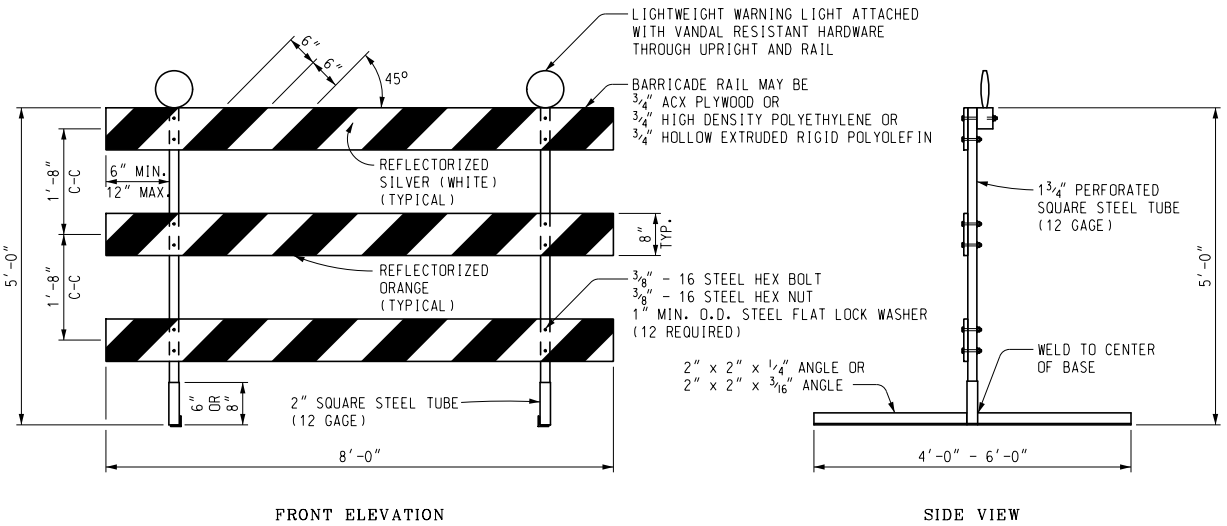
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 10 OF 11

NOTE: THE ORIGINAL SIGNED COPY IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

GENERAL NOTES:

1. A MAXIMUM OF TWO POSTS WITHIN A 7 FOOT PATH IS PERMITTED.
2. ALL SIGN POSTS SHALL COMPLY WITH NCHRP 350.
3. ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 42".
4. BRACING OF POST IS NOT PERMITTED.
5. SIGN SHALL BE LEVEL, AND UPRIGHT FOR THE DURATION OF INSTALLATION.
6. ERECT POSTS SO THE SIGN FACE AND SUPPORTS DO NOT VARY FROM PLUMB BY MORE THAN 3/16" IN 3'. PROVIDE A CENTER-TO-CENTER DISTANCE BETWEEN POSTS WITHIN 2 PERCENT OF PLAN DISTANCE.
7. NO MORE THAN ONE SPLICE PER POST, AS SHOWN, WILL BE PERMITTED.
8. POST TYPES SHALL NOT BE MIXED WITHIN A SIGN SUPPORT INSTALLATION.
9. NO VERTICAL JOINTS ARE PERMITTED IN SIGN. NO HORIZONTIAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE PERMITTED IN SIGN
10. REMOVE SIGN POSTS AND/OR POST STUBS IN THEIR ENTIRETY WHEN NO LONGER REQUIRED.
11. ALL LABOR, MATERIALS, AND EQUIPMENT, INCLUDING TEMPORARY SUPPORTS REQUIRED TO INSTALL, MAINTAIN, RELOCATE, AND/OR REMOVE THE TEMPORARY SIGN, INCLUDING SUPPORTS, ARE CONSIDERED TO BE INCLUDED IN THE COST OF THE TEMPORARY SIGN.
12. SAW CUTS IN WOOD POSTS ARE TO BE PARALLEL TO THE BOTTOM OF THE SIGN.
13. POSTS SHALL NOT EXTEND MORE THAN 4" ABOVE TOP OF SIGN.
14. TEMPORARY WOOD SUPPORTS DO NOT REQUIRE PRESERVATIVE TREATMENT.

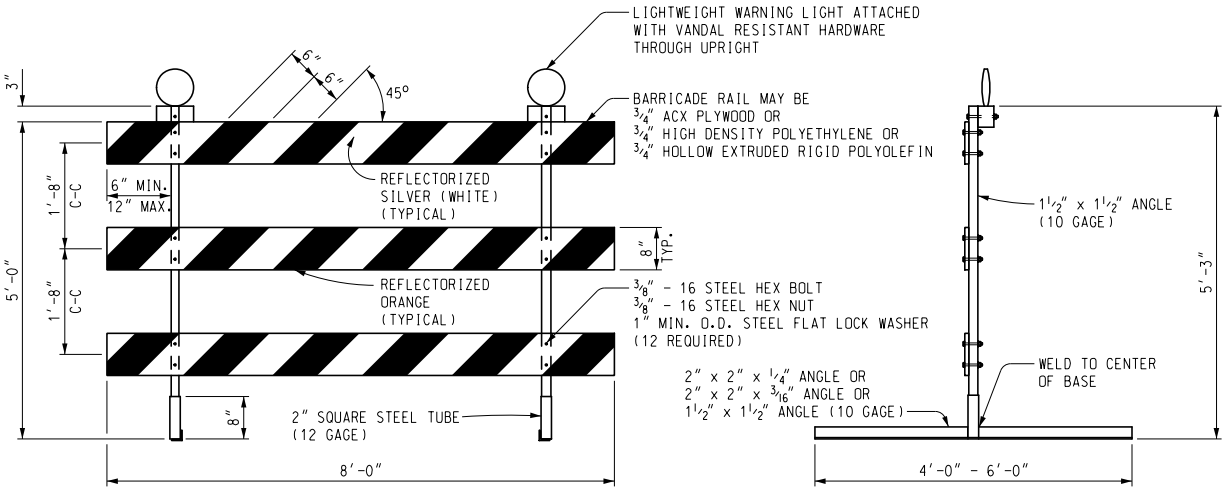
NOT TO SCALE



FRONT ELEVATION

SIDE VIEW

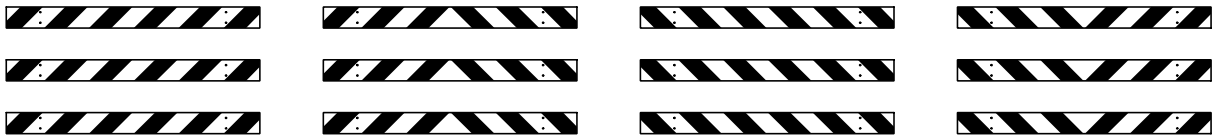
PERFORATED SQUARE STEEL TUBE OPTION



FRONT ELEVATION

SIDE VIEW

ANGLE IRON OPTION



LEFT DIRECTIONAL

BI-DIRECTIONAL

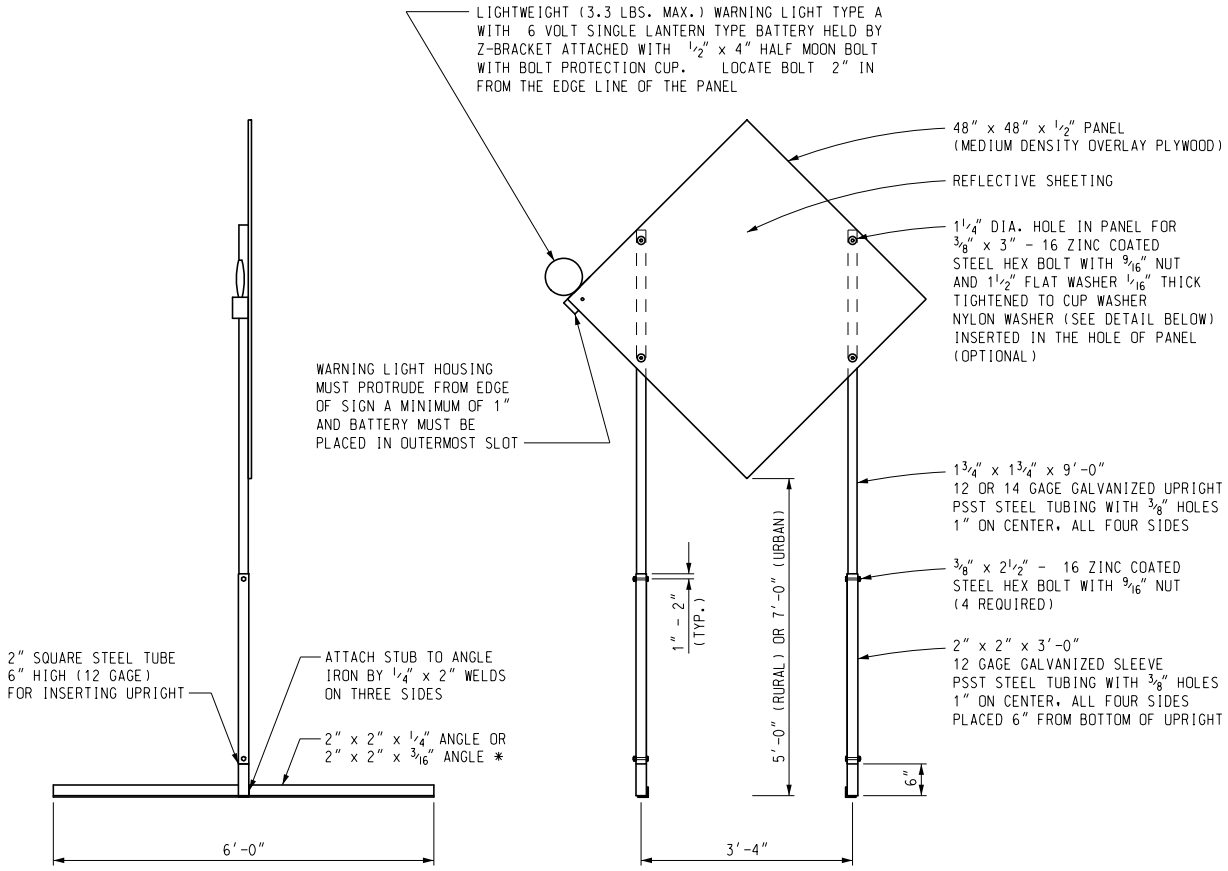
RIGHT DIRECTIONAL

CLOSURES

BARRICADE RAIL SHEETING OPTIONS
TYPE III BARRICADES

Other Type III Barricades meeting current NCHRP crash worthy criteria can be found on the FHWA Safety website at http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm

MDOT Michigan Department of Transportation PREPARED BY OPERATIONS FIELD SERVICES DRAWN BY: ECH CHECKED BY: MWB	DEPARTMENT DIRECTOR Paul C. Ajegba APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES APPROVED BY: (SPECIAL DETAIL) DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF FIELD SERVICES SPECIAL DETAIL FOR Temporary Traffic Control Devices	
		F.H.W.A. APPROVAL	6/16/22 PLAN DATE
		WZD-125-E	SHEET 1 OF 3



SIDE VIEW

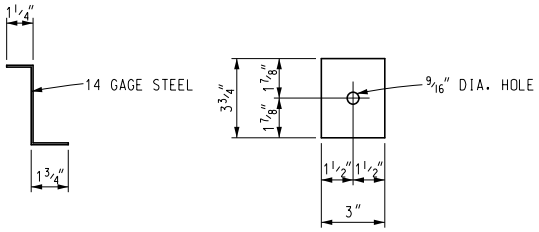
FRONT ELEVATION

TEMPORARY SIGN SUPPORT

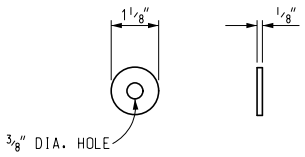
(WARNING LIGHT PLACED ON SIDE CLOSEST TO TRAFFIC)

* SIGN STAND IS BALLASTED WITH FOUR OR MORE 35 LB SANDBAGS. A MINIMUM OF ONE ON EACH END.

UPRIGHTS SHALL NOT EXTEND ABOVE THE SIGN PANEL.



Z-BRACKET DETAIL



OPTIONAL NYLON WASHER

Other temporary sign supports meeting current NCHRP crash worthy criteria can be found on the FHWA Safety website at http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF FIELD SERVICES SPECIAL DETAIL	SPECIAL DETAIL F.H.W.A. APPROVAL	6/16/22 PLAN DATE	WZD-125-E	SHEET 2 OF 3

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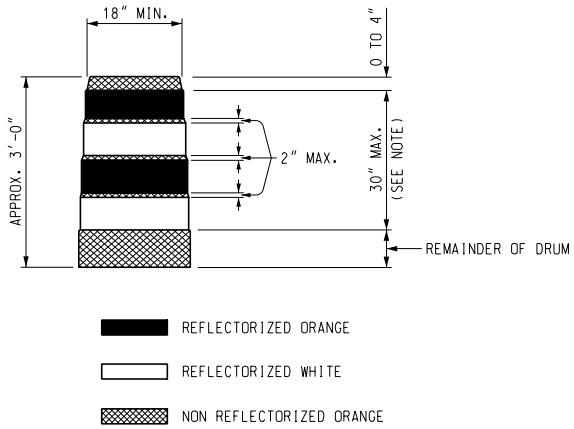


NOTE:
DRUMS SHALL HAVE AT LEAST 4 HORIZONTAL REFLECTORIZED STRIPES (2 ORANGE AND 2 WHITE) OF 6" UNIFORM WIDTH, ALTERNATING IN COLOR WITH THE TOPMOST REFLECTORIZED STRIPE BEING ORANGE. NON REFLECTORIZED SPACES BETWEEN THE HORIZONTAL REFLECTORIZED ORANGE AND WHITE STRIPES SHALL BE ORANGE IN COLOR AND EQUAL IN WIDTH.

PLASTIC DRUM

NOTES:

2" PERFORATED SQUARE STEEL TUBES MAY BE USED TO FABRICATE THE HORIZONTAL BASE OF THE TYPE III BARICADE.

WARNING LIGHTS SHALL BE PLACED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION AND ALL OTHER PROVISIONS IN THE CONTRACT ON TYPE III BARRICADES.

SEE ROAD STANDARD PLANS R-113-SERIES FOR TEMPORARY CROSSOVERS FOR DIVIDED ROADWAY, AND R-126-SERIES FOR TYPICAL LOCATION AND SPACING OF PLASTIC DRUMS FOR PLACEMENT OF TEMORARY CONCRETE BARRIER.

SIGNS, BARRICADES, AND PLASTIC DRUMS SHALL BE FACED WITH PRESSURE-SENSITIVE REFLECTIVE SHEETING ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

SANDBAGS SHALL BE USED WHEN SUPPLEMENTAL WEIGHTS ARE REQUIRED TO ACHIEVE STABILITY OF THE BARRICADE. THE SANDBAGS SHALL BE PLACED SO THEY WILL NOT COVER OR OBSTRUCT ANY REFLECTIVE PORTION OF THE TRAFFIC CONTROL DEVICE.

NOT TO SCALE

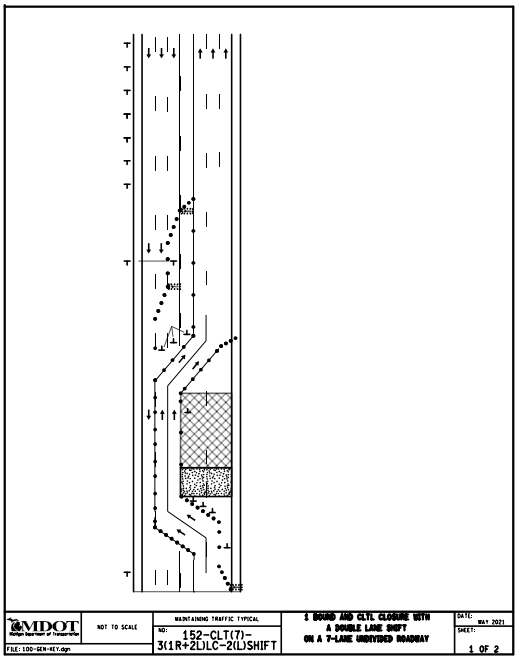
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF FIELD SERVICES SPECIAL DETAIL	(SPECIAL DETAIL) F.H.W.A. APPROVAL	6/16/22 PLAN DATE	WZD-125-E	SHEET 3 OF 3

NOTE: THE ORIGINAL SIGNED COPY IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

TYPICAL NUMBER KEY

CODES

AB = ARROW BOARD AW = ADVANCE WARNING C = CLOSURE CLT = CENTER LEFT TURN LANE CROSS = CROSSOVER CruSha = CRUSH AND SHAPE EM = EARLY MERGE EnR = ENTRANCE RAMP ExR = EXIT RAMP FW = FREEWAY GEN = GENERAL INFORMATION GORE = FREEWAY GORE AREA IN = INSIDE INT = INTERSECTION L = LANE (L) = LEFT LC = LANE CLOSURE LD = LONG DURATION	LO = LANE OPEN O = OUTSIDE (LANE CLOSURE) OUT = OUTSIDE OF SHOULDER MID = MIDDLE OF INTERSECTION OR ROAD NFW = NON-FREEWAY PARK = PARKING LANE PCMS = PORTABLE CHANGEABLE MESSAGE SIGN (R) = RIGHT ROLL = ROLLING ROADBLOCK RUM = RUMBLE STRIP SD = SHORT DURATION SHL = SHOULDER CLOSURE SIGN = SIGN SP = SPECIAL SPEED = SPEED STA = STOPPED TRAFFIC ADVISORY TR = TRAFFIC REGULATOR TS = TEMPORARY SIGNAL ZIP = ZIPPER MERGE



100 - GENERAL NOTES 110 - TRAFFIC REGULATORS 120 - NON-FREEWAY 130 - CENTER LEFT TURN (CLT) LANES 140 - PARKING LANES 150 - CLT 7 LANE SECTIONS 160 - SIGNAL WORK 200 - FREEWAY CLOSURES 210 - FREEWAY LANE SHIFTS 220 - FREEWAY ENTRANCE RAMPS 230 - FREEWAY EXIT RAMPS 300 - ADVANCE WARNINGS 310 - CROSSOVER CLOSURE 320 - CRUSH AND SHAPE 340 - MERGE SYSTEMS 350 - GORE LOCATIONS 360 - ROLLING ROADBLOCK 4000 - MAINTENANCE 5000 - SURVEY

EXAMPLE TYPICAL

CODE: 152-CTL(7)-3(1R+2L)LC-2(L)SHIFT

152 - TYPICAL NUMBER
CTL(7) = CENTER LEFT TURN LANE, 7 LANES TOTAL.
3(1R+2L)LC = 3 LANES CLOSED, (1 RIGHT LANE AND 2 LEFT LANES).
2(L)SHIFT = 2 LANES SHIFTED TO THE LEFT.

NOT TO SCALE

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL	TYPICAL NUMBERING KEY	DATE: DECEMBER 2021
		NO: 100-GEN-KEY		SHEET: 1 OF 1
FILE: 100-GEN-KEY.dgn				

DISTANCE BETWEEN TRAFFIC SIGNS, "D"

"D" DISTANCES	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)										
	25	30	35	40	45	50	55	60	65	70	75
D (FEET)	250	300	350	400	450	500	550	600	650	700	750

GUIDELINES FOR LENGTH OF LONGITUDINAL BUFFER SPACE, "B"

"B" LENGTHS	SPEED,* MPH (PRIOR TO WORK AREA)											
	20	25	30	35	40	45	50	55	60	65	70	75
B (FEET)	33	50	83	132	181	230	279	329	411	476	542	625

* POSTED SPEED, OFF-PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED.

MINIMUM MERGING TAPER LENGTH, "L" (FEET)

OFFSET (FEET)	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)										
	25	30	35	40	45	50	55	60	65	70	75
1	11	15	21	27	45	50	55	60	65	70	75
2	21	30	41	54	90	100	110	120	130	140	150
3	32	45	62	80	135	150	165	180	195	210	225
4	42	60	82	107	180	200	220	240	260	280	300
5	53	75	103	134	225	250	275	300	325	350	375
6	63	90	123	160	270	300	330	360	390	420	450
7	73	105	143	187	315	350	385	420	455	490	525
8	84	120	164	214	360	400	440	480	520	560	600
9	94	135	184	240	405	450	495	540	585	630	675
10	105	150	205	267	450	500	550	600	650	700	750
11	115	165	225	294	495	550	605	660	715	770	825
12	125	180	245	320	540	600	660	720	780	840	900
13	136	195	266	347	585	650	715	780	845	910	975
14	146	210	286	374	630	700	770	840	910	980	1050
15	157	225	307	400	675	750	825	900	975	1050	1125

NOT TO SCALE

THE FORMULAS FOR THE MINIMUM LENGTH OF A MERGING TAPER IN DERIVING THE "L" VALUES SHOWN IN THE ABOVE TABLES ARE AS FOLLOWS:

$"L" = \frac{W \times S^2}{60}$ WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 40 MPH OR LESS

"L" = W X S WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 45 MPH OR GREATER

L = MINIMUM LENGTH OF MERGING TAPER
S = POSTED SPEED LIMIT IN MPH PRIOR TO WORK AREA
W = WIDTH OF OFFSET

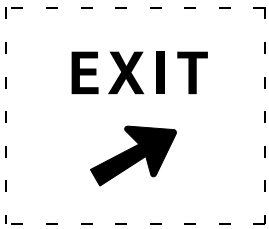
TYPES OF TAPERS	TAPER LENGTH
UPSTREAM TAPERS	
MERGING TAPER	L - MINIMUM
SHIFTING TAPER	1/2 L - MINIMUM
SHOULDER TAPER	1/3 L - MINIMUM
2 TO 1 LANE ROAD TAPER	100' - MAXIMUM
DOWNSTREAM TAPERS	
(USE IS RECOMMENDED)	100' (PER LANE)

MAXIMUM SPACING FOR CHANNELIZING DEVICES

WORK ZONE SPEED LIMIT	DRUM AND 42" DEVICE SPACING (FT)		NIGHTTIME 42" DEVICE SPACING (FT)	
	TAPER	TANGENT	TAPER	TANGENT
< 45 MPH	1 x SPEED LIMIT	2 x SPEED LIMIT	25 FEET	50 FEET
≥ 45 MPH	50 FEET	100 FEET	25 FEET	50 FEET

SIGN OUTLINE KEY

DASHED OUTLINES INDICATE A SIGN THAT EXISTS ON SITE, AND NEEDS TO BE COVERED.



SOLID OUTLINES INDICATE A SIGN THAT IS TO BE PLACED ON THE PROJECT

NOT TO SCALE

GUIDELINES FOR ROLL-AHEAD DISTANCES FOR TMA VEHICLES - TEST LEVEL 2

WEIGHT OF TMA VEHICLE	PREVAILING SPEED (POSTED SPEED PRIOR TO WORK ZONE)	ROLL-AHEAD DISTANCE* (DISTANCE FROM FRONT OF TMA VEHICLE TO WORK AREA)
5.5 TONS (STATIONARY)	40 MPH OR LESS	25 FT

* ROLL-AHEAD DISTANCES ARE CALCULATED USING A 4,410 POUND IMPACT VEHICLE WEIGHT.

GUIDELINES FOR ROLL-AHEAD DISTANCES FOR TMA VEHICLES - TEST LEVEL 3

WEIGHT OF TMA VEHICLE	PREVAILING SPEED (POSTED SPEED PRIOR TO WORK ZONE)	ROLL-AHEAD DISTANCE* (DISTANCE FROM FRONT OF TMA VEHICLE TO WORK AREA)
5 TONS (MOBILE)	45 MPH	100 FT
	50-55 MPH	150 FT
	60-75 MPH	175 FT
12 TONS (STATIONARY)	45 MPH	25 FT
	50-55 MPH	25 FT
	60-75 MPH	50 FT

* ROLL-AHEAD DISTANCES ARE CALCULATED USING A 10,000 POUND IMPACT VEHICLE WEIGHT.

THE FOLLOWING NOTES APPLY IF CALLED FOR ON THE TRAFFIC TYPICAL

GENERAL NOTES

G1: SEE GEN-SPACING-CHARTS FOR COMMON VALUES INCLUDING:
D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES
L = MINIMUM LENGTH OF TAPER
B = LENGTH OF LONGITUDINAL BUFFER
ROLL AHEAD DISTANCE

G2: DISTANCE BETWEEN SIGNS, "D", THE VALUES FOR WHICH ARE SHOWN IN TYPICAL GEN-KEY ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

G3: ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING MUST MEET NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM REPORT 350 (NCHRP 350) TEST LEVEL 3, OR MANUAL FOR ASSESSING SAFETY HARDWARE (MASH) TL-3 AS WELL AS THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

G4: DO NOT STORE EQUIPMENT, MATERIALS OR PERFORM WORK IN ESTABLISHED BUFFER AREAS.

G5: ALL EXISTING PAVEMENT MARKINGS WHICH ARE IN CONFLICT WITH EITHER PROPOSED CHANGES IN TRAFFIC PATTERNS OR PROPOSED TEMPORARY TRAFFIC MARKINGS SHALL BE REMOVED BEFORE ANY CHANGE IS MADE IN THE TRAFFIC PATTERN. EXCEPTION WILL BE MADE FOR TRAFFIC PATTERNS FOR WORK LESS THAN THREE DAYS THAT ARE ADEQUATELY DELINEATED BY OTHER TRAFFIC CONTROL DEVICES.

SIGN NOTES

S1: ALL NON-APPLICABLE SIGNING WITHIN THE CIA MUST BE MODIFIED TO FIT CONDITIONS, COVERED, OR REMOVED. FOR GUIDANCE SEE THE WORK ZONE SAFETY AND MOBILITY MANUAL, SECTIONS 6.01.09 AND 6.01.10.

S2: R5-18b SIGNS ARE ONLY REQUIRED ON FREEWAY PROJECTS WITH A DURATION OF 15 DAYS OR LONGER OR NON-FREEWAY PROJECTS WITH A DURATION OF 90 DAYS OR LONGER. TO APPLY THIS TYPICAL WITHOUT R5-18b SIGNS, REMOVE THE SIGNS AND CONSOLIDATE THE SEQUENCE AS APPROPRIATE.

S3: R5-18c IS ONLY REQUIRED IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. OMIT THIS SIGN IN SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE.

S4: ADDITIONAL SIGNING AND/OR ELONGATED SIGNING SEQUENCES SHOULD BE USED WHEN TRAFFIC VOLUMES ARE SIGNIFICANT ENOUGH TO CREATE BACKUPS BEYOND THE W20-5 SIGNS.

S5: PLACE ADDITIONAL SPEED LIMIT SIGNS REFLECTING THE WORK ZONE SPEED AFTER EACH MAJOR CROSSROAD THAT INTERSECTS THE WORK ZONE, OR AFTER EACH ENTRANCE RAMP THAT COMES ONTO THE FREEWAY WHERE THE REDUCED SPEED IS IN EFFECT. PLACE ADDITIONAL SPEED LIMIT SIGNS AT INTERVALS ALONG THE ROADWAY SUCH THAT NO SPEED LIMIT SIGNS ARE MORE THAN 2 MILES APART. WHEN REDUCED SPEED LIMITS ARE UTILIZED IN THE WORK AREA, PLACE ADDITIONAL SPEED LIMIT SIGNS RETURNING TRAFFIC TO ITS NORMAL SPEED BEYOND THE LIMITS OF THE WORK AREA AS INDICATED. IF PERMANENT SIGNS DISPLAYING THE CORRECT SPEED LIMIT ARE POSTED, OMIT ALL W3-5b AND R2-1 SIGNS AND REDUCE SPACING ACCORDINGLY.

S6: FABRICATE SPECIAL SIGNS IN ACCORDANCE WITH CURRENT SIGNING DESIGN STANDARDS.

S7: PLACE ADDITIONAL R8-3 SIGNS AT A MAXIMUM 500' SPACING THROUGHOUT THE WORK ZONE.

S8: WHEN SPEED LIMIT SIGNS CANNOT BE PLACED SIDE BY SIDE AS SHOWN, PLACE THEM "D" DISTANCE APART.

S9: STOP SIGNS NOT REQUIRED IF SIGNALS ARE ON 4-WAY FLASHING RED. STOP AHEAD SIGNS ARE NOT REQUIRED IF THERE IS ADEQUATE VISIBILITY OF THE STOP SIGN OR IF SIGNALS ARE BEING USED TO CONTROL TRAFFIC.

S10: PLACE REDUCED SPEED ZONE AHEAD SIGN (W3-5b) HERE WHEN USING A SPEED REDUCTION IN THIS DIRECTION.

S11: THE NUMBER OF W1-6 SHIFT SIGNS TO PLACE FOR A SHIFT IS AS FOLLOWS:
SHIFTS 4FT OR LESS, PLACE ONE W1-6(R)(L)
SHIFTS 5FT TO 12FT, PLACE TWO W1-6(R)(L)
SHIFTS MORE THAN 12FT, PLACE THREE OR MORE W1-6(R)(L) SIGNS DEPENDING UPON LENGTH OF SHIFT AND AS PER THE ENGINEER.

S12: PLACE R2-1 SIGNS AS DETAILED IN NOTE S5 WHEN THERE IS A SPEED REDUCTION IN THIS DIRECTION

TRAFFIC REGULATOR NOTES

TR1: TRAFFIC REGULATORS MUST FOLLOW ALL THE REQUIREMENTS IN THE STANDARD SPECIFICATIONS, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS, THE CURRENT VERSIONS OF THE TRAFFIC REGULATOR'S INSTRUCTION MANUAL AND THE VIDEO "HOW TO SAFELY REGULATE TRAFFIC IN MICHIGAN". THE MAXIMUM DISTANCE BETWEEN THE TRAFFIC REGULATORS IS DETERMINED BY THE ROADWAY ADT, GEOMETRICS, AND AS DIRECTED BY THE ENGINEER.

TR2: PROVIDE APPROPRIATE BALLOON LIGHTING TO SUFFICIENTLY ILLUMINATE TRAFFIC REGULATOR'S STATIONS WHEN TRAFFIC REGULATING IS ALLOWED DURING THE HOURS OF DARKNESS.

TR3: PROVIDE EITHER A STOP/SLOW AFAD OR A RED/YELLOW LENS AFAD, MEETING THE REQUIREMENTS OF THE MMUTCD

TEMPORARY TRAFFIC CONTROL DEVICE NOTES

TCD1: THE MAXIMUM DISTANCE IN FEET BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD NOT EXCEED 1.0 TIMES THE WORK ZONE SPEED LIMIT IN MPH FOR ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT LESS THAN 45 MPH AND SHOULD NOT EXCEED 50 FEET ON ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT OF 45 MPH OR GREATER. THE SPACING FOR 42 INCH CHANNELIZING DEVICE TAPERS ARE NOT TO EXCEED 25 FEET AT NIGHT.

TCD2: THE MAXIMUM DISTANCE IN FEET BETWEEN CHANNELIZING DEVICES IN A TANGENT SHOULD NOT EXCEED TWICE THE WORK ZONE SPEED LIMIT IN MPH FOR ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT LESS THAN 45 MPH AND SHOULD NOT EXCEED 100 FEET ON ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT OF 45 MPH OR GREATER. THE SPACING FOR 42 INCH CHANNELIZING DEVICE TANGENTS ARE NOT TO EXCEED 50 FEET AT NIGHT.

TCD3: TYPE III BARRICADES MUST BE LIGHTED FOR OVERNIGHT CLOSURES.

TCD4: WHEN THE HAUL ROAD IS NOT IN USE, PLACE LIGHTED TYPE III BARRICADES WITH "ROAD CLOSED" EXTENDING COMPLETELY ACROSS THE HAUL ROAD.

TCD5: USE OBJECT MARKER SIGNS IN LIEU OF THE TYPE B HIGH INTENSITY LIGHT SHOWN IN THE STANDARD PLAN FOR TEMPORARY CONCRETE BARRIER (R-53, AND R-126) WHEN USED WITH A TEMPORARY SIGNAL SYSTEM. THE OBJECT MARKERS MUST BE A MINIMUM OF 12 INCHES IN WIDTH AND 36 INCHES IN HEIGHT AND HAVE ORANGE AND WHITE RETROREFLECTIVE SHEETING. THE RETROREFLECTIVE SHEETING MUST HAVE ALTERNATING DIAGONAL ORANGE AND WHITE STRIPES SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION VEHICULAR TRAFFIC IS TO PASS.

TCD6: PLACE LIGHTED ARROW PANELS AS CLOSE TO THE BEGINNING OF TAPERS AS PRACTICAL, BUT NOT IN A MANNER THAT WILL OBSCURE OR CONFUSE APPROACHING MOTORISTS WHEN PHYSICAL LIMITATIONS RESTRICT PLACEMENT. IN CURBED SECTIONS, IF ARROW BOARD CANNOT BE PLACED BEHIND CURB, PLACE ARROW BOARD IN THE CLOSED LANE AS CLOSE TO THE BEGINNING OF TAPER AS POSSIBLE.

TCD7: ADDITIONAL TYPE III BARRICADES MAY BE REQUIRED TO COMPLETELY CLOSE OFF ROAD FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT.

TCD8: WHERE THE SHIFTED SECTION IS SHORTER THAN 600 FEET, A DOUBLE REVERSE CURVE SIGN (W24-1) CAN BE USED INSTEAD OF THE FIRST REVERSE CURVE SIGN, AND THE SECOND REVERSE CURVE SIGN CAN BE OMITTED.

TCD9: RUMBLE STRIPS ARE TO BE PLACED AS SPECIFIED IN THE CONTRACT. IF NOT SPECIFIED IN THE CONTRACT, PLACE RUMBLE STRIPS AS SHOWN, AND IN ACCORDANCE WITH THE RUMBLE STRIP MANUFACTURER'S RECOMMENDATIONS. AN ARRAY OF RUMBLE STRIPS CONTAINS THREE RUMBLE STRIPS. PLACE THE RUMBLE STRIPS IN THE ARRAY AT A CONSISTENT DISTANCE, BETWEEN 10' AND 20' APART.

TCD10: SEE THE WORK ZONE SAFETY AND MOBILITY MANUAL, PORTABLE CHANGEABLE MESSAGE SIGN GUIDELINES FOR RECCOMENDED AND CORRECT PCMS MESSAGING. STAGGER PCMS THAT ARE ON OPPOSING SIDES OF THE ROAD 1000 FEET FROM EACH OTHER.

RAMP NOTES

RMP1: WHEN CONDITIONS ALLOW, E5-1 SIGNS MUST BE REMOVED OR COVERED AND CHANELIZING DEVICES MUST BE POSITIONED TO ENABLE RAMP TRAFFIC TO DIVERGE IN A FREE MANNER

RMP2: STOP AND YIELD CONDITIONS SHOULD BE AVOIDED WHENEVER PRACTICAL. WHEN CONDITIONS WARRANT, R1-1 SIGNS MAY BE USED IN PLACE OF R1-2 SIGNS. WHEN R-1 SIGNS ARE USED, W3-1 SIGNS MUST BE USED IN PLACE OF W3-2 SIGNS. CONSIDERATION SHOULD BE GIVEN TO CLOSING THE RAMP TO COMPLETE WORK TO ALLOW AN ADEQUATE MERGE DISTANCE. WORK SHOULD BE EXPEDITED TO AVOID THE STOP AND/OR YIELD CONDITIONS.

THE FOLLOWING NOTES APPLY IF CALLED FOR ON THE TRAFFIC TYPICAL

SIGNAL NOTES

SIG1: EXISTING SIGNAL MUST BE EITHER 4-WAY FLASHING RED, BAGGED, OR TURNED OFF.

SIG2: SIGNAL IS IN OPERATION.

SIG3: DELINEATE THE WORK ZONE AREA WITH 28 INCH CONES FOR DAYTIME WORK, OR 42 INCH CHANNELIZING DEVICES FOR NIGHTTIME WORK.

SIG4: THE CONTRACTOR MUST HAVE A DESIGNATED SPOTTER IF THE AERIAL BUCKET TRUCK IS LOCATED OVER ACTIVE TRAVEL LANES.

SIG5: THE LOWEST POINT OF THE BUCKET MAY NOT TRAVEL BELOW 14 FOOT VERTICAL CLEARANCE. THE CONTRACTOR MUST UTILIZE AN ALTERNATE SET UP, OR PLACE THE INTERSECTION IN A 4 WAY STOP IF THE 14 FOOT VERTICAL CLEARANCE IS COMPROMIZED. USE TRAFFIC REGULATORS TO CONTROL TRAFFIC THROUGH THE INTERSECTION WHEN TRAFFIC IS PLACED IN A 4 WAY STOP.

SIG6: DELINEATE THE TRUCK WITH CHANNELIZING DEVICES. THE POSITION OF THE TRUCK MAY BE MOVED TO FACILITATE WORK.

MAINTENANCE AND SURVEYING NOTES

MS1: WHENEVER STOPPING SIGHT DISTANCE EXISTS TO THE REAR, THE SHADOW VEHICLES SHOULD MAINTAIN THE RECOMENDED DISTANCE FROM THE WORK AREA AND PROCEEED AT THE SAME SPEED. THE SHADOW VEHICLE SHOULD SLOW DOWN AND TRAVEL AT A FARTHER DISTANCE TO PROVIDE ADEQUATE SIGHT DISTANCE IN ADVANCE OF VERTICAL OR HORIZONTAL CURVES.

MS2: WORKERS OUTSIDE OF VEHICLES SHOULD WORK WITHIN 150' OF WORK VEHICLES WITH AN ACTIVATED BEACON, BETWEEN THE "BEGIN WORK CONVOY" SIGN AND THE "END WORK CONVOY" SIGN, OR BETWEEN THE "WORK ZONE BEGINS" AND "END ROAD WORK" SIGN.

MS3: WORK OR SHADOW VEHICLES WITH OR WITHOUT A TMA MAY BE USED TO SEPARATE THE WORK SPACE FROM TRAFFIC. IF USED, THE VEHICLES SHOULD BE PARKED ACCORDING TO THE ROLL AHEAD DISTANCE TABLES.

MS4: WORK AND SHADOW VEHICLES SHALL BE APPROPRIATELY EQUIPPED WITH AN ACTIVATED AMBER BEACON.

MS5: WHEN WORKERS ARE OUTSIDE THEIR VEHICLES IN AN EXISTING LANE WHILE A MOBILE OPERATION IS OCCURRING DURING THE NIGHTTIME HOURS, CHANNELIZING DEVICES TO DELINEATE OPEN OR CLOSED LANES AT 50 FT SPACING MUST BE USED. AN EXAMPLE OF AN OPERATION (BUT NOT LIMITED TO) IS THE LAYOUT OF CONCRETE PATCHES.

MS6: W21-6 AND W20-1 SIGNS MAY BE SUBSTITUTED AS DETERMINED BY THE TYPE OF WORK TAKING PLACE AS PER THE ENGINEER.

SIGN NUMBER KEY

E5-1f
48" x 48"
60" x 48"

E5-2
48" x 36"

E5-2a
48" x 36"

E5-3
48" x 36"

E13-1P
VAR x 24"

E13-1aP
36" x 24"

G20-1
60" x 24"

G20-2
48" x 24"

G20-4
36" x 18"


I-6a
18" x 18"
24" x 24"
30" x 30"

M1-1
18" x 18"
24" x 24"
36" x 36"
48" x 48"

M1-1
22.5" x 18"
30" x 24"
45" x 36"
60" x 48"

M1-2
18" x 18"
24" x 24"
36" x 36"
48" x 48"

M1-2
22.5" x 18"
30" x 24"
45" x 36"
60" x 48"

M1-3
18" x 18"
24" x 24"
36" x 36"
48" x 48"

M1-3
22.5" x 18"
30" x 24"
45" x 36"
60" x 48"

M1-4
18" x 18"
24" x 24"
36" x 36"
48" x 48"

M1-4
22.5" x 18"
30" x 24"
45" x 36"
60" x 48"

M1-5
18" x 18"
24" x 24"
30" x 30"
36" x 36"

M1-5a
18" x 18"
24" x 24"

M1-6
18" x 18"
24" x 24"
36" X 36"

M1-6
22.5" x 18"
30" x 24"
45" x 36"

M3-1
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M3-2
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M3-3
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M3-4
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-1
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-1a
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-2
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-3
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-4
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-5
12" X 6"
18" x 9"
24" X 12"
30" X 15"
36" X 18"

M4-6
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-7
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-7a
12" x 6"
18" x 9"
24" x 12"
30" x 15"
36" x 18"

M4-8
12" x 6"
18" x 9"
24" x 12"
30" x 15"

M4-8a
24" x 18"

M4-8b
24" x 12"

M4-9L
30" x 24"
48" x 36"
60" x 48"

M4-9R
30" x 24"
48" x 36"
60" x 48"

M4-9j
30" x 24"
48" x 36"
60" x 48"

M4-9kL
30" x 24"
48" x 36"
60" x 48"

M4-9kR
30" x 30"
48" x 42"
60" x 54"

M4-9mL
30" x 30"
48" x 42"
60" x 54"

M4-9mR
30" x 30"
48" x 42"
60" x 54"


M4-9dL
12" x 18"


M4-9dR
12" x 18"


M4-9e
12" x 18"

M4-9f
12" x 18"


M4-9gL
12" x 18"


M4-9gR
12" x 18"


M4-9h
12" x 24"

M4-9i
12" x 18"

M4-10L
48" x 18"

M4-10R
48" x 18"

M4-11a
12" X 6"
18" x 9"
24" X 12"
30" X 15"
36" X 18"


M5-1L
12" x 9"
21" x 15"
30" x 21"


M5-1R
12" x 9"
21" x 15"
30" x 21"


M5-2L
12" x 9"
21" x 15"
30" x 21"


M5-2R
12" x 9"
21" x 15"
30" x 21"


M5-3
12" x 9"
21" x 15"
30" x 21"


M6-1L
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-1R
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-2L
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-2R
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-3
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-4
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-5
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-6L
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-6R
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-7L
12" x 9"
18" x 12"
21" x 15"
30" x 21"


M6-7R
12" x 9"
18" x 12"
21" x 15"
30" x 21"

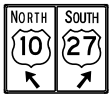
SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

MDOT Michigan Department of Transportation	MAINTAINING TRAFFIC TYPICAL	STANDARD HIGHWAY SIGNS	DATE: 10/17/24
NO SCALE	CODE: 103-GEN-SIGN		SHEET: 1 OF 5

SIGN NUMBER KEY

M8-1gL
36" x 66"

M8-1gR
36" x 66"

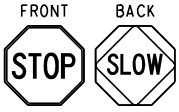


M8-2d
60" x 48"


OM-3L
12" x 36"
24" x 48"
36" x 72"


OM-3R
12" x 36"
24" x 48"
36" x 72"

R1-1
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"



R1-1a
18" x 18"
24" x 24"

R1-2
18"
24"
30"
36"
48"
60"

R1-2aP
24" x 18"
36" x 30"
48" x 36"

R2-1
18" x 24"
24" x 30"
30" x 36"
36" x 48"
48" x 60"

R2-1a
48" x 60"


R3-1
24" x 24"
30" x 30"
36" x 36"
48" x 48"


R3-2
24" x 24"
30" x 30"
36" x 36"
48" x 48"

R3-3
24" x 24"
36" x 36"
48" x 48"


R3-4
24" x 24"
30" x 30"
36" x 36"
48" x 48"

R3-5L
30" x 36"
36" x 48"

R3-5R
30" x 36"
36" x 48"

R3-5a
30" x 36"
36" x 48"

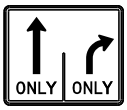

R3-6L
30" x 36"
42" x 48"


R3-6R
30" x 36"
42" x 48"

R3-7L
30" x 30"
36" x 36"

R3-7R
30" x 30"
36" x 36"

R3-8c
36" x 30"



R3-8d
36" x 30"

R4-1
12" x 18"
18" x 24"
24" x 30"
36" x 48"
48" x 60"

R4-2
12" x 18"
18" x 24"
24" x 30"
36" x 48"
48" x 60"


R4-7
12" x 18"
18" x 24"
24" x 30"
36" x 48"
48" x 60"


R4-8
18" x 24"
24" x 30"
36" x 48"
48" x 60"

R4-9
18" x 24"
24" x 30"
36" x 48"
48" x 60"

R5-1
30" x 30"
36" x 36"
48" x 48"

R5-1a
30" x 18"
36" x 24"
42" x 30"

R5-18b
48" x 60"

R5-18c
48" x 48"

R5-18d
78" x 12"

R5-18e
72" x 12"

R5-18f
48" x 60"

R5-18g
30" x 42"

R5-18h
48" x 60"

R6-1L
36" x 12"
54" x 18"

R6-1R
36" x 12"
54" x 18"

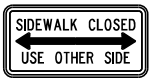
R6-2L
12" x 16"
18" x 24"
24" x 30"
36" x 48"
48" x 60"

R6-2R
12" x 16"
18" x 24"
24" x 30"
36" x 48"
48" x 60"


R8-3
12" x 12"
18" x 18"
24" x 24"
36" x 36"
48" x 48"

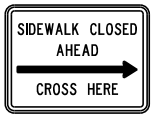
R9-8
36" x 18"

R9-9
24" x 12"
30" x 18"



R9-10
24" x 12"
48" x 24"

R9-11L
24" x 12"
48" x 36"



R9-11R
24" x 12"
48" x 36"

R9-11aL
24" x 12"
48" x 24"

R9-11aR
24" x 12"
48" x 24"

R10-6b
36" x 54"

R11-2
48" x 30"

R11-2a
48" x 30"

R11-2b
48" x 30"

R11-2c
60" x 30"

R11-3a
60" x 30"

R11-3b
60" x 30"

R11-4
60" x 30"

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

MDOT Michigan Department of Transportation	MAINTAINING TRAFFIC TYPICAL	STANDARD HIGHWAY SIGNS	DATE: 10/17/24
NO SCALE	CODE: 103-GEN-SIGN		SHEET: 2 OF 5

SIGN NUMBER KEY

W1-1L
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-1R
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-2L
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-2R
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-2bL
36" x 36"
48" x 48"

W1-2bR
36" x 36"
48" x 48"

W1-3L
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-3R
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-4L
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-4R
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-4bL
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-4bR
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-4cL
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W1-4cR
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W24-1L
30" x 30"
36" x 36"
48" x 48"

W24-1cP
24" x 18"
30" x 24"

W24-1R
30" x 30"
36" x 36"
48" x 48"

W24-1aL
30" x 30"
36" x 36"
48" x 48"

W24-1aR
30" x 30"
36" x 36"
48" x 48"

W24-1bL
30" x 30"
36" x 36"
48" x 48"

W24-1bR
30" x 30"
36" x 36"
48" x 48"

W1-6L
24" x 12"
36" x 18"
48" x 24"
60" x 30"
96" x 48"

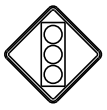
W1-6R
24" x 12"
36" x 18"
48" x 24"
60" x 30"
96" x 48"

W1-8L
12" x 18"
18" x 24"
24" x 30"
30" x 36"
36" x 48"

W1-8R
12" x 18"
18" x 24"
24" x 30"
30" x 36"
36" x 48"

W3-1
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W3-2
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"



W3-3
18" x 18"
30" x 30"
36" x 36"
48" x 48"

W3-4
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W3-4b
30" x 30"
36" x 36"
48" x 48"

W3-5
36" x 36"
48" x 48"

W3-5a
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W3-5b
30" x 30"
36" x 36"
48" x 48"

W4-1L
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W4-1R
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W4-2L
30" x 30"
36" x 36"
48" x 48"

W4-2R
30" x 30"
36" x 36"
48" x 48"

W4-3L
30" x 30"
36" x 36"
48" x 48"

W4-3R
30" x 30"
36" x 36"
48" x 48"

W4-5L
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W4-5R
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W4-5P
18" x 24"
24" x 30"

W4-6L
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W4-6R
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W4-7L
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W4-7R
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W5-1
30" x 30"
36" x 36"
48" x 48"

W5-2
18" x 18"
30" x 30"
36" x 36"
48" x 48"

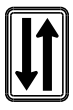
W5-3
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W5-4
30" x 30"
36" x 36"
48" x 48"

W6-1
30" x 30"
36" x 36"
48" x 48"

W6-2
30" x 30"
36" x 36"
48" x 48"

W6-3
30" x 30"
36" x 36"
48" x 48"



W6-4
12" x 18"

W7-1
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W7-1a
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-1
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

MDOT Michigan Department of Transportation	MAINTAINING TRAFFIC TYPICAL	STANDARD HIGHWAY SIGNS	DATE: 10/17/24
NO SCALE	CODE: 103-GEN-SIGN		SHEET: 3 OF 5

SIGN NUMBER KEY

W8-2
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-3
18" x 18"
30" x 30"
36" x 36"
48" x 48"

W8-4
18" x 18"
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-5
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-5P
24" x 18"
30" x 24"
36" x 30"

W8-7
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-8
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-9
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-11
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-12
30" x 30"
36" x 36"
48" x 48"

W8-14
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-15
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-15P
24" x 18"
30" x 24"
36" x 30"

W8-17L
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-17R
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-17P
24" x 18"
30" x 24"
36" x 30"

W8-18
24" x 24"
36" x 36"
48" x 48"

W8-23
24" x 24"
36" x 36"
48" x 48"

W8-24
30" x 30"
36" x 36"
48" x 48"

W8-25
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W8-26
36" x 36"
48" x 48"

W9-1L
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W9-1R
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W9-2L
30" x 30"
36" x 36"
48" x 48"

W9-2R
30" x 30"
36" x 36"
48" x 48"

W9-3C
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W9-3L
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W9-3R
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W9-3a
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W9-3b
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W11-10
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W11-10a
24" x 24"
30" x 30"
36" x 36"
48" x 48"

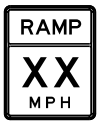
W11-24
36" x 36"
48" x 48"

W12-1
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W12-2
18" x 18"
30" x 30"
36" x 36"
48" x 48"

W13-1P
18" x 18"
24" x 24"
30" x 30"

W13-2
24" x 30"
36" x 48"
48" x 60"



W13-3
24" x 30"
36" x 48"
48" x 60"

W13-4P
24" x 24"
36" x 36"

W13-6
24" x 42"
36" x 60"
48" x 84"

W13-6a
24" x 42"
36" x 60"
48" x 84"

W13-7
24" x 42"
36" x 60"
48" x 84"

W13-7a
24" x 42"
36" x 60"
48" x 84"

W14-3
36" x 24"
40" x 30"
48" x 36"
64" x 48"

W16-2P
18" x 12"
24" x 18"
30" x 24"

W16-4aP
18" x 12"
24" x 18"
30" x 24"
36" x 30"

W16-12P
24" x 18"

W16-13P
24" x 18"
30" x 24"

W20-1
24" x 24"
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W20-1a
24" x 24"
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W20-1b
24" x 24"
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W20-1c
24" x 24"
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W20-1d
24" x 24"
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W20-2
30" x 30"
36" x 36"
48" x 48"

W20-3
30" x 30"
36" x 36"
48" x 48"

W20-3a
30" x 30"
36" x 36"
48" x 48"

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

MDOT Michigan Department of Transportation	MAINTAINING TRAFFIC TYPICAL	STANDARD HIGHWAY SIGNS	DATE: 10/17/24
NO SCALE	CODE: 103-GEN-SIGN		SHEET: 4 OF 5

SIGN NUMBER KEY

W20-3b
30" x 30"
36" x 36"
48" x 48"

W20-4
30" x 30"
36" x 36"
48" x 48"

W20-4c
36" x 36"
48" x 48"

W20-5C
30" x 30"
36" x 36"
48" x 48"

W20-5L
30" x 30"
36" x 36"
48" x 48"

W20-5L1
30" x 30"
36" x 36"
48" x 48"

W20-5L2
30" x 30"
36" x 36"
48" x 48"

W20-5R
30" x 30"
36" x 36"
48" x 48"

W20-5R1
30" x 30"
36" x 36"
48" x 48"

W20-5R2
30" x 30"
36" x 36"
48" x 48"

W20-5aL2
30" x 30"
36" x 36"
48" x 48"

W20-5aL3
30" x 30"
36" x 36"
48" x 48"

W20-5aR2
30" x 30"
36" x 36"
48" x 48"

W20-5aR3
30" x 30"
36" x 36"
48" x 48"

W20-7a
30" x 30"
36" x 36"
48" x 48"

W20-8
24" x 18"

W20-9
54" x 48"

W20-10
48" x 24"
66" x 30"

W20-11
12" x 18"

W20-12P
VARIABLE x 12"

W20-13P
VARIABLE x 12"

W20-14L
36" x 36"
48" x 48"

W20-14R
36" x 36"
48" x 48"

W20-14aP
36" x 12"
48" x 12"

W20-14bP
36" x 12"
48" x 12"

W20-15
36" x 36"
48" x 48"

W20-16
36" x 36"
48" x 48"

W20-17
36" x 36"
48" x 48"

W20-18
48" x 54"

W20-18a
48" x 54"

W21-1
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W21-2
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W21-2
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W21-3
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W21-4
36" x 18"

W21-5
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W21-5aL
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W21-5aR
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W21-5bL
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W21-5bR
30" x 30"
36" x 36"
48" x 48"
60" x 60"

W21-6
24" x 24"
30" x 30"
36" x 36"
48" x 48"

W21-7
30" x 30"
36" x 36"
48" x 48"

W21-8
30" x 30"
36" x 36"
48" x 48"

W22-1
30" x 30"
36" x 36"
48" x 48"

W22-2
42" x 36"

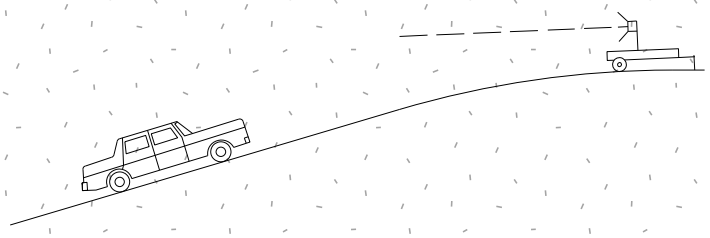
W22-3
36" x 30"
42" x 36"

W23-1
48" x 24"

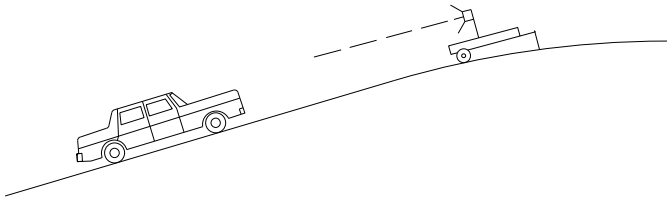
W23-2
36" x 36"
48" x 48"

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

MDOT Michigan Department of Transportation	MAINTAINING TRAFFIC TYPICAL	STANDARD HIGHWAY SIGNS	DATE: 10/17/24
NO SCALE	CODE: 103-GEN-SIGN		SHEET: 5 OF 5

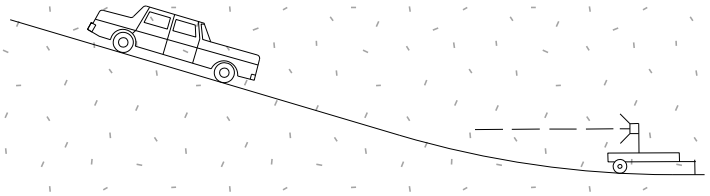


INCORRECT USAGE

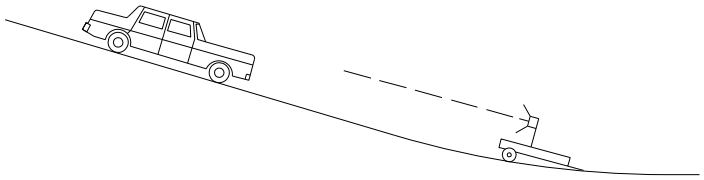


CORRECT USAGE

PLACEMENT ON A CREST VERTICAL CURVE

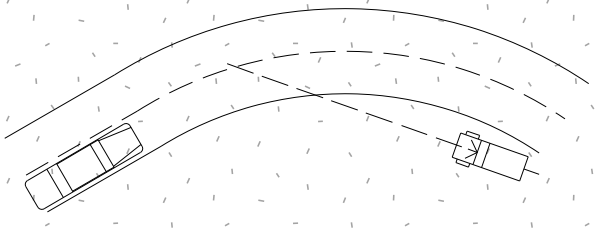


INCORRECT USAGE

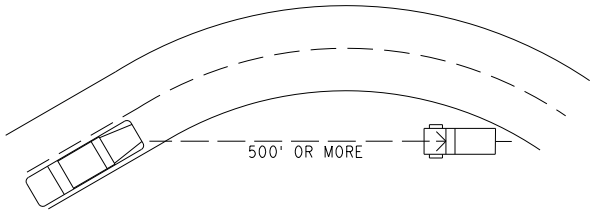


CORRECT USAGE

PLACEMENT ON A SAG VERTICAL CURVE



INCORRECT USAGE



CORRECT USAGE

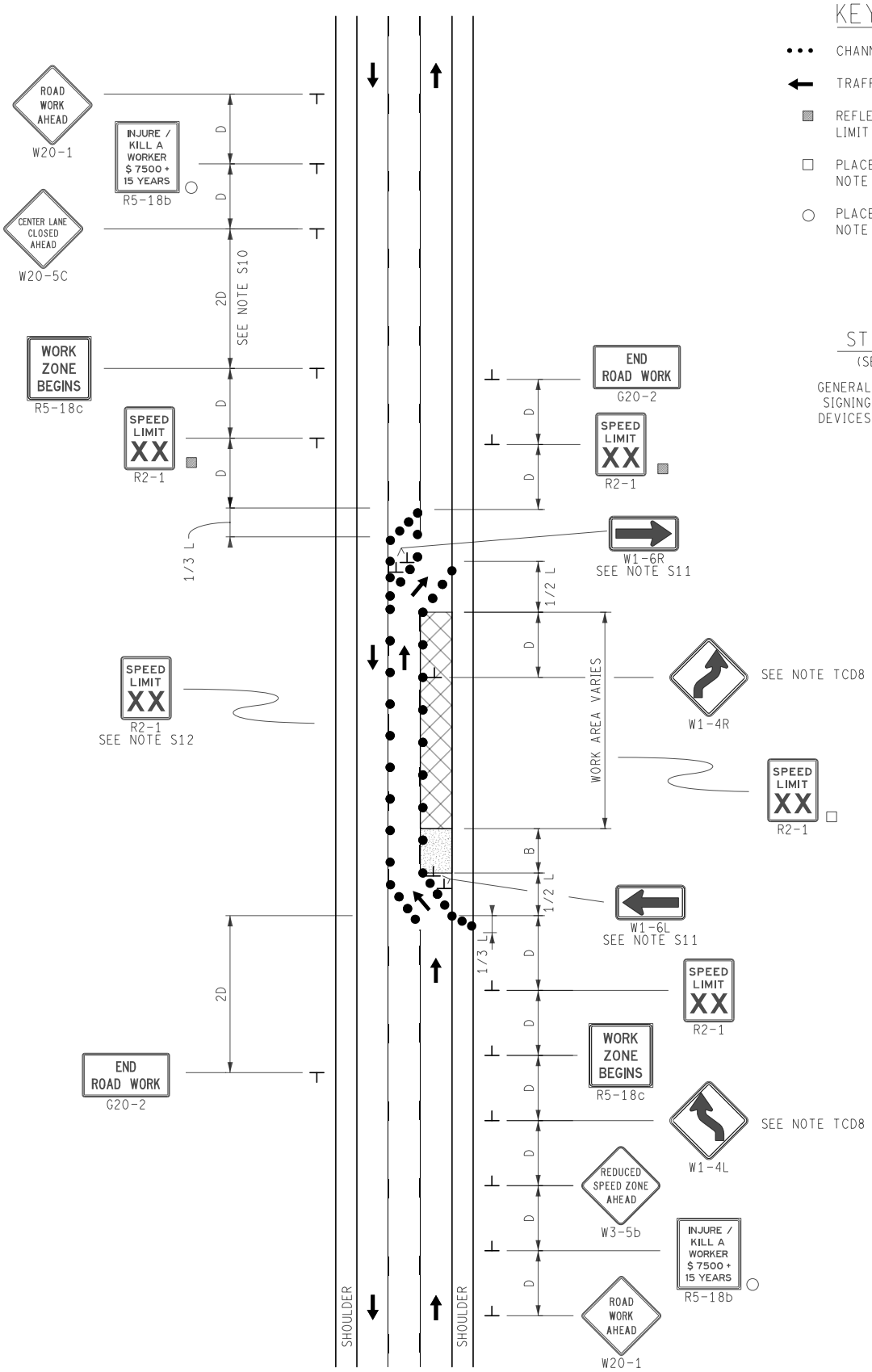
NOT TO SCALE

PLACEMENT ON A HORIZONTAL CURVE

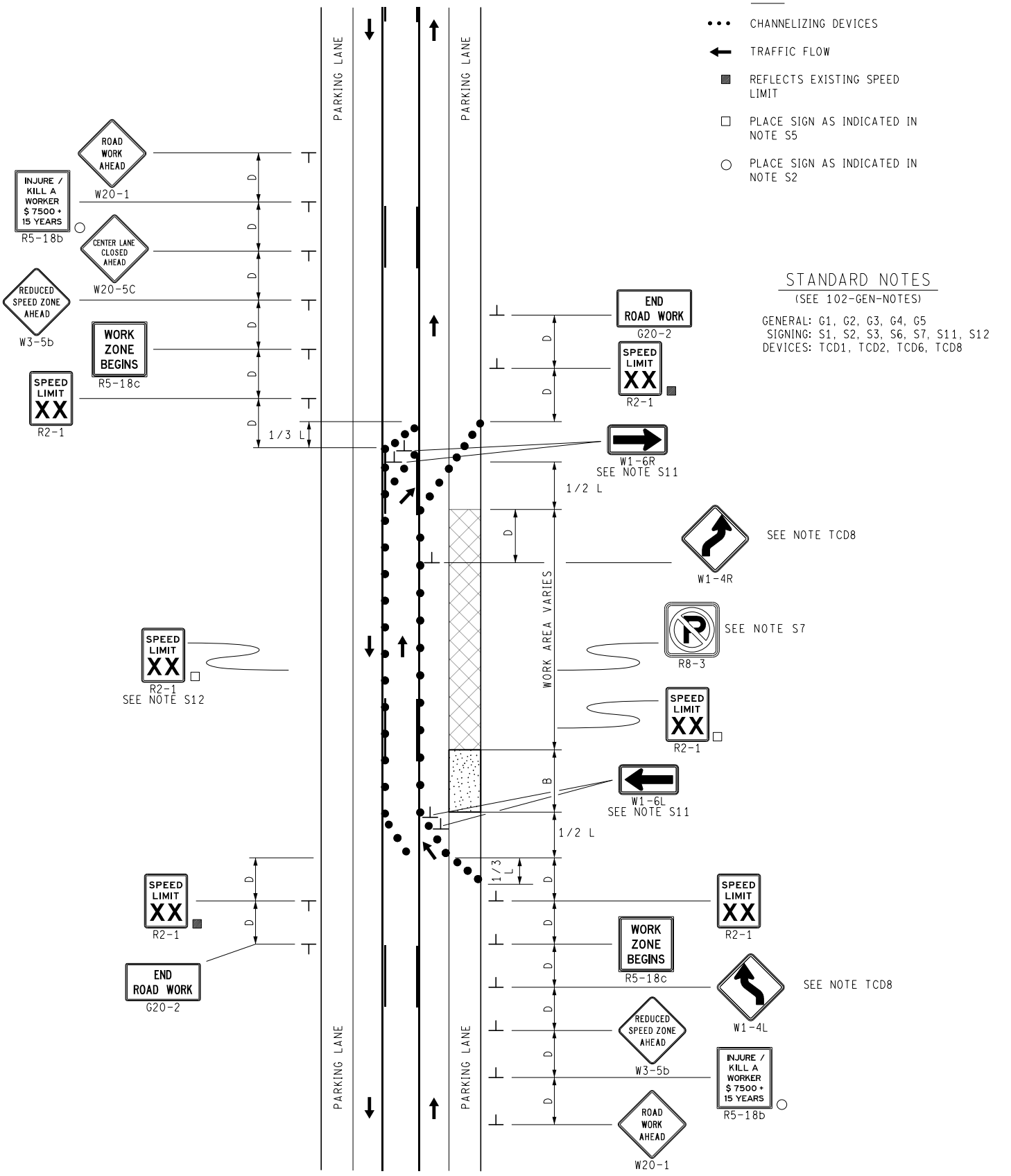
NOTE:

ENSURE THE ARROW REMAINS CLEARLY LEGIBLE AT DISTANCES FROM 2,500 FEET TO 200 FEET, FROM ALL TRAFFIC LANES AND ROADWAY ENTRANCES. DO NOT PLACE THE LIGHTED ARROW ON A HORIZONTAL OR VERTICAL CURVE THAT MIGHT INTERFERE WITH THIS LEGIBILITY REQUIREMENT.

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL NO: 104-GEN-AB	**USE OF ARROW BOARD ON HILL OR CURVE AND WORK ZONE LAYOUT**	DATE: MAY 2021 SHEET: 1 OF 1
FILE: 104-GEN-AB.dgn				



MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL	LANE SHIFT ON A 3-LANE UNDIVIDED ROADWAY	DATE: DECEMBER 2021
		NO: 137-CLT-SHIFT-OLC		SHEET: 1 OF 1
FILE: 137-CLT-SHIFT-OLC.dgn				



MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL	PARKING LANE CLOSURE WITH ONE BOUND SHIFTED ON AN UNDIVIDED ROADWAY	DATE: MAY 2021
FILE: 142-CLT-PARK-SHL.dgn		NO: 142-CLT-PARK-SHL		SHEET: 1 OF 1

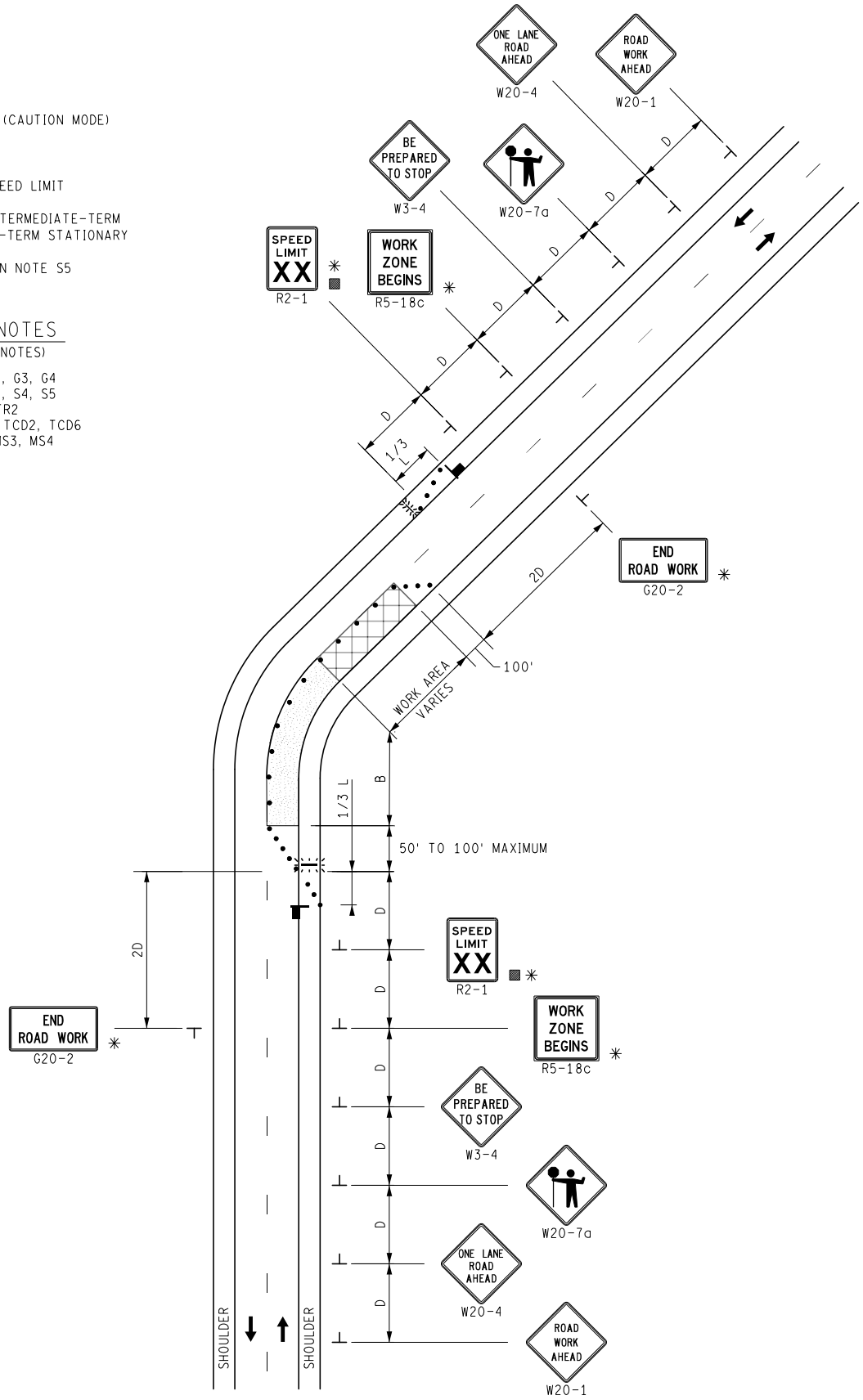
KEY

- TRAFFIC REGULATOR
- CHANNELIZING DEVICES
- LIGHTED ARROW PANEL (CAUTION MODE)
- TRAFFIC FLOW
- REFLECTS EXISTING SPEED LIMIT
- ✳ ONLY REQUIRED FOR INTERMEDIATE-TERM STATIONARY AND LONG-TERM STATIONARY
- □ PLACE AS INDICATED IN NOTE S5

STANDARD NOTES

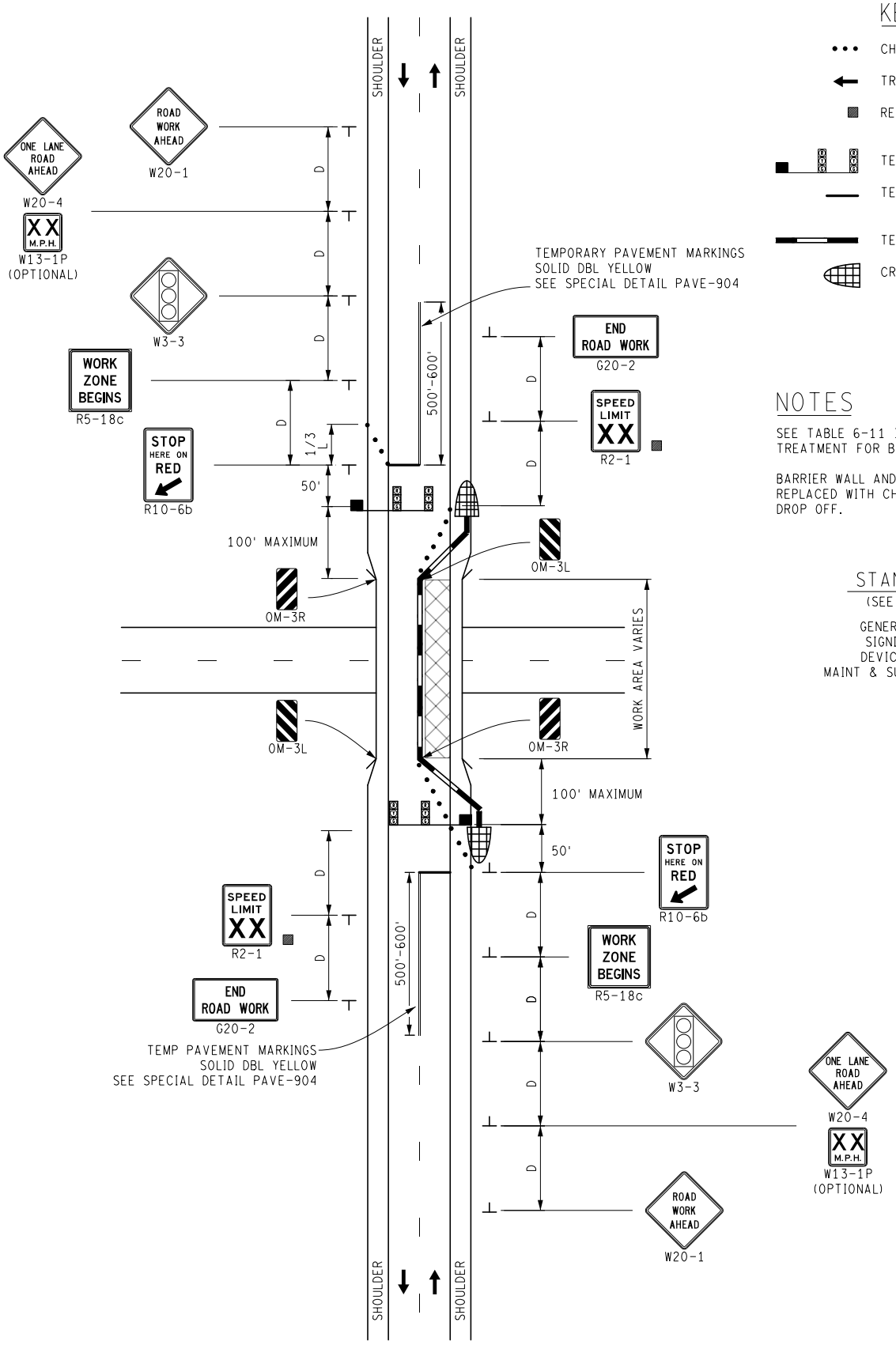
(SEE 102-GEN-NOTES)

GENERAL: G1, G2, G3, G4
SIGNING: S1, S3, S4, S5
TRAF REG: TR1, TR2
DEVICES: TCD1, TCD2, TCD6
MAINT & SURV: MS2, MS3, MS4



NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: LONG-TERM STATIONARY INTERMEDIATE-TERM STATIONARY SHORT-TERM STATIONARY	LANE CLOSURE FOR A TWO-LANE, TWO-WAY ROADWAY UTILIZING TRAFFIC REGULATORS NO SPEED REDUCTION	DATE: MAY 2021 NO: 4110A-M-TR-NFW-2L SHEET: 1 OF 1
FILE: 4110A-M-TR-NFW-2L.dgn				



KEY

- CHANNELIZING DEVICES
- TRAFFIC FLOW
- REFLECTS EXISTING SPEED LIMIT
- TEMPORARY TRAFFIC SIGNAL
- TEMPORARY PAVEMENT MARKING (SOLID 24" STOP BAR)
- TEMPORARY CONCRETE BARRIER WALL
- CRASH ATTENUATOR

NOTES

SEE TABLE 6-11 IN DESIGN MANUAL, EDGE DROP TREATMENT FOR BARRIER WALL USAGE GUIDELINES.

BARRIER WALL AND OM-3 SIGNS MAY BE REMOVED AND REPLACED WITH CHANNELIZING DEVICES IF THERE IS NO DROP OFF.

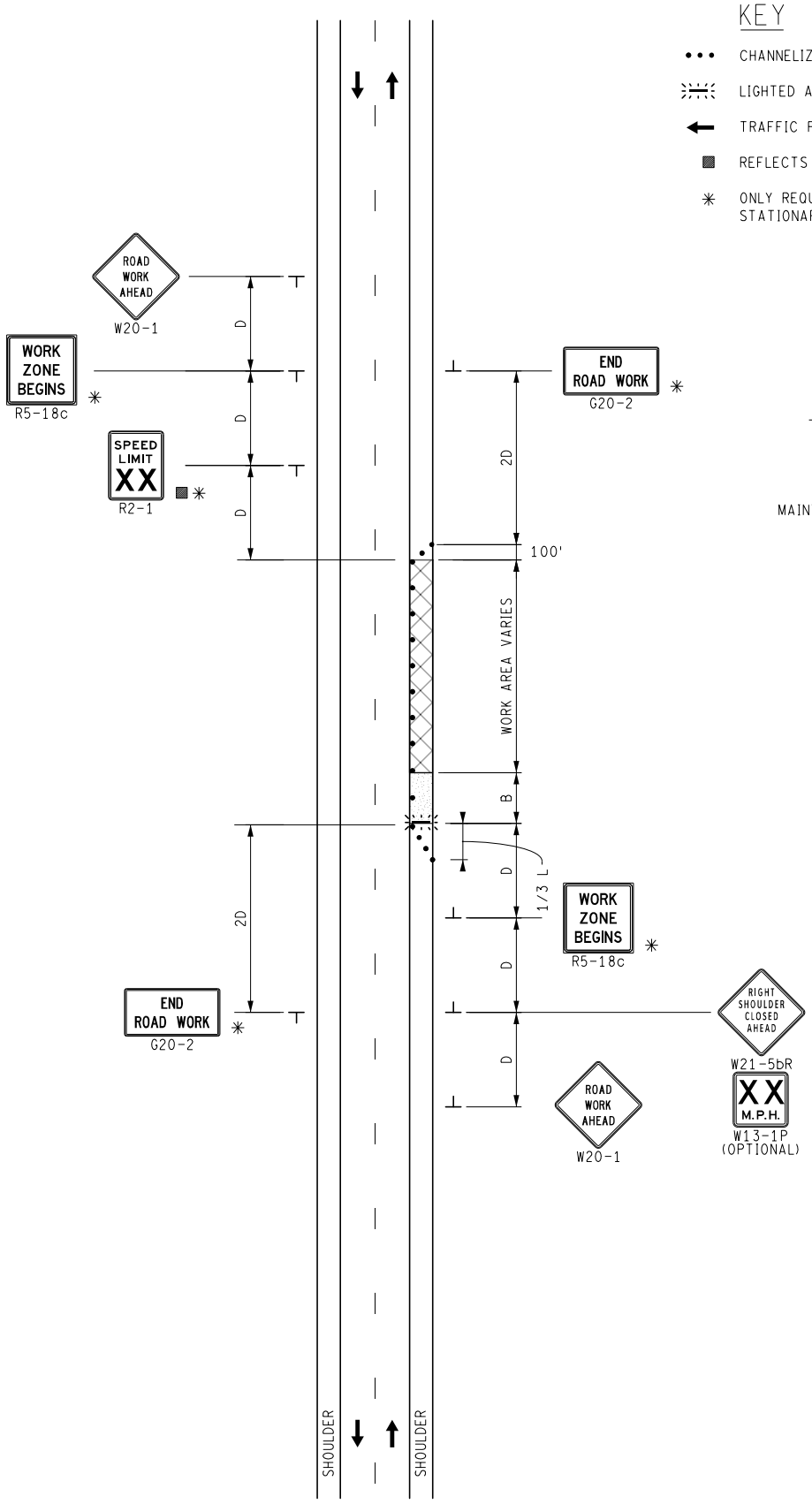
STANDARD NOTES

(SEE 102-GEN-NOTES)

GENERAL: G1, G2, G3, G5
SIGNING: S1, S3, S4
DEVICES: TCD1, TCD5
MAINT & SURV MS2, MS3, MS4

NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: LONG-TERM STATIONARY INTERMEDIATE-TERM STATIONARY	**TEMPORARY TRAFFIC SIGNAL ON A TWO-LANE, TWO-WAY ROADWAY NO SPEED REDUCTION (WITH TEMPORARY BARRIER WALL)**	DATE: MAY 2021
				NO: 4121-M-TS
FILE: 4121-M-TS.dgn				SHEET: 1 OF 1



STANDARD NOTES

(SEE 102-GEN-NOTES)

GENERAL: G1, G2, G3, G4
SIGNING: S1, S3
DEVICES: TCD1, TCD2, TCD6
MAINT & SURV: MS2, MS3, MS4

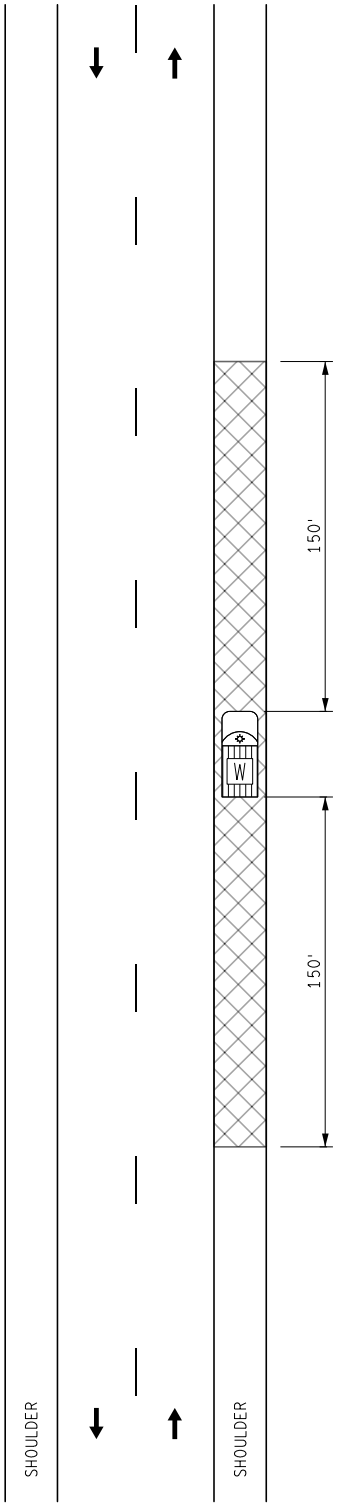
NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: SHORT-TERM STATIONARY, SHORT DURATION LONG-TERM STATIONARY INTERMEDIATE-TERM STATIONARY	**SHOULDER CLOSURE ON A TWO-LANE, TWO-WAY ROADWAY**	DATE: MAY 2021 NO: 4122-M-NFW-SHL SHEET: 1 OF 1
FILE: 4122-M-NFW-SHL.dgn				

KEY

VEHICLE FROM WHICH WORK IS BEING PERFORMED

TRAFFIC FLOW



STANDARD NOTES

(SEE 102-GEN-NOTES)

GENERAL: G1, G2, G3, G4
SIGNING: S1
MAINT & SURV: MS2, MS3, MS4

NOTES

AT A MINIMUM, MAINTAINING TRAFFIC SHALL CONSIST OF AN APPROPRIATELY MARKED VEHICLE WITH A ROTATING BEACON. NO SIGNS OR CHANNELIZING DEVICES ARE REQUIRED.

THE FOLLOWING FACTORS SHOULD BE CONSIDERED IN DETERMINING THE NEED FOR ADDITIONAL ADVANCE WARNING:

1. TRAFFIC VOLUME
2. POSTED AND OPERATING SPEED LIMITS
3. HORIZONTAL AND VERTICAL ALIGNMENTS
4. URBAN OR RURAL SITE
5. WORK TYPE
6. AVAILABLE SHOULDER WIDTH

NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: MOBILE	**SHOULDER WORK WITH TRAFFIC VOLUMES LESS THAN 10,000 ADT AND ADEQUATE SIGHT DISTANCES**	DATE: MAY 2021
				NO: 4400-M-NFW-SHL-M0B
FILE: 4400-M-SHL-M0B.dgn				SHEET: 1 OF 1

KEY

LIGHTED ARROW PANEL (CAUTION MODE)

TRAFFIC FLOW

SHADOW VEHICLE WITH OPTIONAL TRUCK MOUNTED ATTENUATOR

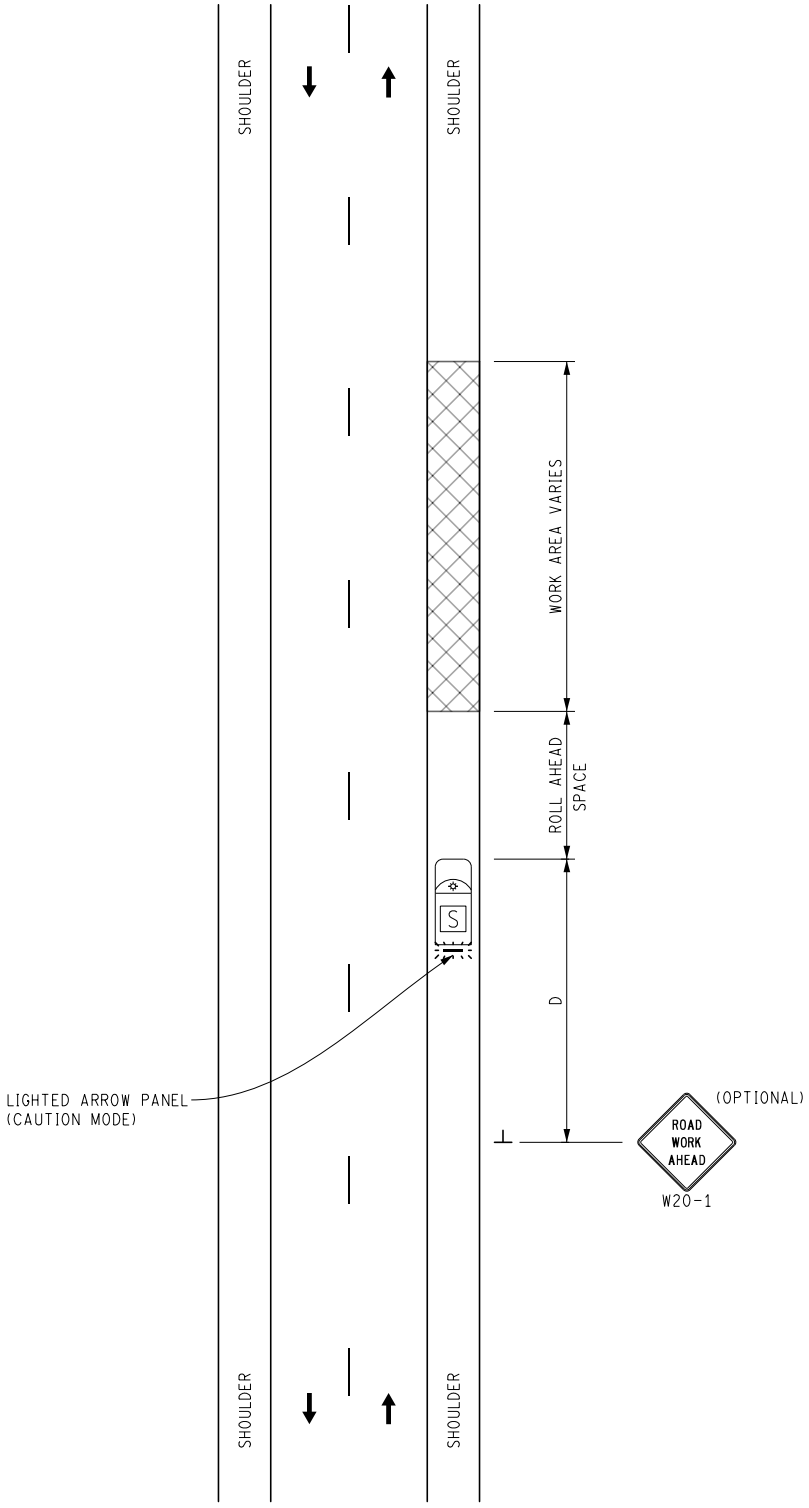
STANDARD NOTES

(SEE 102-GEN-NOTES)

GENERAL: G1, G2, G3, G4
SIGNING: S1
MAINT & SURV: MS2, MS3, MS4

NOTES

THERE MUST BE EITHER AN APPROPRIATELY MARKED VEHICLE WITH A ROTATING BEACON OR OPTIONAL W20-1 SIGNS TO INDICATE TO THE PUBLIC THAT WORK IS BEING DONE IN THE AREA.



NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: SHORT-DURATION MOBILE	**SHOULDER WORK ON A TWO-LANE, TWO-WAY ROADWAY**	DATE: MAY 2021
				NO: 4401-M-NFW-SHL-2L
FILE: 4401-M-NFW-SHL-2L.dgn				SHEET: 1 OF 1

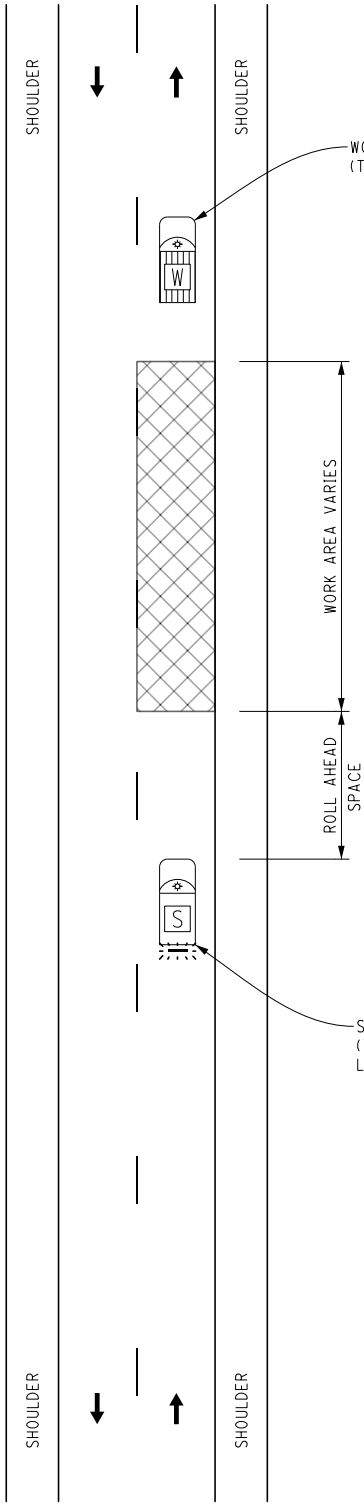
KEY

LIGHTED ARROW PANEL (CAUTION MODE)

TRAFFIC FLOW

SHADOW VEHICLE WITH OPTIONAL TRUCK MOUNTED ATTENUATOR

WORK VEHICLE WITH OPTIONAL TRUCK MOUNTED ATTENUATOR



NOTES

WHERE VEHICLE TRAFFIC CANNOT EFFECTIVELY SELF REGULATE, ONE OR TWO TRAFFIC REGULATORS SHALL BE USED.

STANDARD NOTES

(SEE 102-GEN-NOTES)

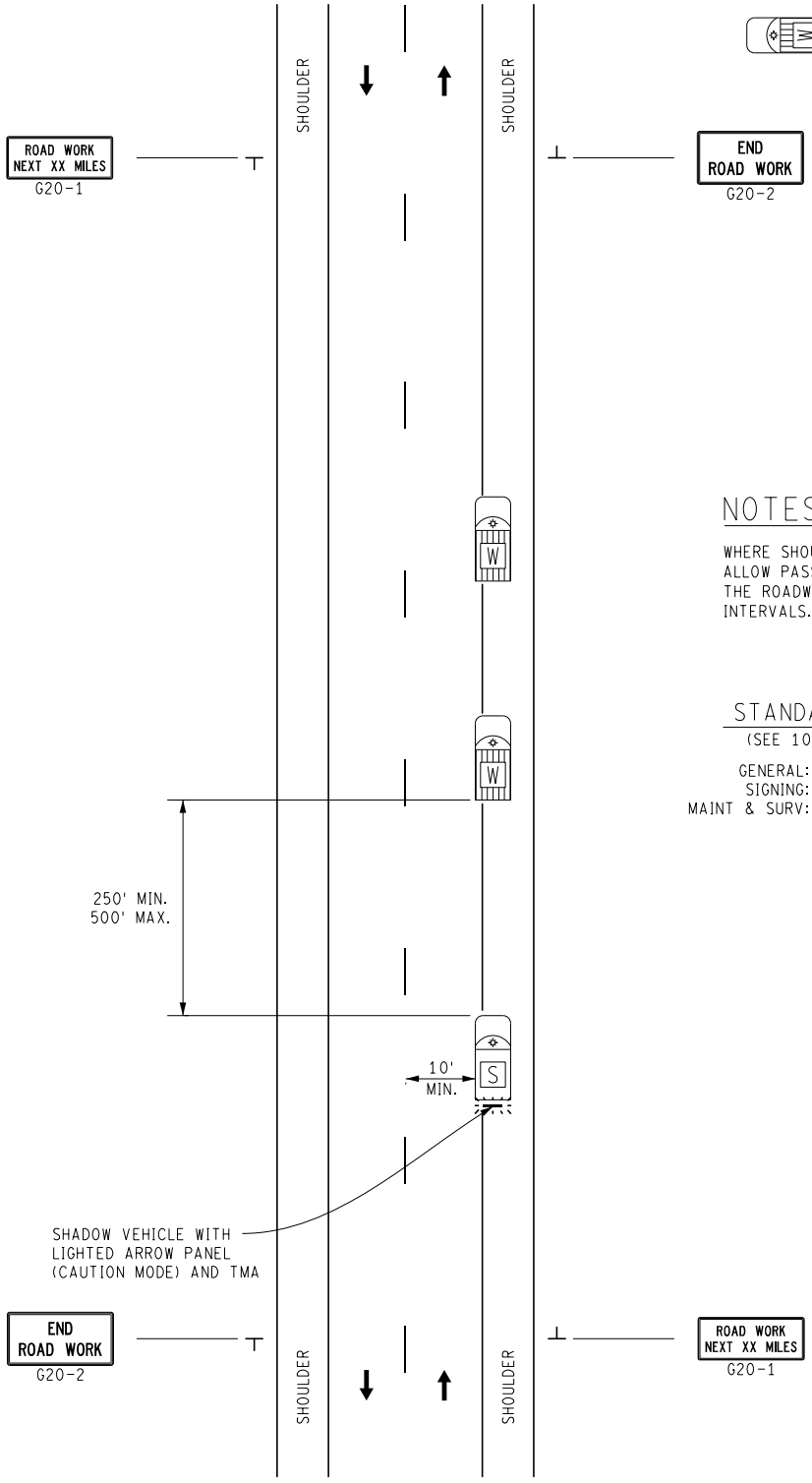
GENERAL: G1, G3, G4
SIGNING: S1
MAINT & SURV: MS1, MS2, MS3, MS4, MS5

NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: SHORT-DURATION MOBILE	**MOBILE OPERATION ON A TWO-LANE ROADWAY**	DATE: MAY 2021
				NO: 4403-M-NFW-2L
FILE: 4403-M-NFW-2L.dgn				SHEET: 1 OF 1

KEY

- LIGHTED ARROW PANEL (TRUCK MOUNTED) (CAUTION MODE)
- TRAFFIC FLOW
- SHADOW VEHICLE WITH TRUCK MOUNTED ATTENUATOR
- WORK VEHICLE



NOTES

WHERE SHOULDERS ARE NARROW AND INSUFFICIENT WIDTH EXISTS TO ALLOW PASSING, THE CONVOY SHALL CEASE OPERATION AND PULL OFF THE ROADWAY TO ALLOW QUEUED TRAFFIC TO PASS AT REASONABLE INTERVALS.

STANDARD NOTES

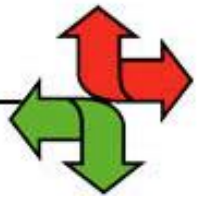
(SEE 102-GEN-NOTES)

GENERAL: G1, G3, G4
SIGNING: S1
MAINT & SURV: MS1, MS2, MS3, MS4, MS5

NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: MOBILE	SHOULDER WORK ON A TWO-LANE, TWO-WAY ROADWAY WITH LANE ENCROACHMENTS	DATE: MAY 2021
				NO: 4405-M-NFW-SHL
FILE: 4405-M-NFW-SHL.dgn				SHEET: 1 OF 1

Manual on Uniform Traffic Control Devices (MUTCD)



PART 6

STANDARD DETAILS

Table 6P-2. Meaning of Symbols on Typical Application Diagrams


Arrow board


Arrow board support or trailer (shown facing down)


Changeable message sign or support trailer


Channelizing device


Crash cushion


Direction of temporary traffic detour

Direction of travel

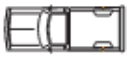

Flagger


High-level warning device (Flag tree)


Longitudinal channelizing device


Luminaire


Pavement markings that should be removed for a long-term project


Shadow vehicle


Sign (shown facing left)


Surveyor


Temporary barrier


Temporary barrier with warning light


Traffic or pedestrian signal


Truck-mounted attenuator


Type 3 barricade


Warning light


Work space


Work vehicle

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

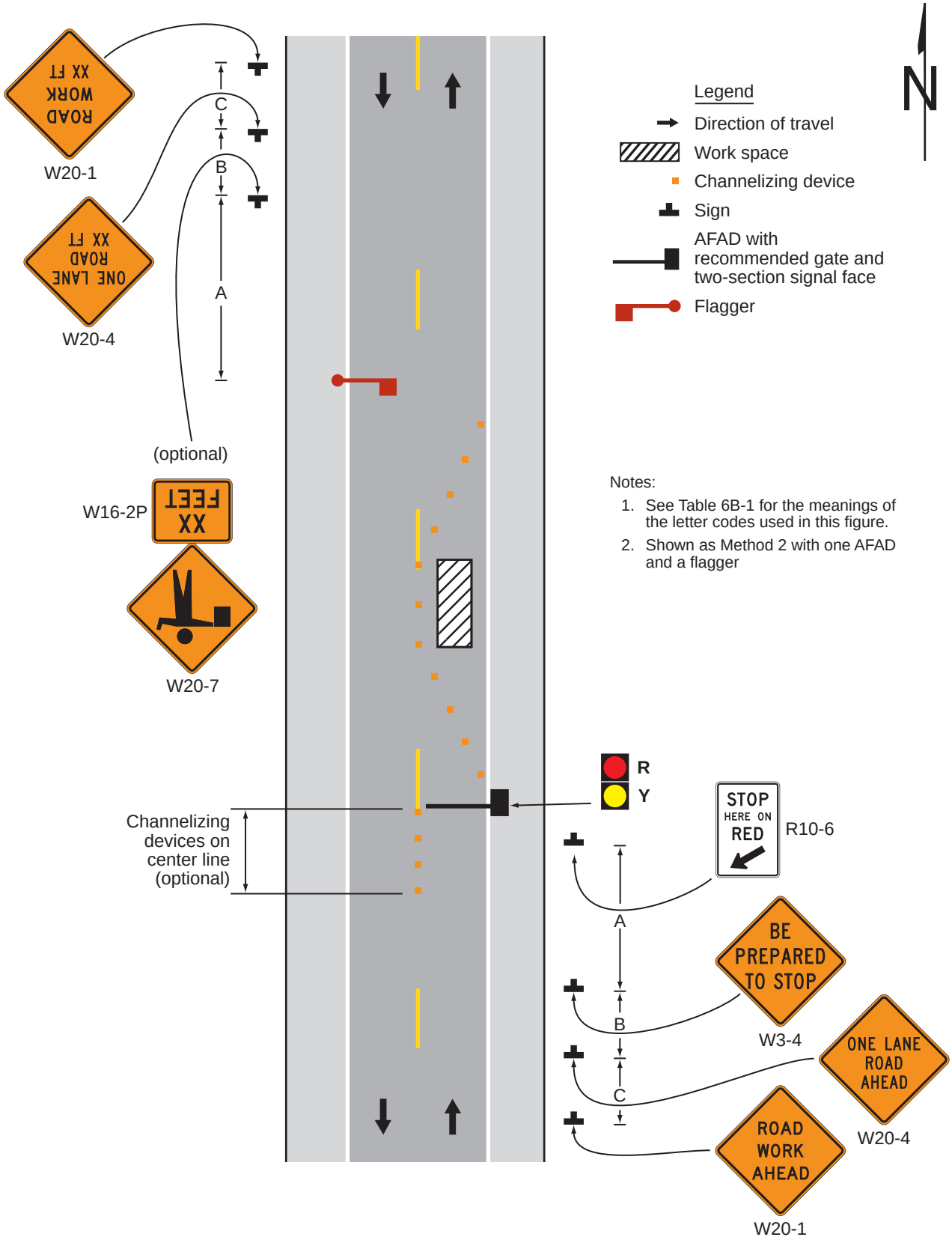
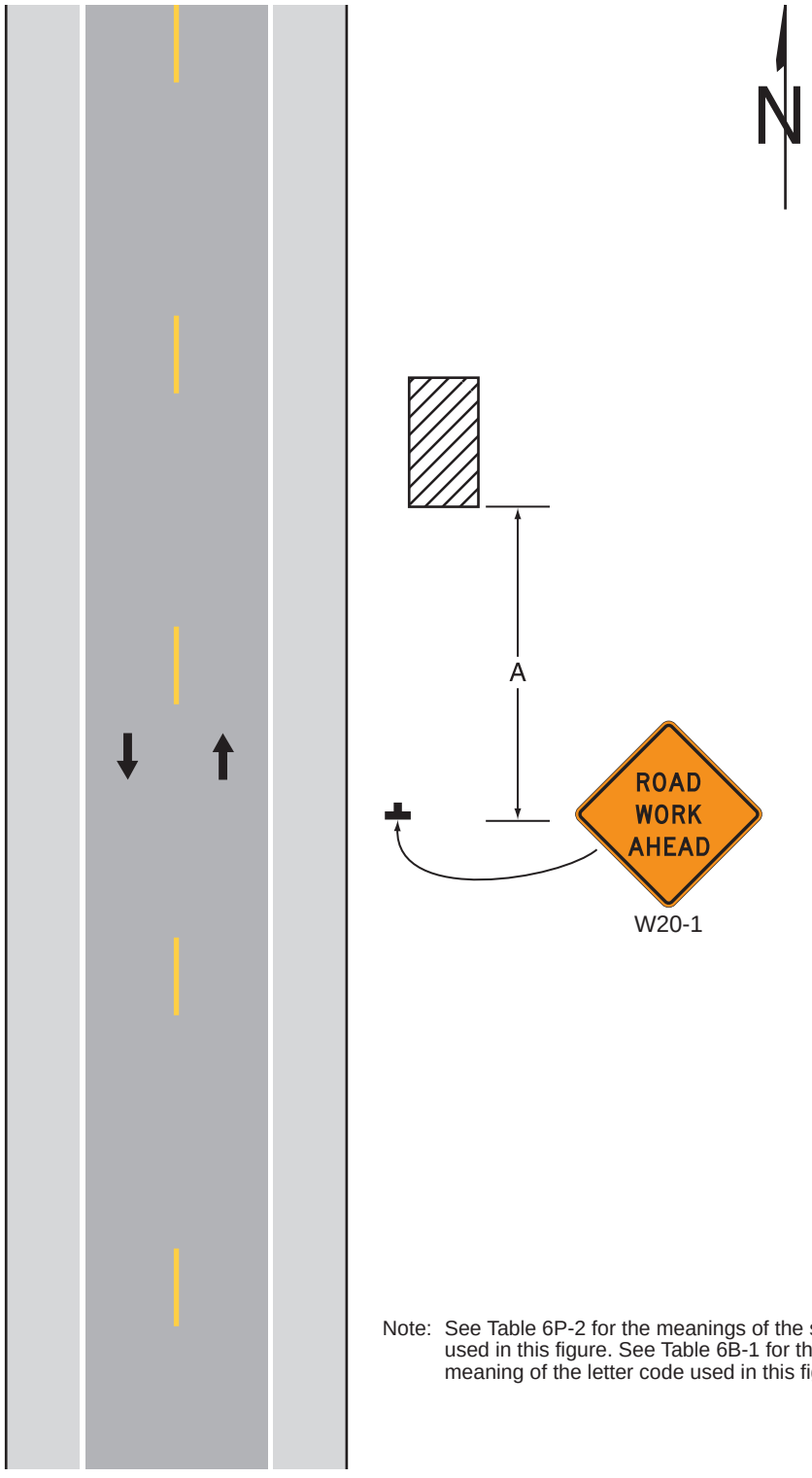


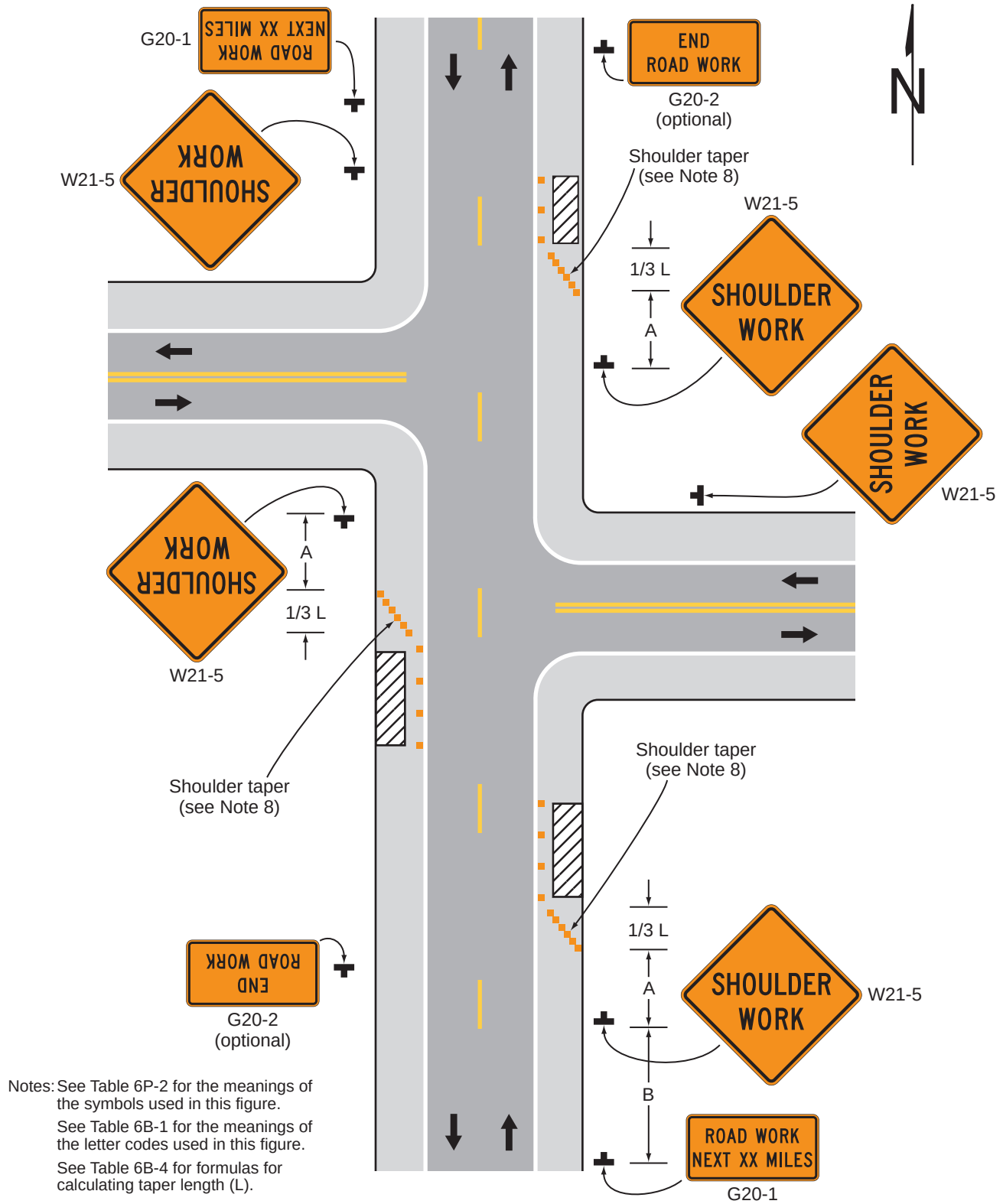
Figure 6P-1. Work Beyond the Shoulder (TA-1)



Note: See Table 6P-2 for the meanings of the symbols used in this figure. See Table 6B-1 for the meaning of the letter code used in this figure.

Typical Application 1

Figure 6P-3. Work on the Shoulders (TA-3)



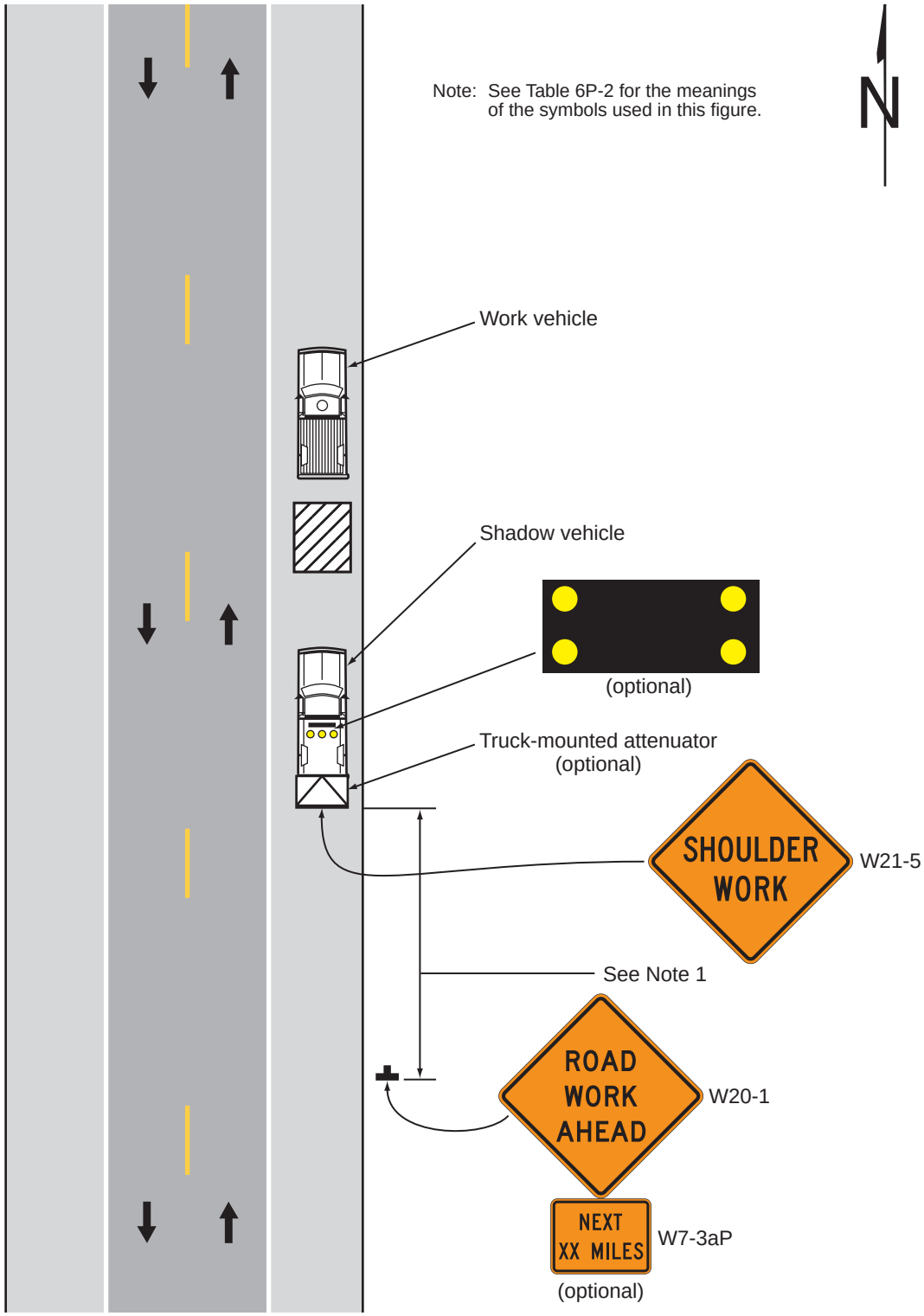
Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

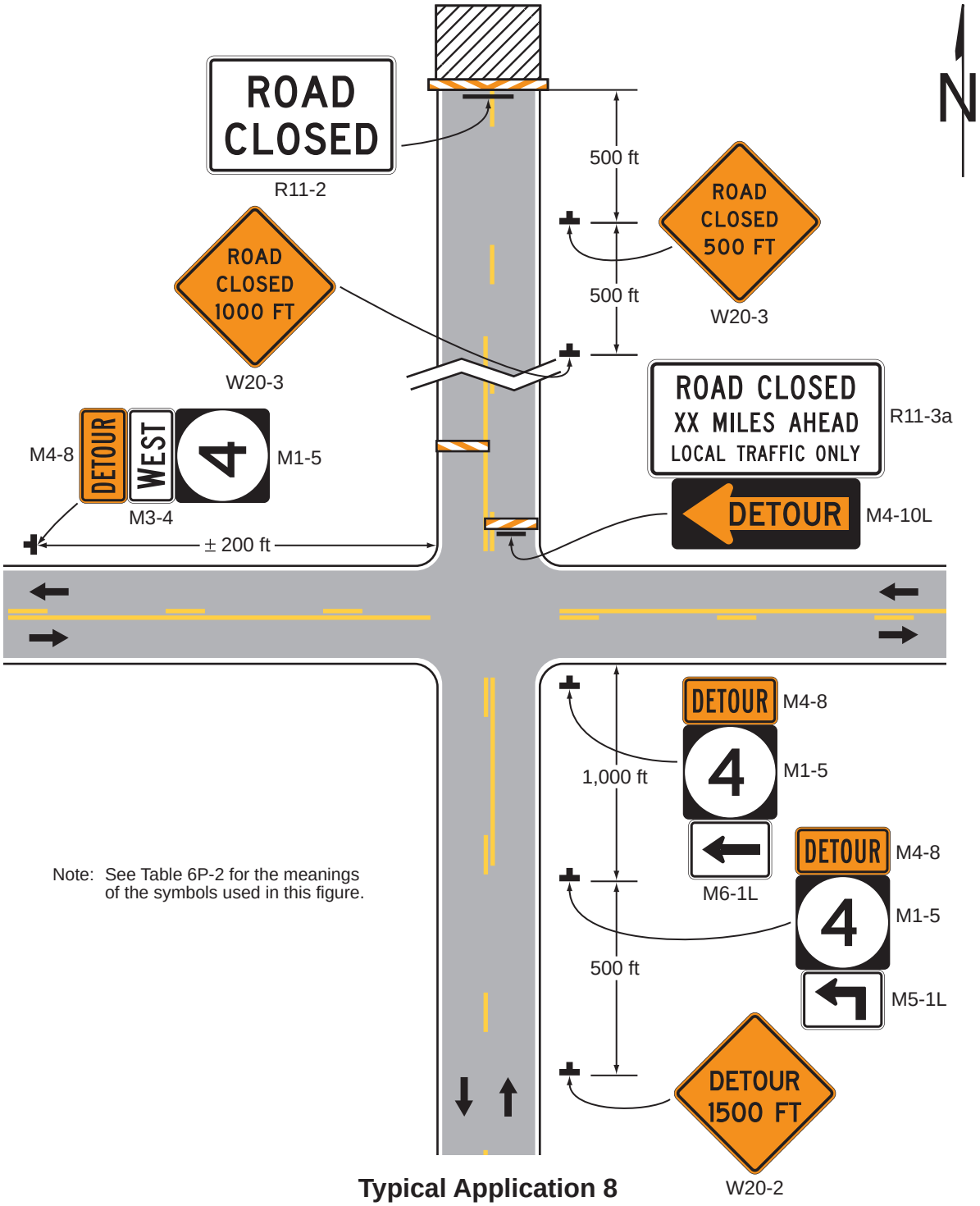
Typical Application 3

Figure 6P-4. Short-Duration or Mobile Operation on a Shoulder (TA-4)



Typical Application 4

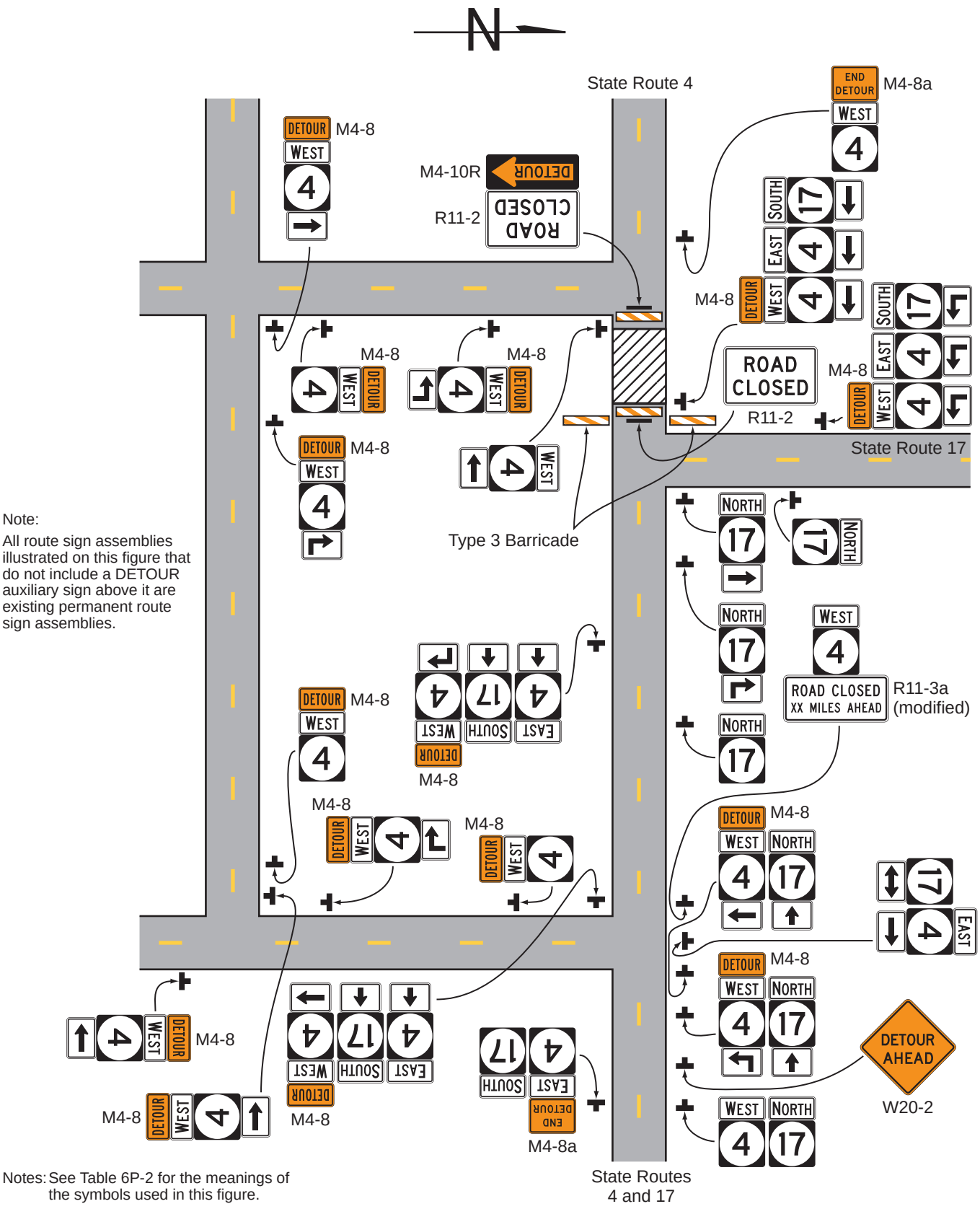
Figure 6P-8. Road Closure with an Off-Site Detour (TA-8)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

Typical Application 8

Figure 6P-9. Overlapping Routes with a Detour (TA-9)



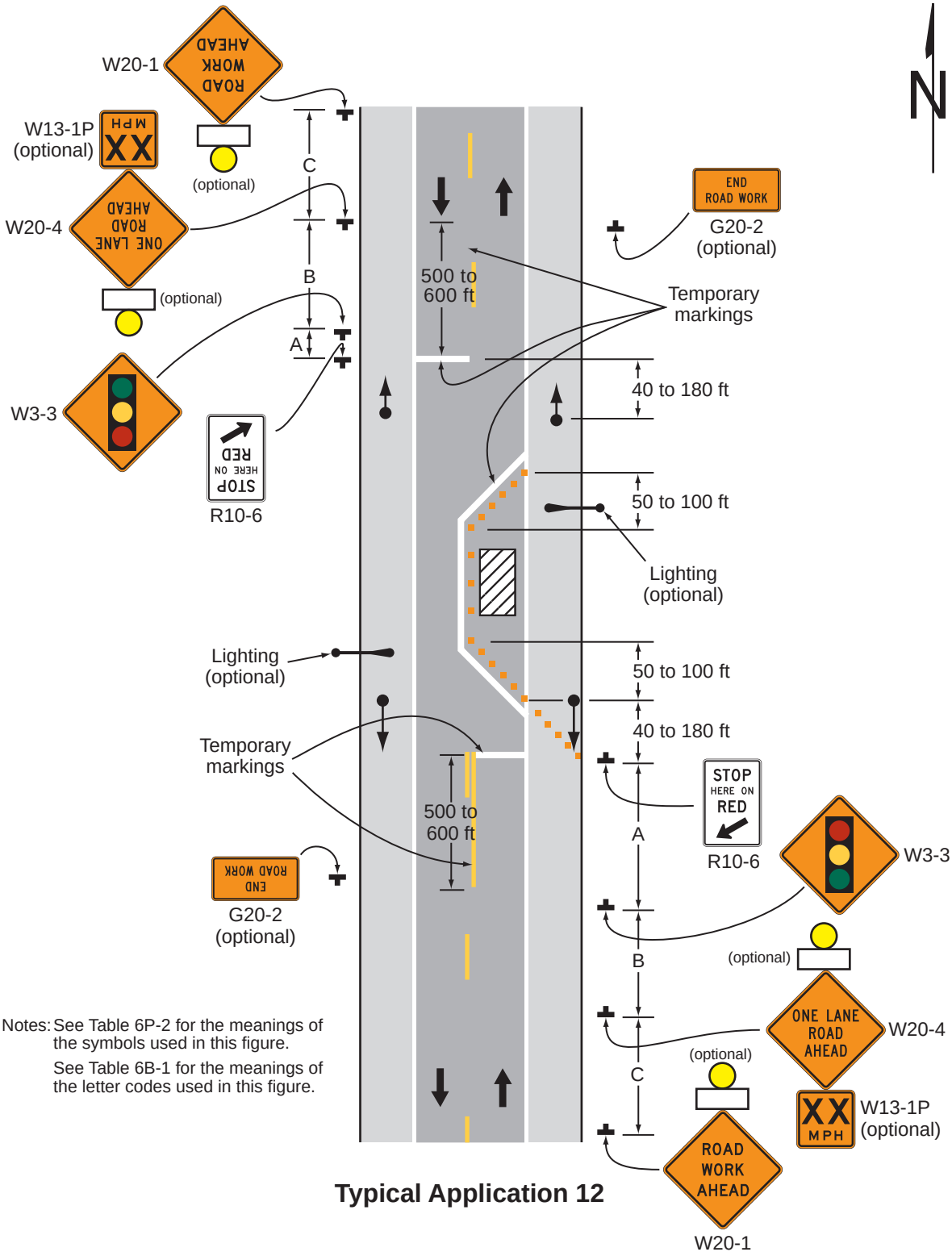
Note:
All route sign assemblies illustrated on this figure that do not include a DETOUR auxiliary sign above it are existing permanent route sign assemblies.

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Figures 2D-4 through 2D-6 for the sign codes for the route signs and the directional and arrow auxiliary signs associated with them.

Typical Application 9

Figure 6P-12. Lane Closure on a Two-Lane Road Using Temporary Traffic Control Signals (TA-12)

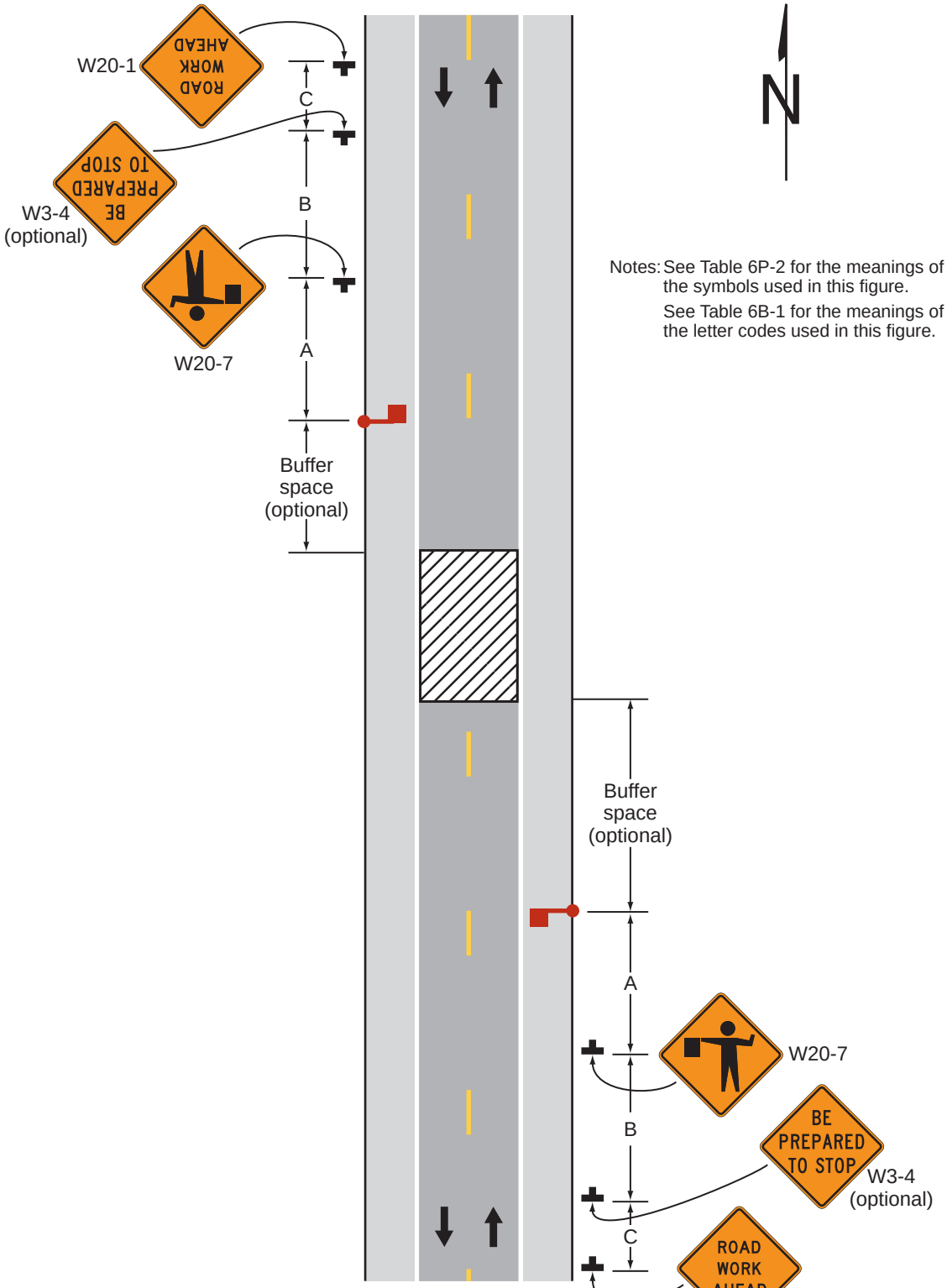


Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

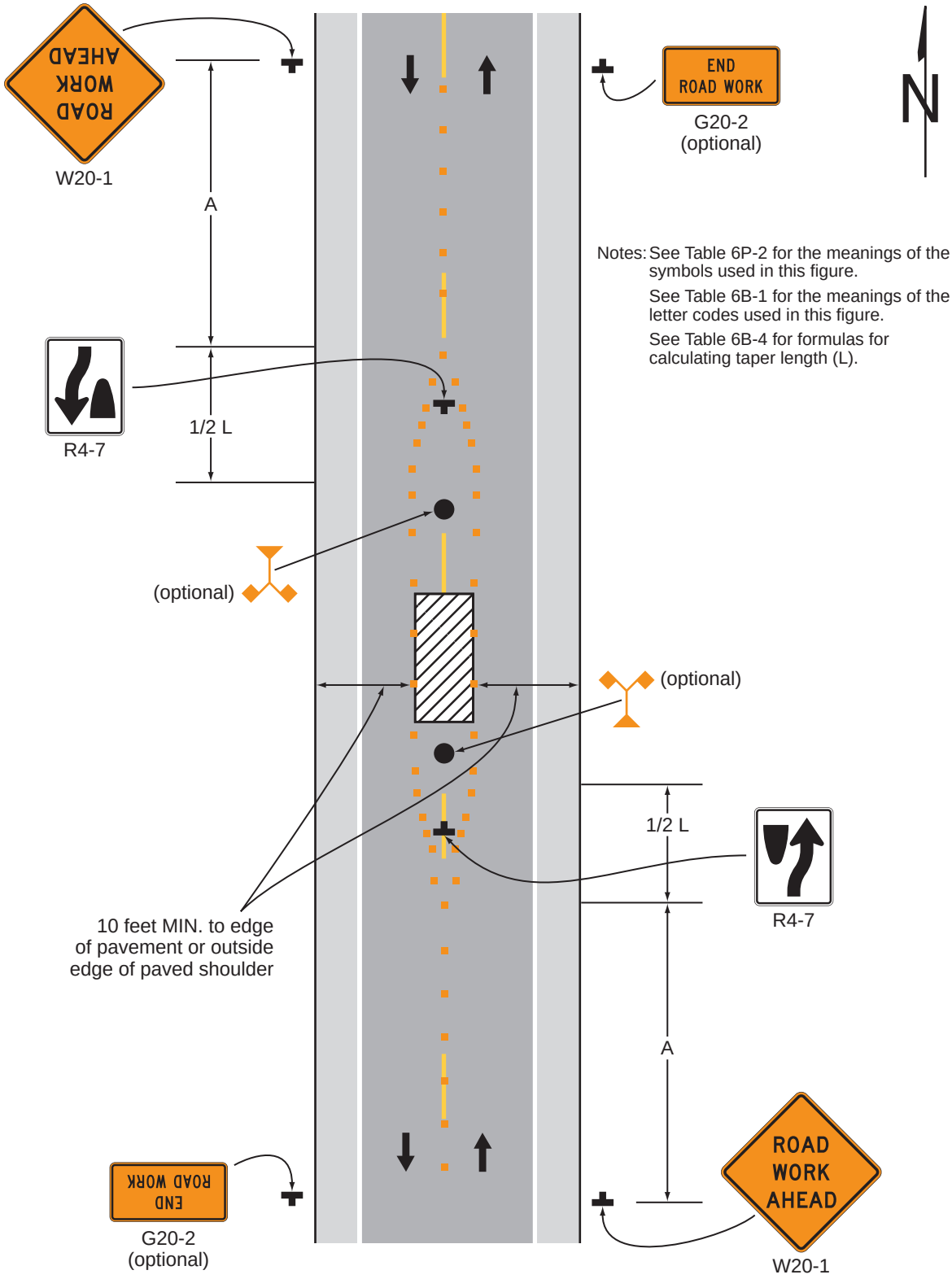
Typical Application 12

Figure 6P-13. Temporary Road Closure (TA-13)



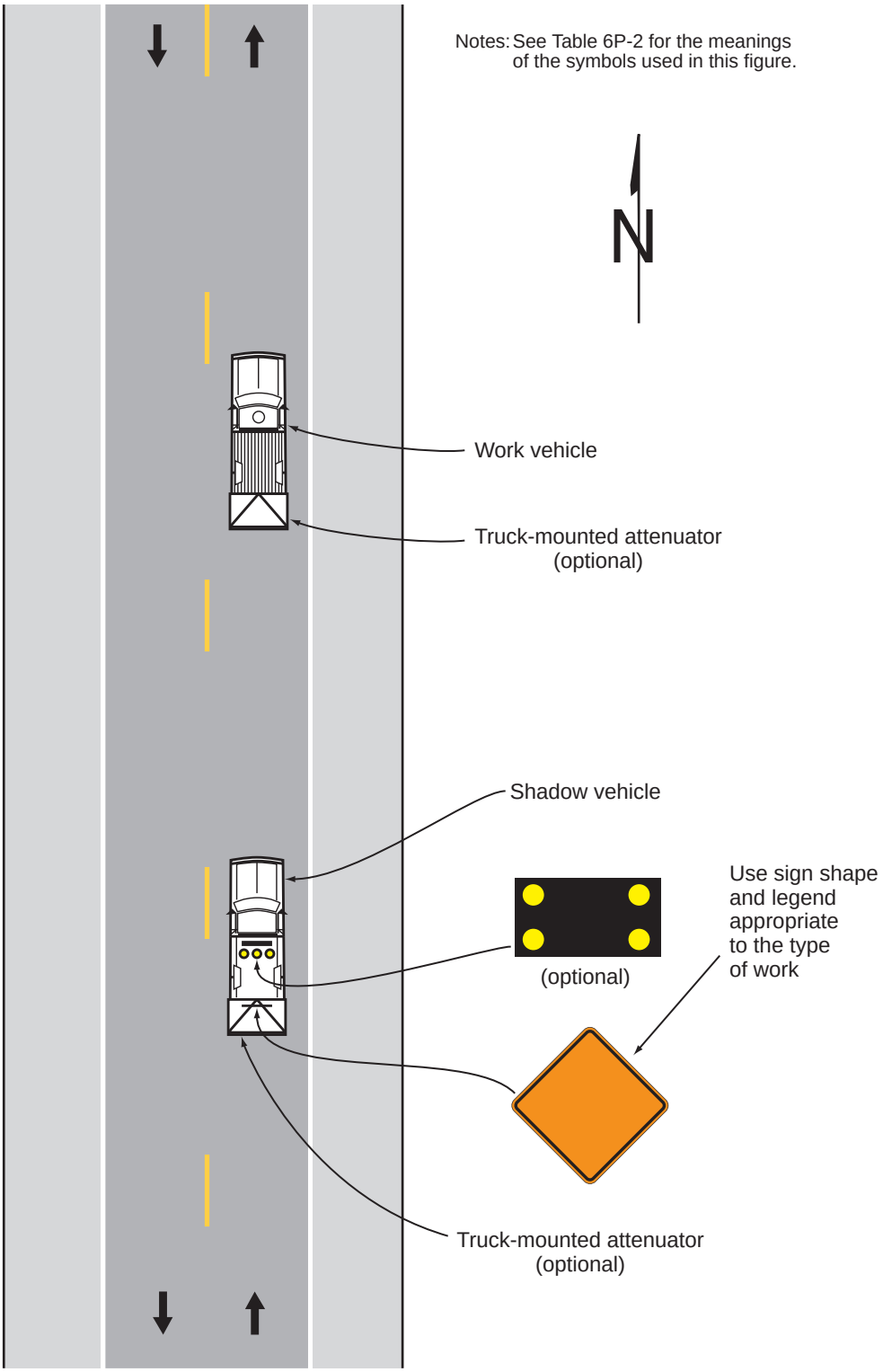
Typical Application 13

Figure 6P-15. Work in the Center of a Road with Low Traffic Volumes (TA-15)



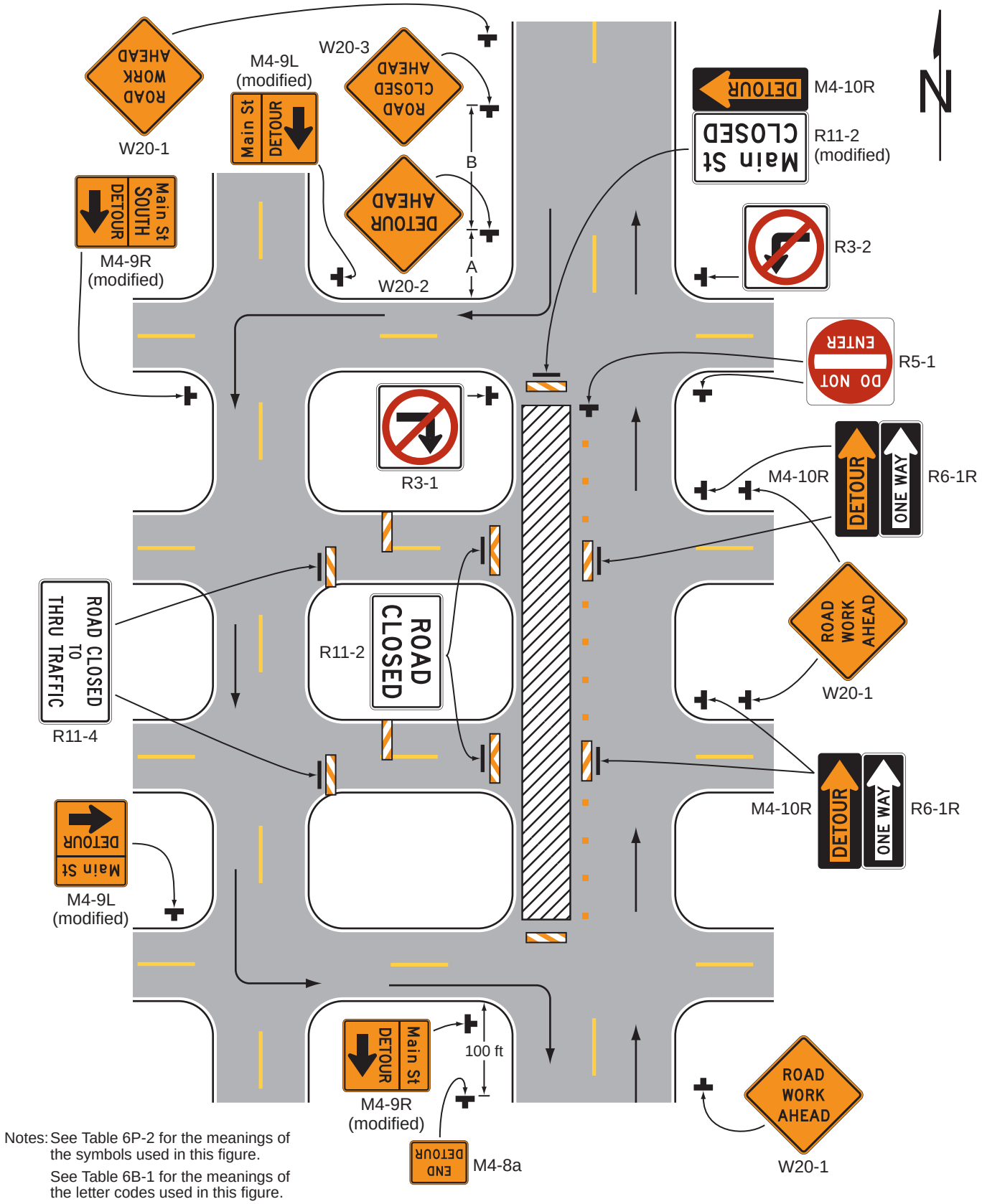
Typical Application 15

Figure 6P-17. Mobile Operations on a Two-Lane Road (TA-17)



Typical Application 17

Figure 6P-19. Detour for One Travel Direction (TA-19)

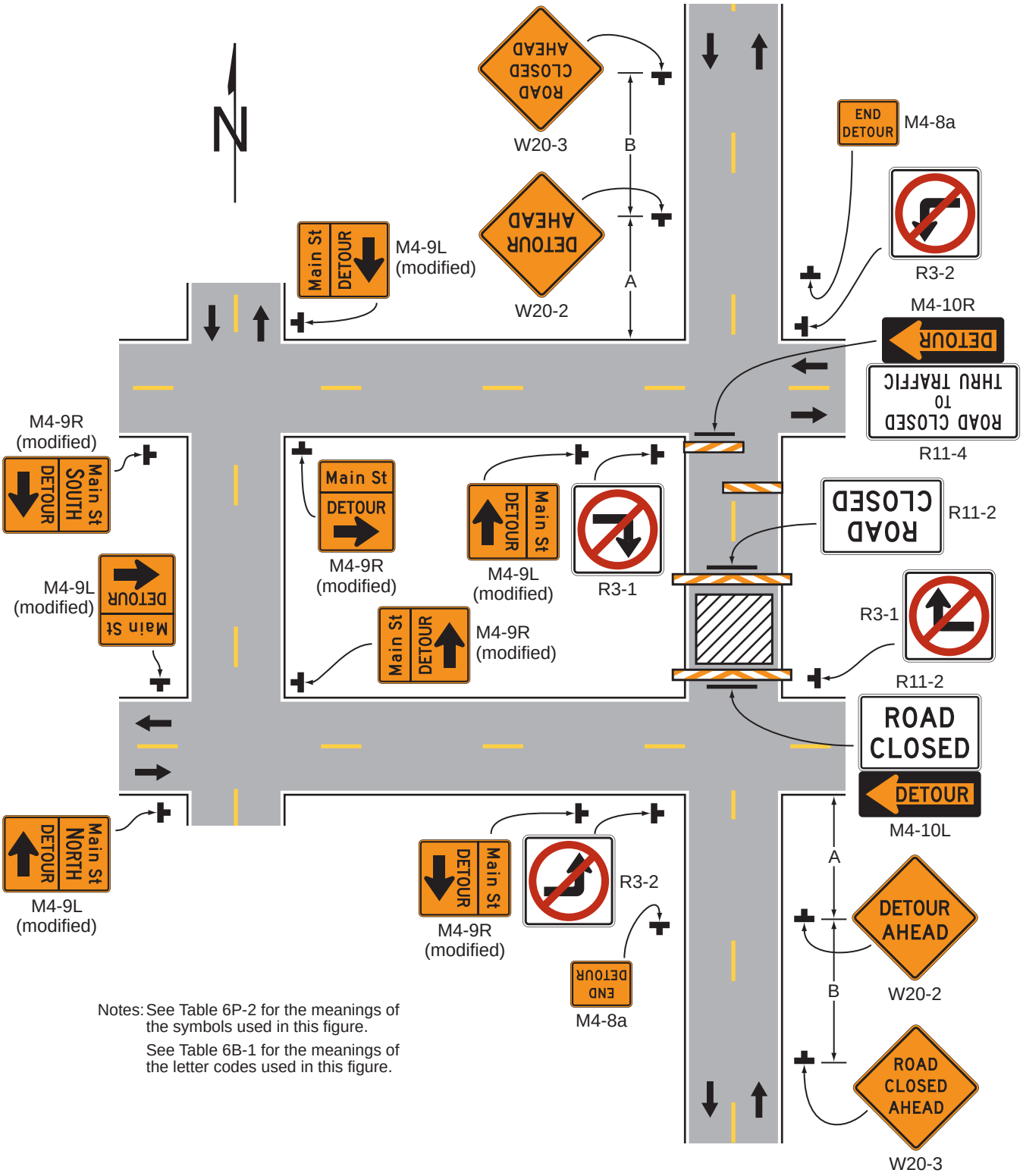


Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

Typical Application 19

Figure 6P-20. Detour for a Closed Street (TA-20)

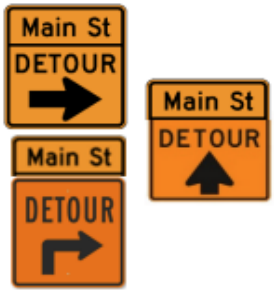


Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

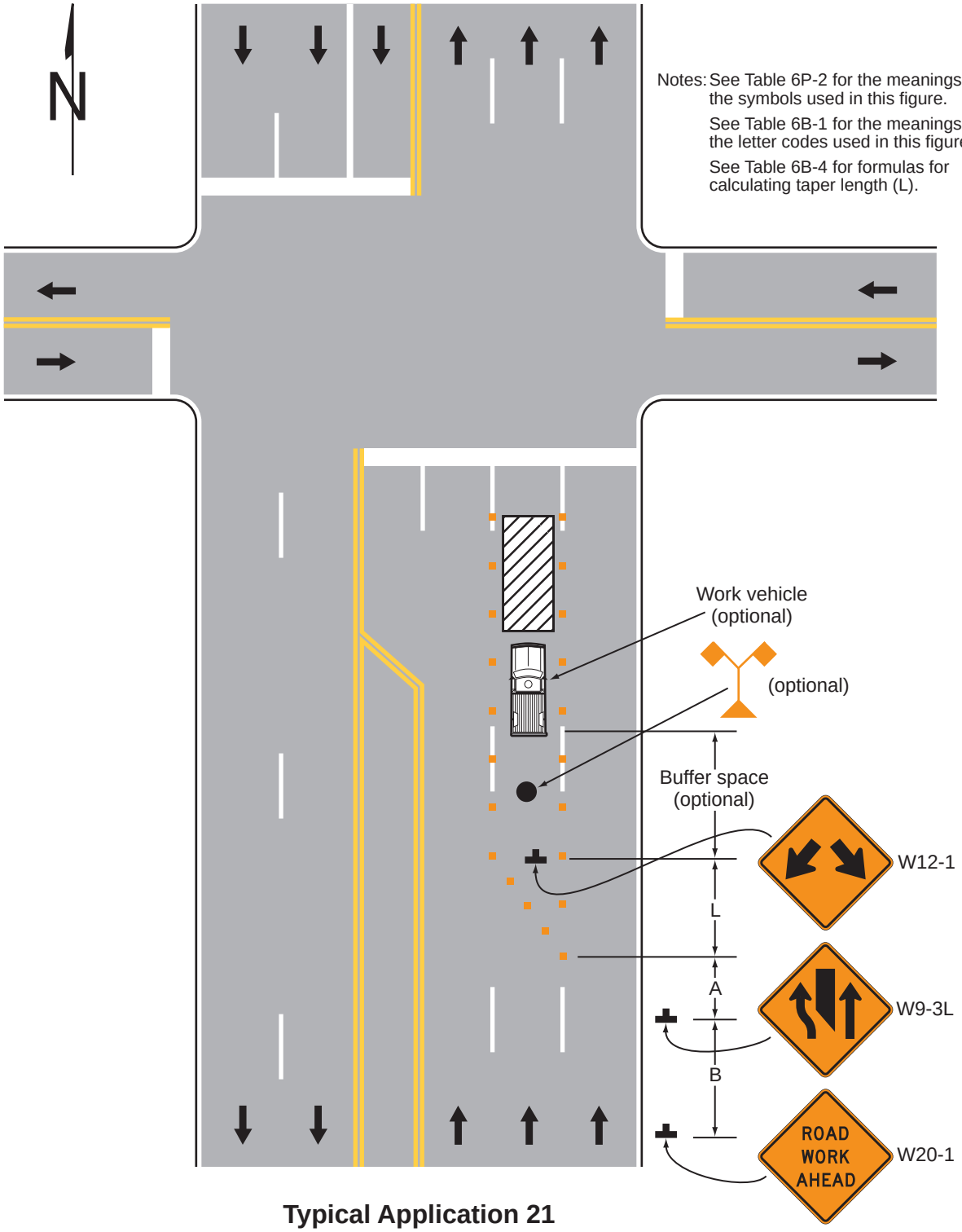
Typical Application 20

TABLE 6-5: NON-TRUNK LINE DETOUR SIGNING DESIGN GUIDELINES

Detour Duration	Non-Trunk Line Detour	
	Signing	**Example** (*all road name signs to be paid for as Sign Type B Special)
< 24 hours	• M4-9 (R) (L) - Detour Sign with appropriate directional arrow at each decision point. • Or portable changeable message boards (6.04.04 Section C)	
24-72 hours	• M4-9 (R) (L) - Detour Sign with Road Name Plaque and appropriate directional arrow at each decision point. • Or portable changeable message board (6.04.04 Section C)	
> 72 hours	• M4-9 (R) (L) (U) - Detour Sign with Road Name Plaque and appropriate directional arrow at each decision point near right and far left corners of the intersection. • M4-9 (UL) (UR) - to be placed in advance of each turn. • An "up" pull through arrow should be required after each major intersection, and should be considered after each turn decision point.	

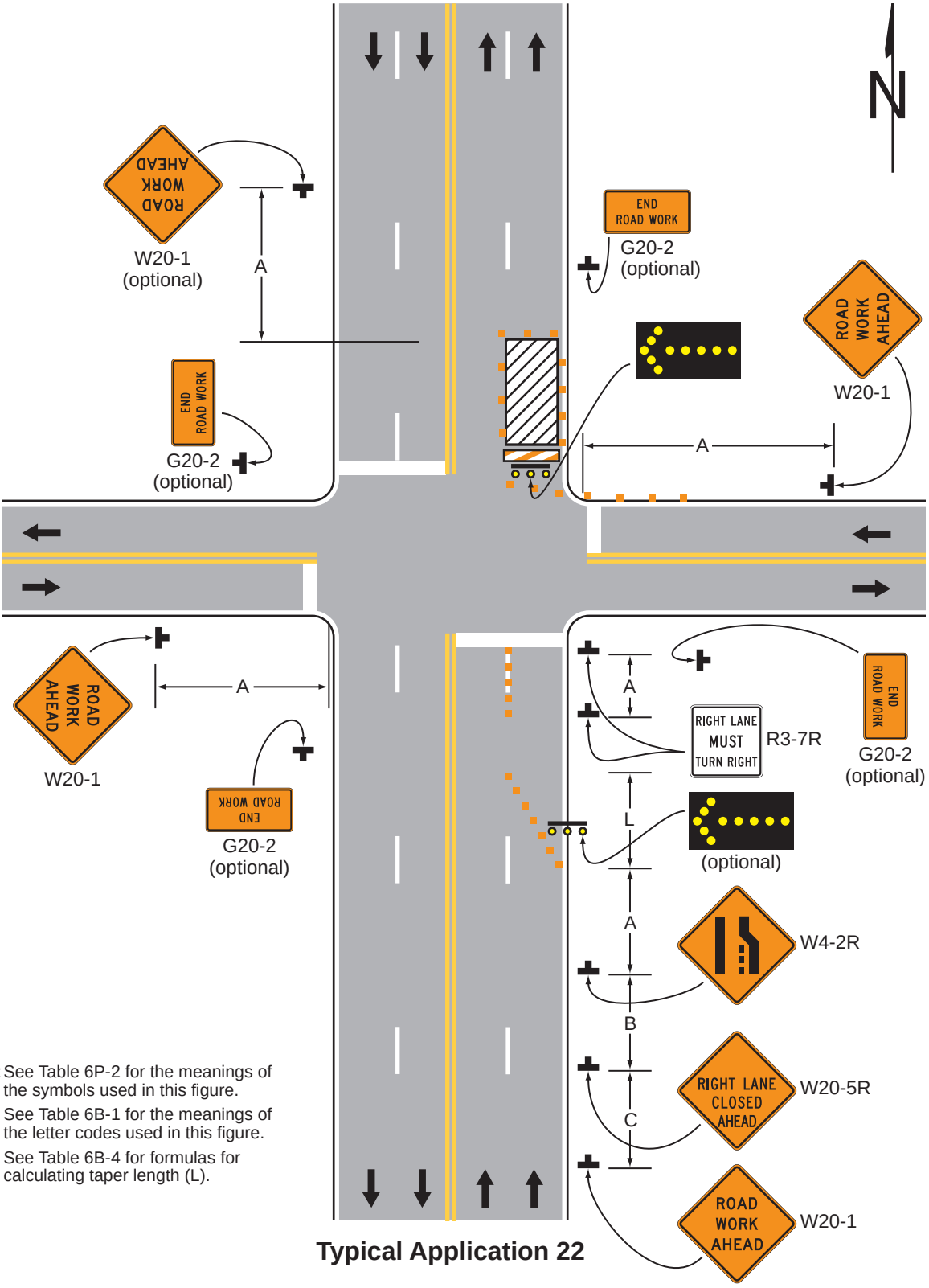
Source: MDOT Work Zone and Mobility Manual

Figure 6P-21. Lane Closure on the Near Side of an Intersection (TA-21)



Typical Application 21

Figure 6P-22. Right-Hand Lane Closure on the Far Side of an Intersection (TA-22)



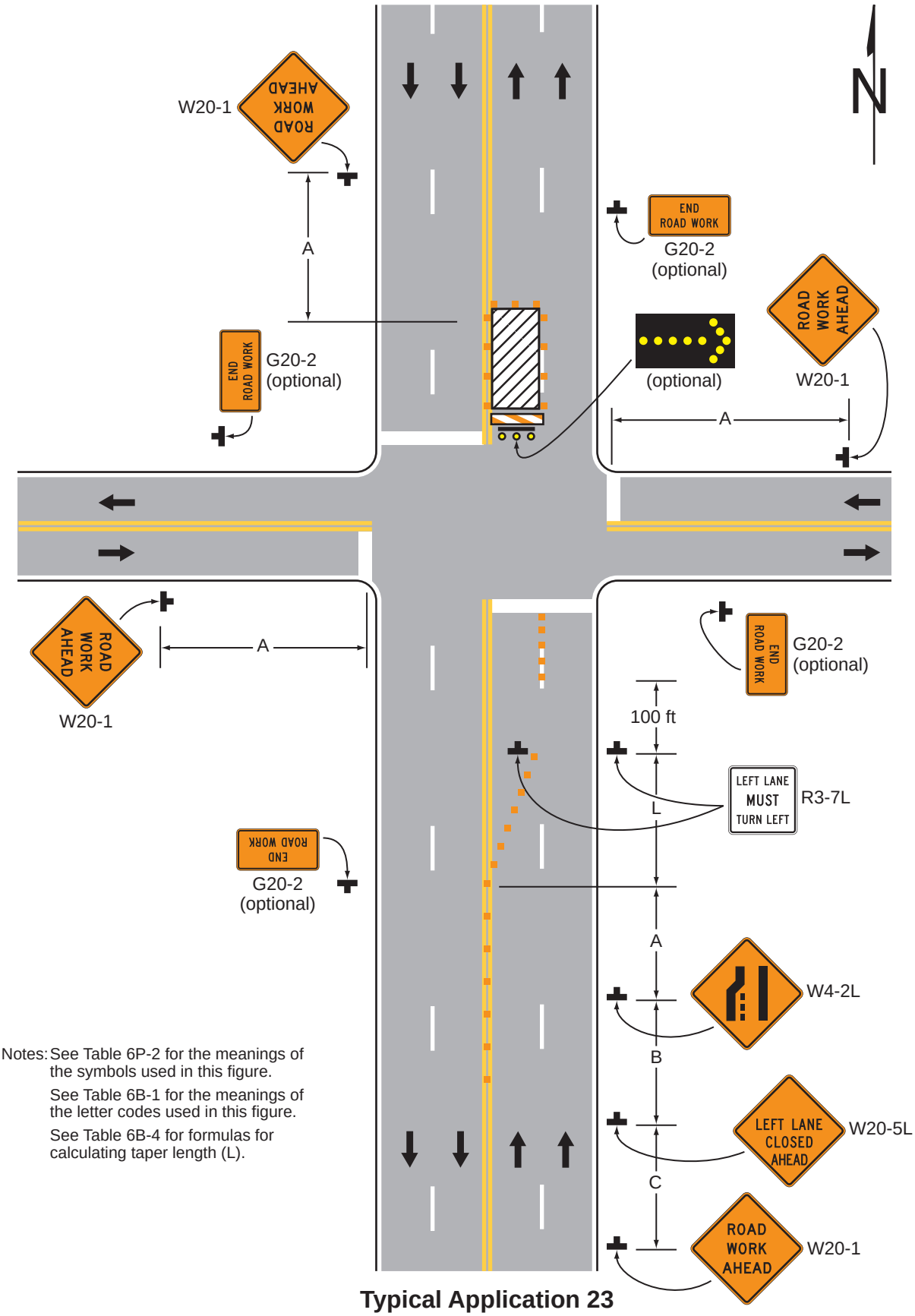
Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 22

Figure 6P-23. Left-Hand Lane Closure on the Far Side of an Intersection (TA-23)



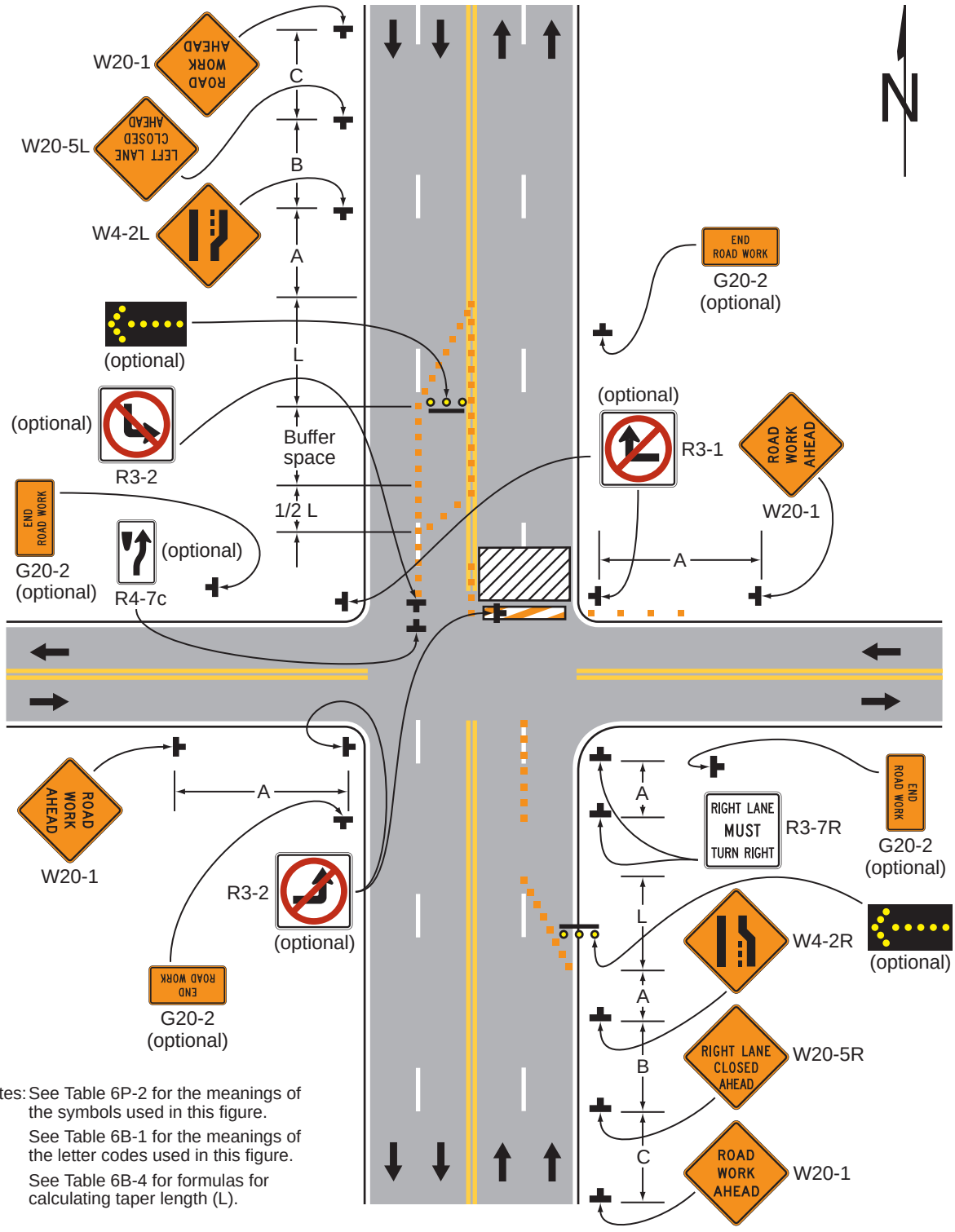
Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 23

Figure 6P-24. Half Road Closure on the Far Side of an Intersection (TA-24)



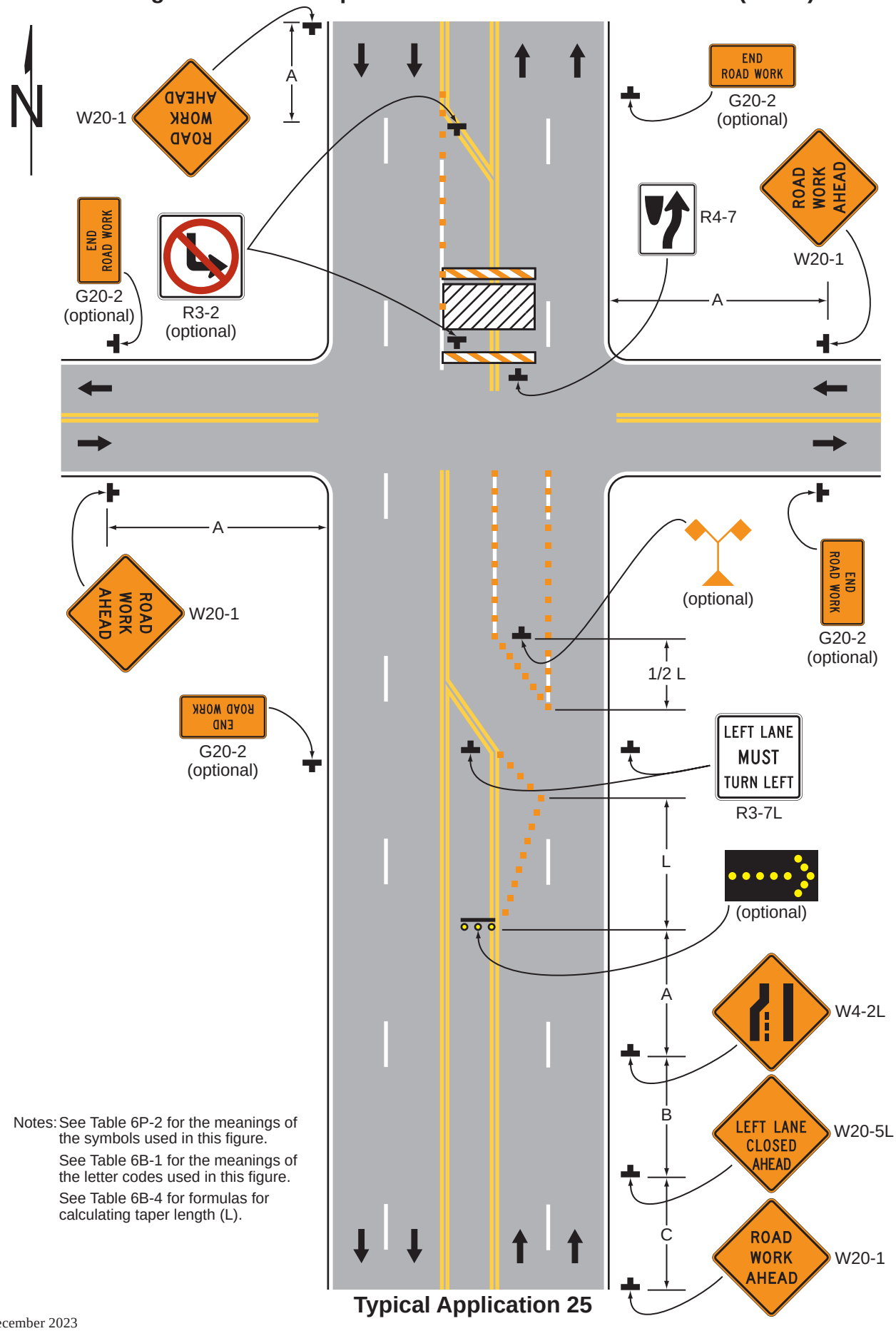
Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 24

Figure 6P-25. Multiple Lane Closures at an Intersection (TA-25)



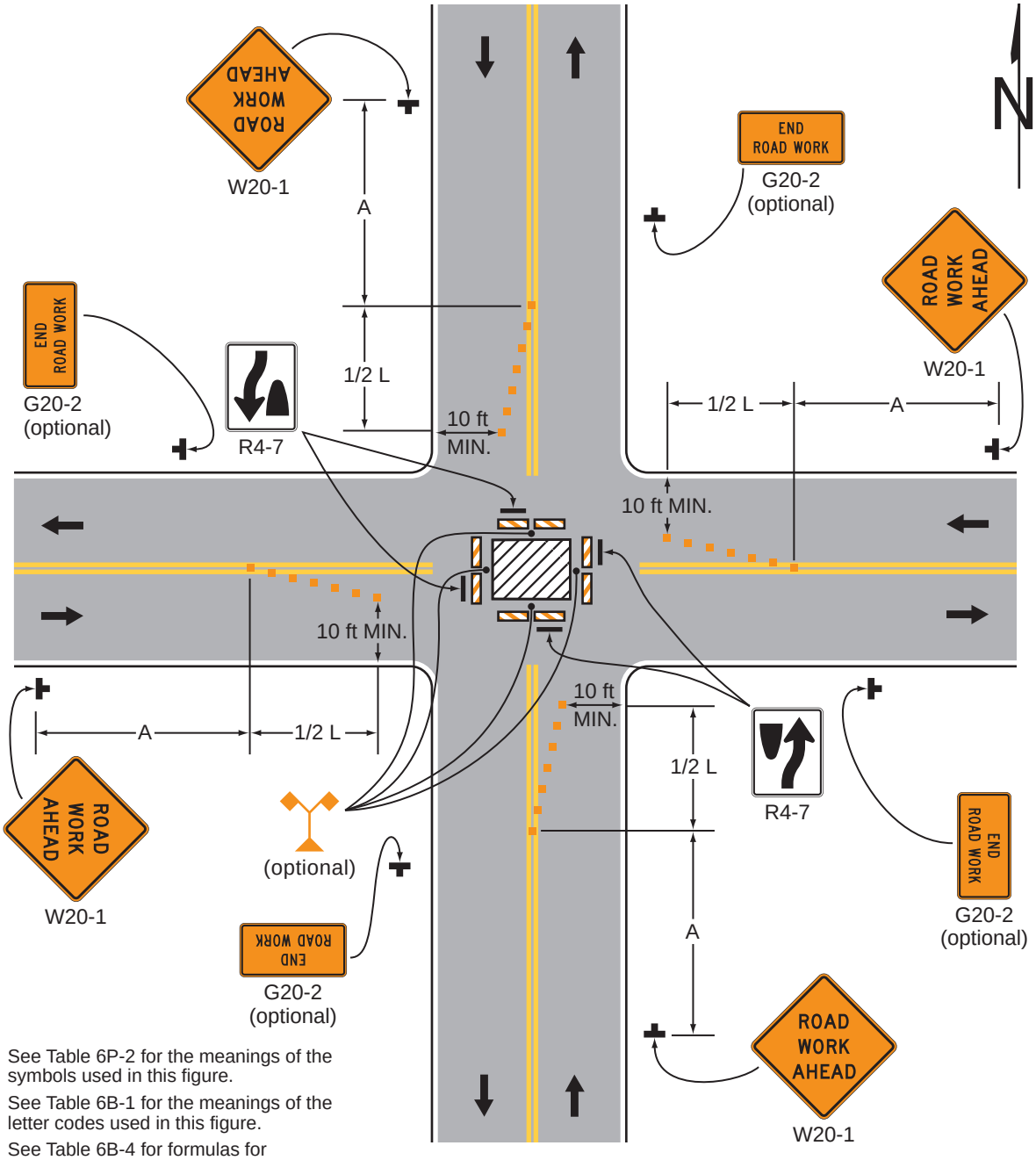
Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 25

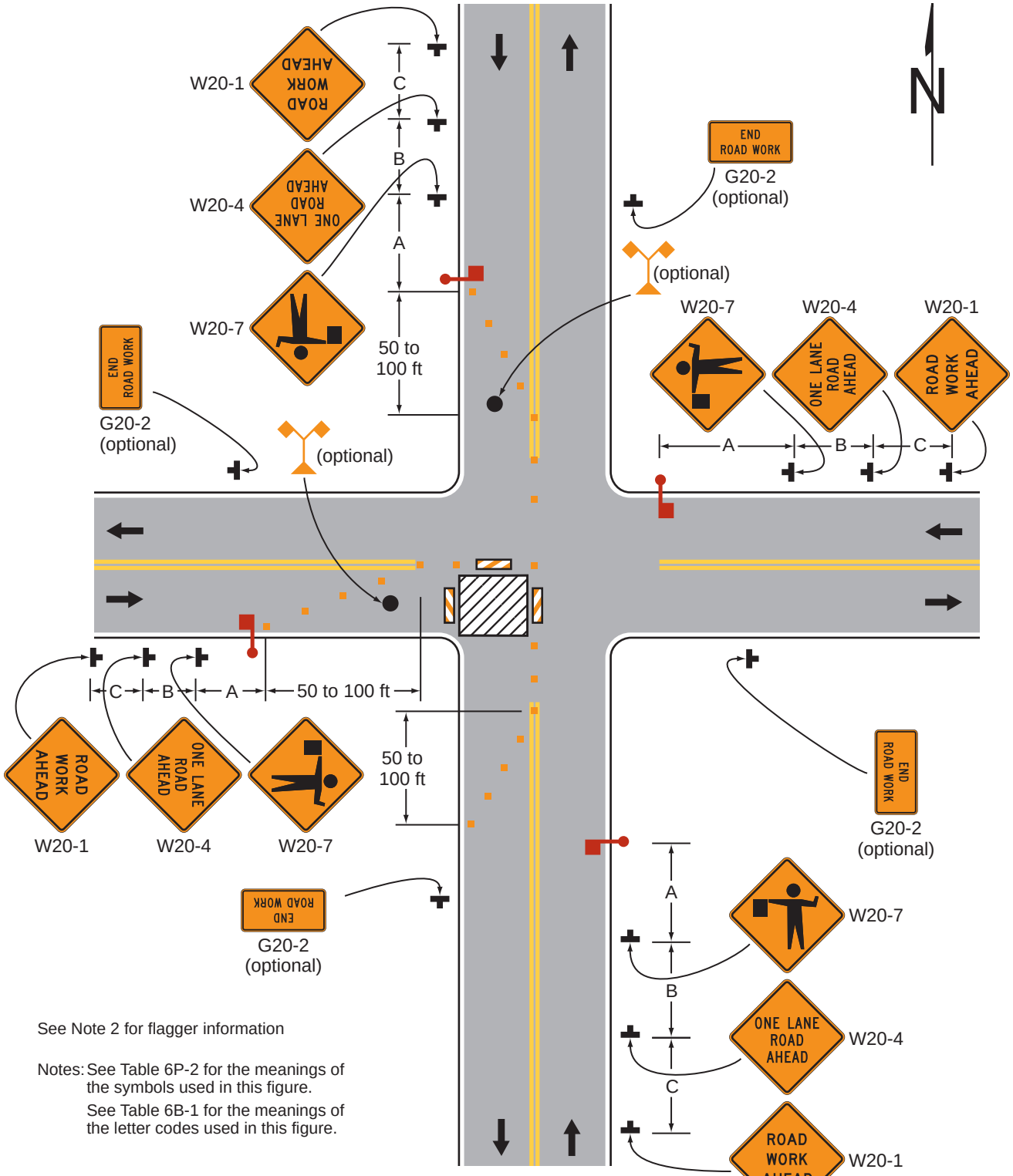
Figure 6P-26. Closure in the Center of an Intersection (TA-26)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.
See Table 6B-4 for formulas for calculating taper length (L).

Typical Application 26

Figure 6P-27. Closure at the Side of an Intersection (TA-27)



See Note 2 for flagger information

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.

See Table 6B-1 for the meanings of the letter codes used in this figure.

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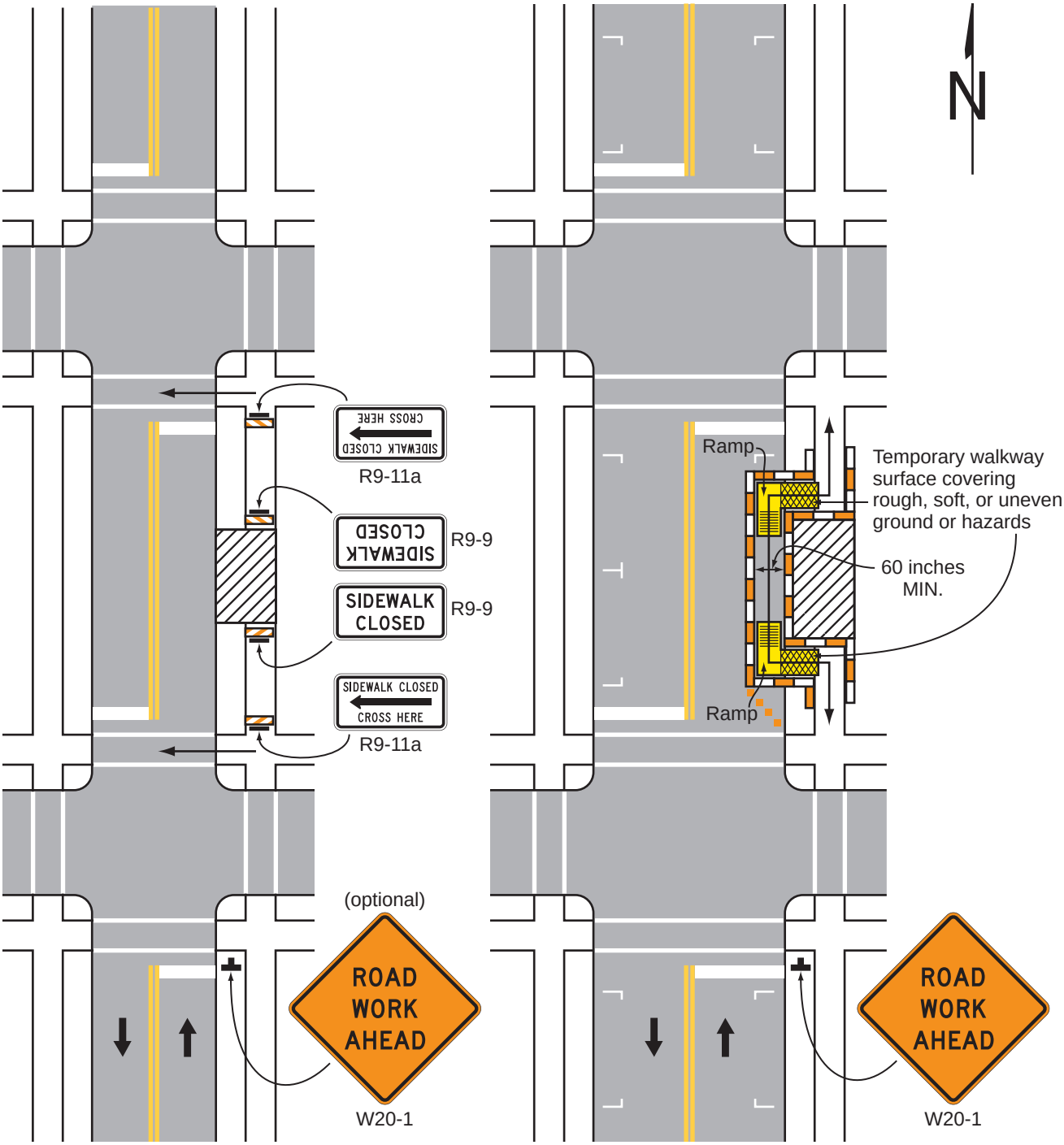
Figure 6P-28. Sidewalk Detour or Diversion (TA-28)



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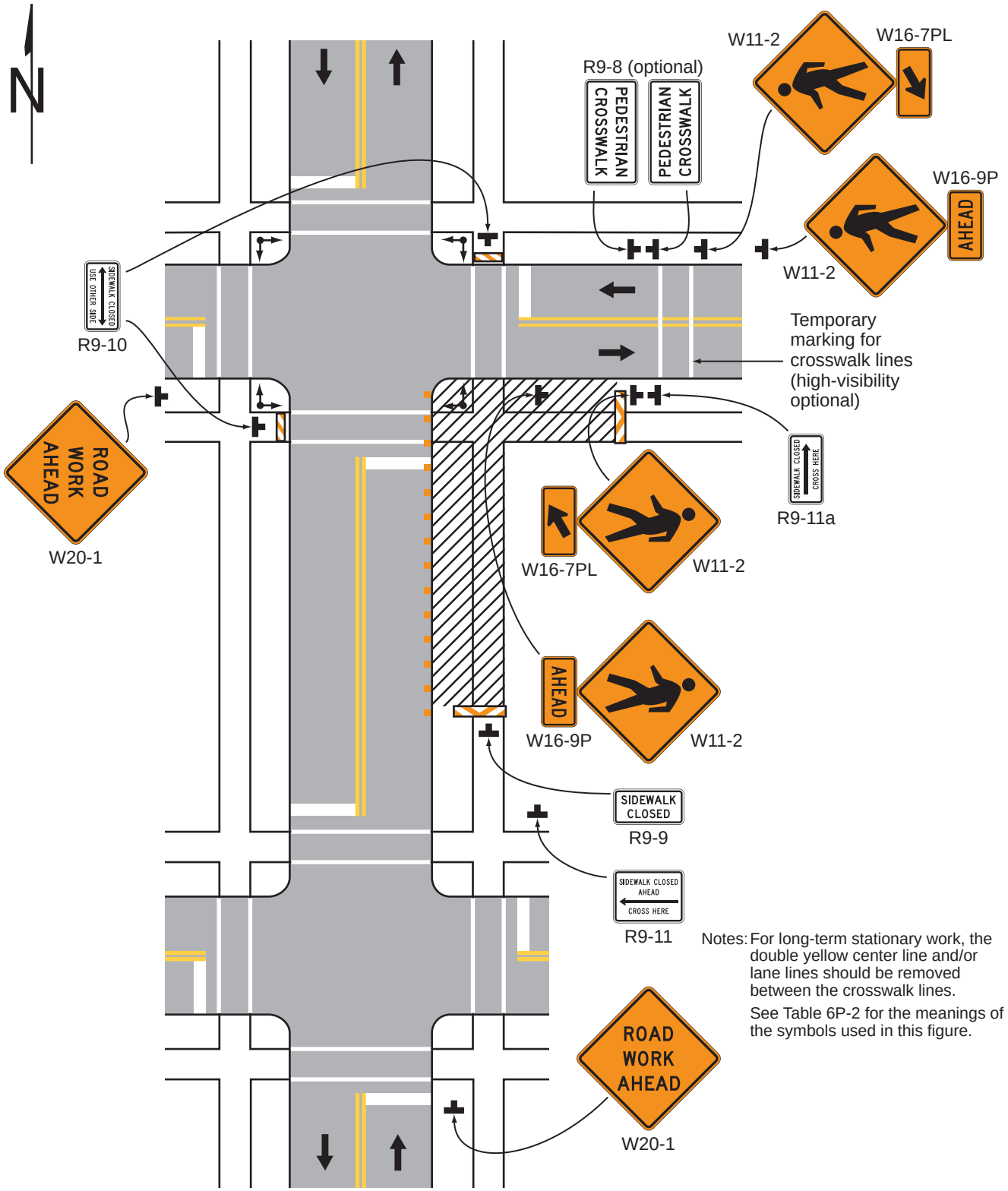
Note: SeeTable 6P-2 for the meanings of the symbols used in this figure.

Figure 6P-29. Crosswalk Closures and Pedestrian Detours (TA-29)



Notes: For long-term stationary work, the double yellow center line and/or lane lines should be removed between the crosswalk lines.

See Table 6P-2 for the meanings of the symbols used in this figure.

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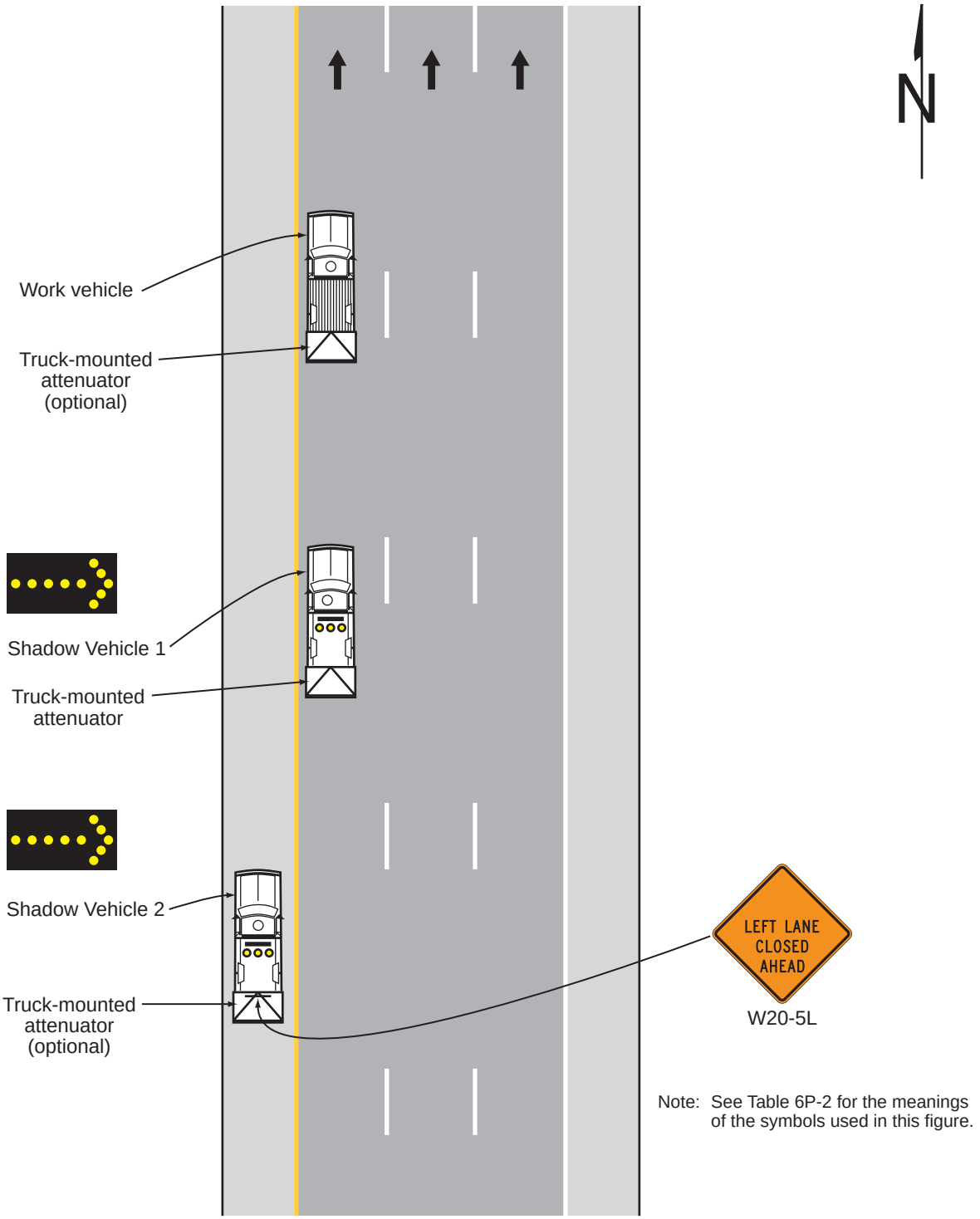
Figure 6P-35. Mobile Operation on a Multi-Lane Road (TA-35)



Note: See Table 6P-2 for the meanings of the symbols used in this figure.

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