

# Introduction



- Field Manual is a chapter of Part 6 of the Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD)
- Typical layouts for temporary traffic control (TTC), 3 Days or less

# Compliance Levels

- Shall:
  - Indicates a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device
- Should:
  - Indicates a statement of recommended practice, but not mandatory, in typical situations, with deviations allowed if engineering judgement or engineering study indicates the deviation to be appropriate
- May:
  - Indicates a statement of practice that is a permissive condition and carries no requirement or recommendation

# New or Modified Definitions-Glossary

- Alternate Pedestrian Routes (APR) & Temporary Pedestrian Access Route (TPAR)
- Clear Zone
- Deadheading
- Fixed Object
- Drivable
- Lane Width
- Spotter
- Urban Street

# Glossary

- Advance Warning Area

The area of a TTC zone used to inform the motorist what to expect ahead. This area may contain devices ranging from a single sign or vehicle warning light on a vehicle to a series of signs and the use of a portable changeable message sign (PCMS). The location of the TTC zone is dependent upon its visibility to motorists. Good visibility is achieved where the sight distance is sufficient to meet the Decision Sight Distance

# Glossary

## Alternate Pedestrian Route (APR)

- A temporary pedestrian facility created to replace an existing facility impacted by a work zone. The APR must contain accessibility features consistent with the features present in the impacted facility.

## Average Daily Traffic (ADT)

- The average 24-hour volume of traffic during a stated time period divided by the number of days in that period.

- **Duration** -The length of time any work operation occupies a specific location or causes a traffic obstruction without changing the location. This time is measured from the first disruption to traffic until the total clearing of the area.
- **Mobile** - when an operation is continuously moving or stopped in one location for periods of 15 minutes or less.
- **Short Duration** - when an operation stays in one location during daylight conditions from 15 minutes to 1 hour.
- **Short Term** - when an operation stays in one location during daylight conditions from 15 minutes to twelve hours.
- **Intermediate Term/Night** - when an operation stays in one location during daylight conditions from 15 minutes to no more than three days, or stays in one location during hours of darkness.
- **Long Term** - when an operation stays in one location for more than three days

# TTC General Guidelines and Responsibilities



- Be trained for the work you are doing
- Protect the work space
- Safely direct traffic
- Keep devices clean and in position
- **Perform and document routine day and night inspections**

# Permission to Work Within the Right-of-Way



- Obtain a permit from the road authority
- Any work requiring traffic control to extend across a railroad right-of-way requires coordination with the railroad authority

# Selecting the Appropriate Layout

- Roadway designations are:
- Low Volume Rural & Urban
- Two-Lane, Two-Way
- Two-Way Continuous Left Turn Lanes
- Multi-Lane Undivided
- Multi-Lane Divided



# Selecting the Appropriate Layout

- Continuity for existing road users (vehicles, pedestrians, and/or bicyclists) needs to be provided by the TTC



# Enhancement of the TTC Layouts

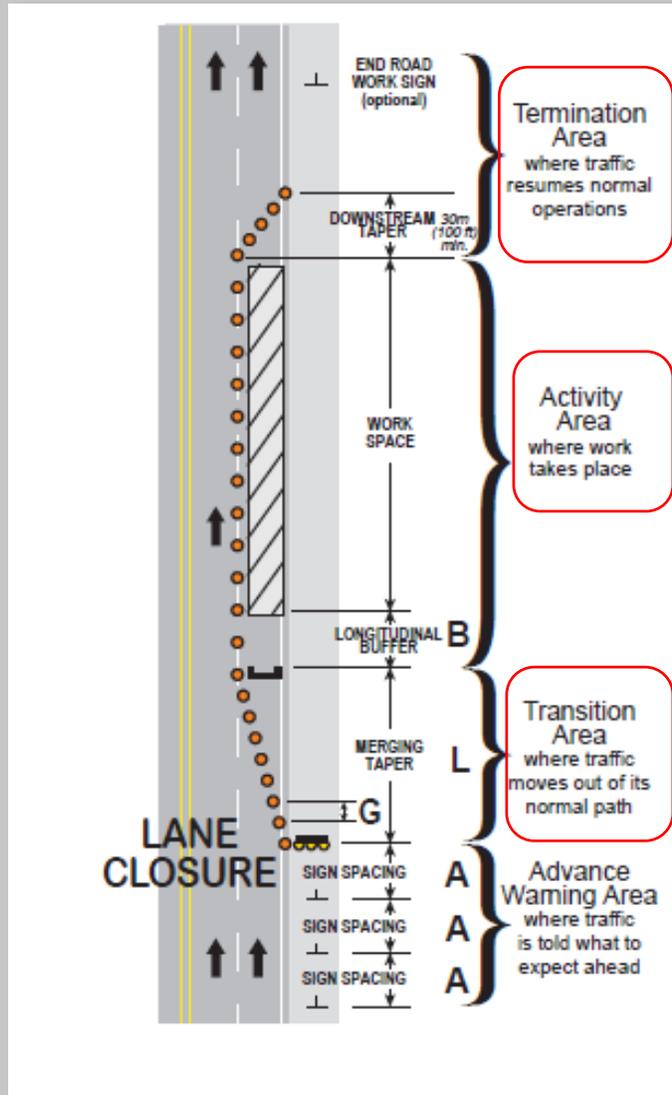
- Additional Personnel
  - Spotters
  - Law Enforcement
  - Multiple Flaggers
- Additional Devices
  - Protection Vehicles
- Lateral Buffer Space or Closing an Additional Lane
- Closing Shoulders with Shoulder Tapers and/or Protection Vehicles
- Lighting
  - Sequential Lighting

# Installing the TTC Zone

- A lane width of 10 feet **should** be provided, anything less **shall** be approved by the road authority
- Routine inspections should be performed and documented



# Removing the TTC Zone



- Remove devices in opposite order, especially devices in the **termination, activity and transition areas**



# Removing the TTC Zone



- **Devices in the advance warning area may be removed in the order they were installed**
- Alternatively, a **Mobile Lane Closure** may be used to remove the TTC devices in the order that they were installed

# Crossing Live Lanes of Traffic

- Personnel may cross live traffic lanes only if it is safe, consider geometry and volume
- At a **walking pace**



# Roadside Safety

- **Provide clear zones where practical**
- **Work equipment, worker vehicles, materials, and debris stored to reduce probability of impact by run-off-road vehicles**



# Glossary

## Clear Zone

The work zone clear zone is the unobstructed (clear of obstructions, hazards, or fixed objects), relatively flat area impacted by construction that extends outward from the edge of the traveled way. Because of the limited horizontal clearance available and the heightened awareness of motorists through work zones, recommended clear zones are less than those for the non-construction conditions.

**Table 6K-1: Recommended Clear Zones**

Speed (mph)	Width (ft)
60 or greater	30
45-55	20
40	15
35 or less	10

# Roadside Safety



- **Lateral offset to obstruction of 1.5 feet behind curb face used in urban areas**
- **When work not active, hazards or fixed objects should not be in clear zone or lateral offset to obstruction**
- **If not practical, shield; if that's not practical, delineate**

# Marking Hazards

- Repair damaged infrastructure as soon as possible
- Mark hazards with either a Type I or Type II barricade with a Type A flashing warning light or Drums
- Cones may be used in emergencies



# Marking Hazards



- If construction operations leave structures such as manhole covers exposed above or below grade, they should be marked so that drivers, bicyclists and pedestrians can avoid or slow down to minimize the hazard

### Checklist for Establishing a Temporary Traffic Control Zone

- Obtain permission from all affected road authority(ies).
- Determine the type of roadway.
- Determine the type of road users (vehicles, pedestrians, bicyclists).
- Determine the type of work space.
- Determine the duration of work.
- Select hours of work to avoid peak periods.
- Select the appropriate layout(s) using:  
Type of roadway, type of work, duration, traffic volume, speed, and impact on pedestrian and bicycle travel (see the appropriate Index Chart at the start of each section). Review all NOTES on Layout(s).
- Determine any modifications to typical layout(s) (see Enhancement of TTC Layouts on page 6K-m).
- Check Decision Sight Distance(s) (D).
- If possible, maintain access to intersections, parking areas, driveways (public and private), and mass transit.
- Coordinate with mass transit if needed.
- Allow for buffer space free of obstructions.
- Contact the road authority if the work zone interferes with normal signal operation in the area.
- Check the condition and orientation of devices (see Quality Standards, pages 6K-93 through 6K-108).
- Install devices beginning with the first device the driver will see.
- Conduct a drive through to check for problems, modify as needed.
- Document Temporary Traffic Control zone problems and major modifications to the layouts.
- Observe traffic to see if the TTC is working correctly.
- Remove, turn, or cover the devices as soon as work is suspended or completed.

Figure 6K-1

### SAMPLE PROJECT INSPECTION CHECKLIST

PROJECT - \_\_\_\_\_

ITEM	YES	NO	HOW MANY?
1. Are any devices missing?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Do any devices need repair?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Were all replaced or repaired?	<input type="checkbox"/>	<input type="checkbox"/>	_____
2. Are any lights (flashers, etc.) not functioning?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Were they all replaced or repaired?	<input type="checkbox"/>	<input type="checkbox"/>	_____
3. Are any devices improperly placed?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Were all positions corrected?	<input type="checkbox"/>	<input type="checkbox"/>	_____
4. Do any devices need cleaning?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Were all devices cleaned?	<input type="checkbox"/>	<input type="checkbox"/>	_____
ADDITIONAL COMMENTS ON THE BACK OF THIS FORM?	<input type="checkbox"/>	<input type="checkbox"/>	_____

The above check was completed by \_\_\_\_\_  
(name/title)

on \_\_\_\_\_ at \_\_\_\_\_  a.m.  p.m.  
(date) (time)

Figure 6K-2

# Temporary Traffic Control Devices

- Trailer Mounted Devices (Arrow Boards & PCMS) shall be installed per Layout 7
- When not in use these devices should not be stored on the shoulder



# Acceptable High Visibility Clothing

- ANSI/107-2004
- ANSI/107-2010
- ANSI/ISEA 107-2015 Type R
- Clothing shall have an **attached original label** indicating performance class
- In areas where a hardhat isn't required, a **High Visibility hat should be worn**



# Vehicle Warning Lights

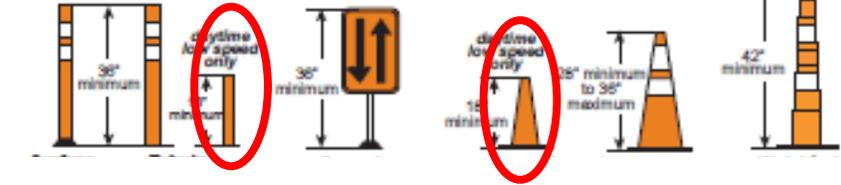
- Vehicle warning lights shall be visible 360° at a minimum height of 3 ½ feet and a radius of 60 feet or greater



# Channelizing Devices

## TYPE A CHANNELIZERS

- Type A channelizing devices are typically used in attended Temporary Traffic Control zones.



## TYPE B CHANNELIZERS

- Channelizers used on high speed roadways shall have a minimum of 270 square inches of retroreflective area facing road users.
- Orange diagonals shall slope down toward the traffic side.
- Type B channelizing devices shall be used if the Temporary Traffic Control zone will be installed for more than 12 hours or if it is left unattended. Weighted channelizers may be used in lieu of a Type B channelizer with the permission of the road authority.
- Type A Flashing Warning Lights may be used - place on the side with traffic.

## TYPE C CHANNELIZER

- Orange diagonals shall slope down toward the traffic side.
- Signs mounted on Type III barricades should not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.
- Type A Flashing Warning Lights may be used - place on the side with traffic.



Types of Channelizing Devices  
Figure 6K-3

# Work Zone Signing

- Any portable sign or barricade placed in a pedestrian walkway that could be a hazard to a visually impaired person should have a detectable edge to guide people around the hazard



**Detectable Edge**  
for Portable Sign Stand

# Work Zone Signing

- Advisory plaques shall be placed directly below or on the lower side of sign nearest traffic



**W8-15P**  
**Motorcycle**  
**Plaque**



**W7-3aP**



**W13-1P**

R1-1	R9-9	W4-2 (R or L) Transition Symbol
R1-2	R9-10	W5-1 RAMPS
R1-X3	R9-11 (R or L)	W6-4 Opposing Traffic Lane Divider
R2-1	R10-6 (R or L)	W7-3aP
R2-6bP	R11-2 STREET RAMP BIKE LANE	W8-1
R2-12	R11-4	W8-1a
R3-1	W1-4 (R or L) Reverse Curve	W8-2
R3-2	W1-6 One Direction Large Arrow (R or L)	W8-7
R3-5 (R or L)	W3-1 Stop Ahead	W8-8
R3-7	W3-2 Yield Ahead	W8-9
R3-18	W3-3 Signal Ahead	W8-11
R4-7c	W3-4	W8-15
R4-11	W3-5 Speed Reduction	

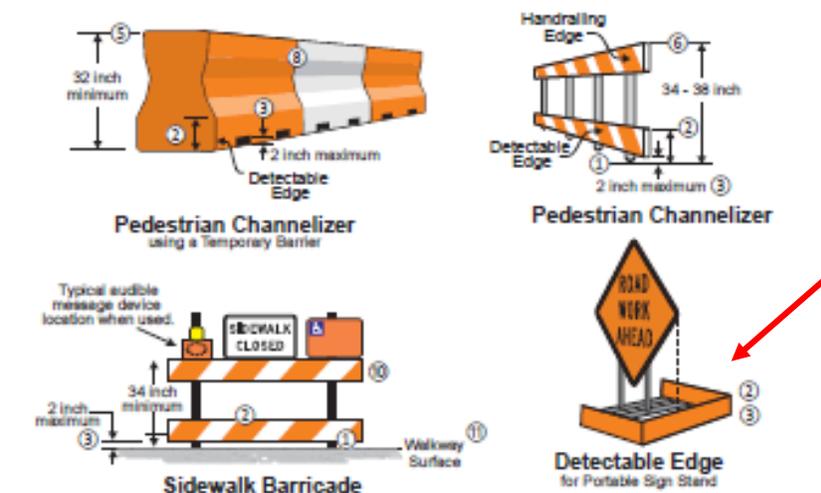
For additional signs and information on typical sizes and usage, see the [Minnesota Manual on Uniform Traffic Control Devices](#).

Sign Codes Quick Reference  
Figure 6K-4

W8-15P Motorcycle Plaque	W20-1a	W20-X17
W8-23	W20-3	W20-X18
W8-24	W20-4	W20-X19
W12-1 Double Arrow	W20-7 Flagger Ahead	W20-X20
W13-1P	W20-100P Distance Plaque FEET	W20-X21
W13-4P	W20-X3 (R or L)	W21-1a Worker Ahead
W14-1	W20-X5 LEFT CENTER 1000 FT 1/2 MILE BIKE	W21-X3 Large Arrow (Variable Arrow Angle)
W14-2	W20-X10	W21-X4a LEFT CENTER RAMP SHOULDER
W14-X12	W20-X11 Reduced Width	W21-X5 LEFT CENTER BIKE
W14-X13	W20-X12	W21-X5a
W16-7P (R or L)	W20-X13 (R or L)	W20-1
W20-1	W20-X16	W21-X6

For additional signs and information on typical sizes and usage, see the [Minnesota Manual on Uniform Traffic Control Devices](#).

Sign Codes Quick Reference  
Figure 6K-4



## NOTES:

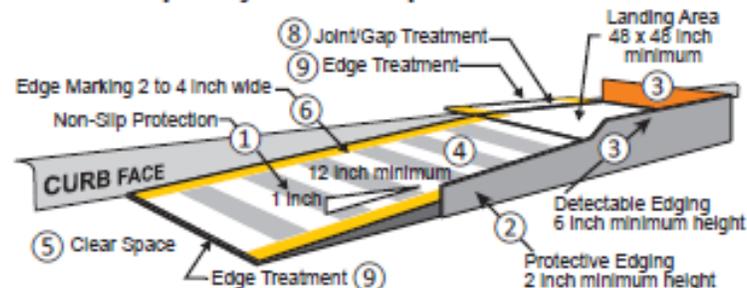
- To prevent any tripping hazard to pedestrians, ballast shall be located behind or internal to the device. Any support on the front of the device shall not extend into the 48 inch minimum walkway clear space and shall have 0.5 inch maximum height above the walkway surface with approved beveling (see Note #9 on page 6K-aa for beveling details).
- Detectable edges for long canes shall be continuous and 6 inches minimum above the walkway surface and have color or markings contrasting with the walkway surface. The detectable edge around a portable sign stand should be placed in the walkway area in which the sign poses a hazard to a visually impaired pedestrian.
- Devices shall not block water drainage from the walkway. A gap height or opening from the walkway surface up to 2 inch maximum height is allowed for drainage purposes.
- Railings or other objects may protrude a maximum of 4 inches into the walkway clear space when located 27 inches minimum above the walkway surface.
- Longitudinal channelizing devices for pedestrians shall be 32 inches high or greater.
- When hand guidance is required, the top rail or top surface shall be:
  - In vertical plane perpendicular to the walkway above the detectable edge,
  - Continuous at a height of 34 to 38 inches above the walkway surface, and
  - Supported with minimal interference to the pedestrian's hands or fingers.
- All devices shall be free of sharp or rough edges and fasteners (bolts) shall be rounded to prevent harm to hands, arms, or clothing.
- All devices used to channelize pedestrian flow should interlock such that gaps do not allow pedestrians to stray from the channelized path.
- Any pedestrian devices used to provide positive protection (traffic or hazard) for pedestrians or workers shall meet crashworthy requirements appropriate for the barriers' application.
- Barricades shall be used to close the entire width of the walkway surface.
- A walkway surface shall be firm, stable, and slip resistant.

Refer to the MnDOT website [Pedestrian Accommodations Through Work Zones](http://www.dot.state.mn.us/trafficeng/workzone/apr.html) for more information (<http://www.dot.state.mn.us/trafficeng/workzone/apr.html>).

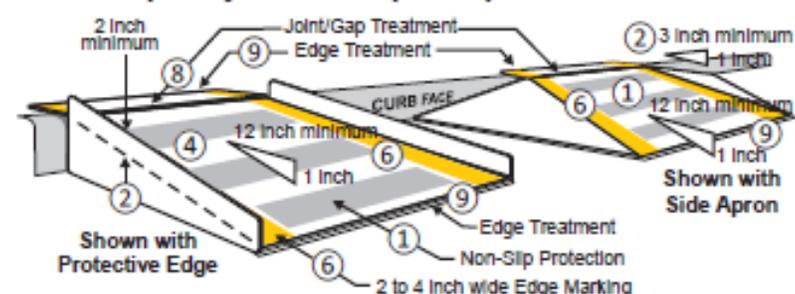
Typical TPAR Devices  
Figure 6K-5

6K-z

## Temporary Curb Ramp - Parallel to Curb



## Temporary Curb Ramp - Perpendicular to Curb



## NOTES:

- Curb ramps shall be 48 inches minimum width with a firm, stable, and non-slip surface.
- Protective edging with a 2 inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of 6 inches or greater or has a side apron slope steeper than 1:3 (33%). Protective edging should be considered when curb ramps or landing platforms have a vertical drop of 3 inches or more.
- Detectable edging with 6 inches minimum height and contrasting color shall be installed on all curb ramp landings where the walkway changes direction (turns).
- Curb ramps and landings should have a 1:50 (2%) max cross-slope.
- Clear space of 48 x 48 inches minimum shall be provided above and below the curb ramp.
- The curb ramp walkway edge shall be marked with a contrasting color 2 to 4 inch wide marking. The marking is optional where color contrasting edging is used.
- Water flow in the gutter system shall have minimal restriction.
- Lateral joints or gaps between surfaces shall be less than 0.5 inches in width.
- Changes between surface heights should not exceed 0.5 inches. Lateral edges should be vertical up to 0.25 inches high, and beveled at 1:2 between 0.25 inches and 0.5 inches in height.

Refer to the MnDOT website [Pedestrian Accommodations Through Work Zones](http://www.dot.state.mn.us/trafficeng/workzone/apr.html) for more information (<http://www.dot.state.mn.us/trafficeng/workzone/apr.html>).

Typical TPAR Devices  
Figure 6K-5

6K-aa

# Portable Changeable Message Signs (PCMS)



- The PCMS shall use days of the week not calendar dates unless the PCMS is placed 7 days or greater in advance

Table 6K-3: Abbreviations Allowable on PCMS(s)

Emergency Word Message	Standard Abbreviation	Typical Prompt Word that Precedes the Abbreviation	Typical Prompt Word that Follows the Abbreviation
Access	ACCS	PARKING, STADIUM	ROAD
Afternoon/Evening	PM	---	---
Ahead	AHD	FOG	---
Alternate	ALT	---	ROUTE, ACCESS
Avenue	AVE, AV	---	---
Bicycle	BIKE	---	---
Blocked	BLKD	LANE, ROAD	---
Boulevard	BLVD*	---	---
Bridge	BR	(NAME)*	---
Cannot	CANT	---	---
Center	CNTR	---	LANE
Center (as part of a place name)	CTR	---	---
Chemical	CHEM	---	SPELL
Circle	CIR**	---	---
Closed	CLSD, CLOSD	---	---
Condition	COND	TRAFFIC	---
Congested	CONG	TRAFFIC	---
Construction	CONST	---	AHEAD
County Road Numbered Route	CR	---	ROUTE DESIGNATION*
Court	CT**	---	---
Crossing (other than highway-rail)	X-ING	---	---
Do Not	DONT	---	---
Downtown	DWNTN	---	TRAFFIC
Drive	DR**	---	---
East	E	---	---
Eastbound	E, E-BND, EB	---	---
Emergency	EMER	---	---
Entrance, Enter	ENT	---	---
Exit	EX	NEXT	---
Express	EXP	---	LANE

Table 6K-3: Abbreviations Allowable on PCMS(s), cont.

Emergency Word Message	Standard Abbreviation	Typical Prompt Word that Precedes the Abbreviation	Typical Prompt Word that Follows the Abbreviation
Expressway	EXPRS, EXPWY**	---	---
Feet	FT	---	---
Freeway	FRWY, FWY**	---	---
Friday	FRI	---	---
Frontage	FRNTG	---	ROAD
Hazardous	HAZ	---	DRIVING
Hazardous Material	HAZMAT	---	---
High Occupancy Vehicle	HOV	---	---
Highway	HWY	---	---
Highway-Rail Grade Crossing	RR XING	---	---
Hospital	HOSP	---	---
Hour(s)	HR, HRS	---	---
Information	INFO	---	---
International	INTL	---	---
Interstate Numbered Route	I	---	ROUTE DESIGNATION*
Junction/Intersection	JCT	---	---
Lane	LN, LA	RIGHT, LEFT, CENTER	---
Left	LFT, LF, L	---	---
Local	LOC	---	TRAFFIC
Lower	LWR	---	LEVEL
Maintenance	MAINT	---	---
Major	MAJ	---	CRASH
Maximum	MAX	---	---
Mile(s)	MIL	---	---
Miles Per Hour	MPH	---	---
Minnesota Numbered Route	MN	---	ROUTE DESIGNATION*
Minimum	MIN	---	---
Minor	MNR	---	CRASH

Table 6K-4: Unacceptable PCMS Abbreviations

Abbreviation	Intended Word	Common Misinterpretation
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Poll
RED	Reduce	Red
STAD	Stadium	Standard
TH	Trunk Highway	Misunderstood

## Operating Mode

Panel Display  
(Element layout for Type C panel shown.)

1. At least one of the following three modes shall be provided:

(Right arrow is shown,  
left arrow is similar)

## Flashing Arrow



Move/Merge Right

## Sequential Arrow



Move/Merge Right

## Sequential Chevron



Move/Merge Right

2. The following mode shall be provided:

## Flashing Double Arrow



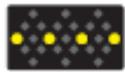
Move/Merge Right or Left

3. At least one of the following three modes shall be provided:

## Flashing Four Corners



## Flashing Bar



## Alternating Flashing Diamonds



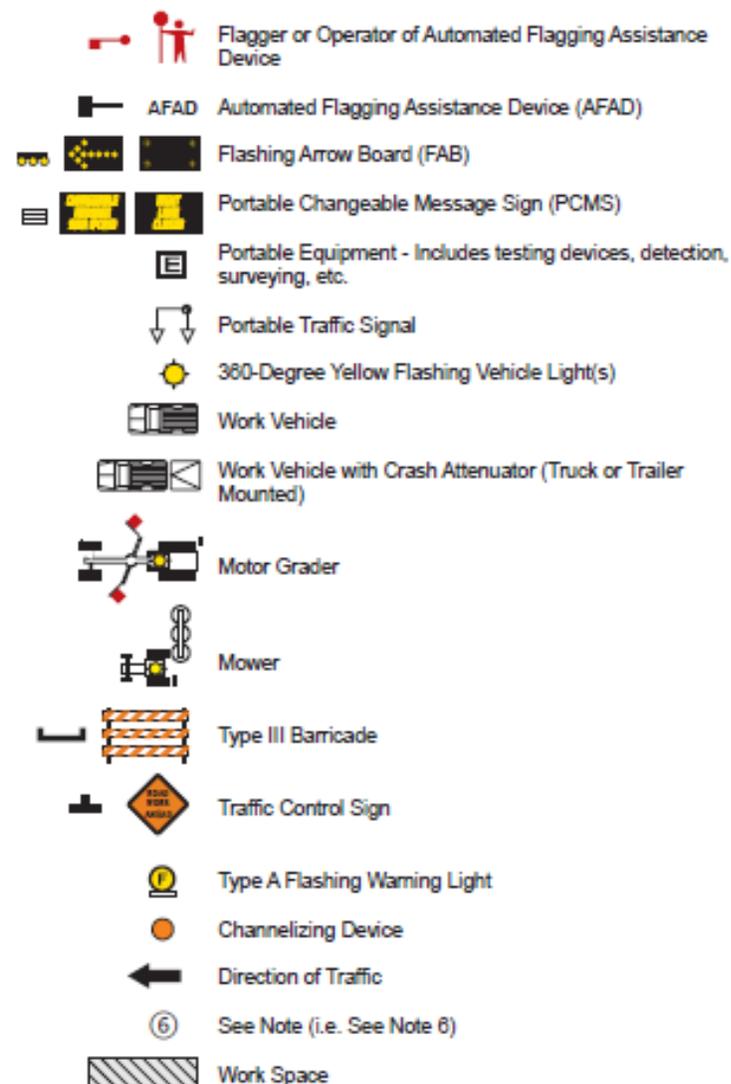
Caution

Panel Type	Minimum Size (Inches)	Minimum Legibility Distance (miles)	Minimum Number of Elements	Recommended Usage
A	48 x 24	0.50	12	Low Speed Streets
B	60 x 30	0.75	13	Anything not covered in A or C
C	96 x 48	1.00	15	Freeways and Expressways

## Arrow Stick



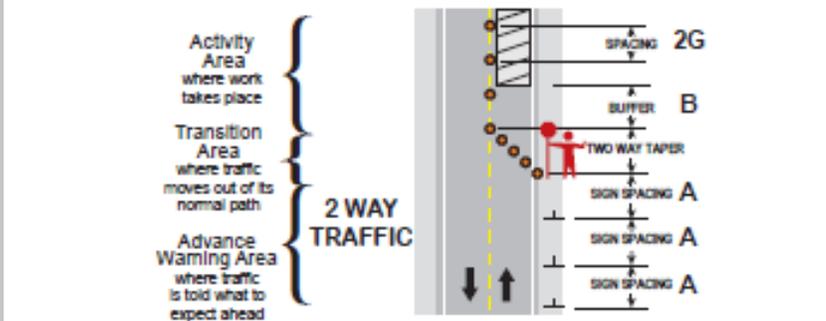
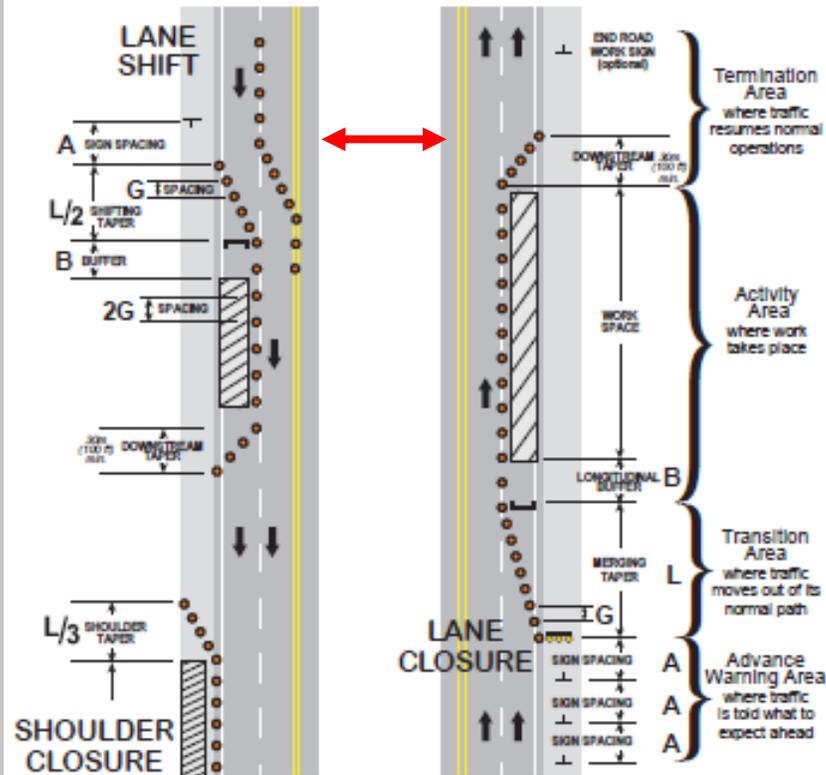
Arrow Sticks may supplement other TTC devices, but shall not be used in place of arrow boards.



## Symbols Used in Typical Layouts

Figure 6K-8

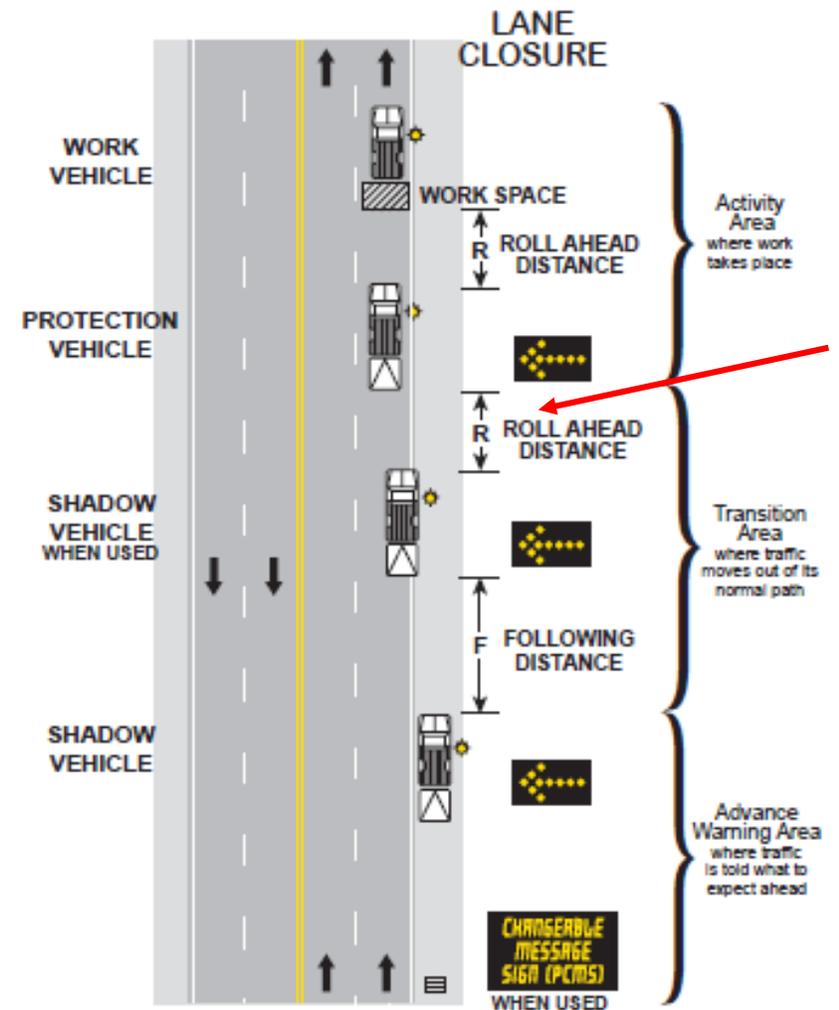
6K-am



Components of a Stationary Temporary Traffic Control Zone

Figure 6K-9

6K-an



Components of a Mobile Temporary Traffic Control Zone

Figure 6K-10

6K-ao

# Distance Charts

- At 30 mph, 100' spacing for Advanced Warning signs or truck
- Buffer Space in top row
- Roll Ahead Distance based on vehicle weight
- Wheels straight ahead on Shadow and Protection truck

Temporary Traffic Control Distance Charts

Posted Speed Limit Prior to Work Starting (mph)	Advance Warning Sign Spacing (A) feet	Decision Sight Distance (D) feet	Taper Length (12 ft lane) (L) feet	Shifting Taper (12 ft lane) (L/2) feet	Typical Shoulder Taper (L/3) feet	Buffer Space	
						(B) feet	
0-30	G = 26 ft.	100	550	200	100	75	200
36-40		325	700	325	175	125	305
46-60	G = 60 ft.	600	900	600	300	200	425
66		750	1200	700	350	250	500
80-86		1000	1400	800	400	275	650
70-76		1200	1600	900	450	300	820

Posted Speed Limit Prior to Work Starting (mph)	Advance Warning Following Distance (F) feet	Roll Ahead Distance Charts				
		Recommended Spacing for Vehicles Weighing 9,900 to 22,000 lbs GVW (R) feet		Recommended Spacing for Vehicles Weighing Greater than 22,000 lbs GVW (R) feet		
		Stationary Operation	Moving Operation 16 MPH max	Stationary Operation	Moving Operation 16 MPH max	
0-30	G = 26 ft.	100 - 550	100	100	75	100
36-40		325 - 700	100	100	75	100
46-60	G = 60 ft.	600 - 900	125	175	100	150
66		750 - 1200	125	175	100	150
80-86		1000 - 1400	175	225	150	175
70-76		1200 - 1600	175	225	150	175

Shadow and Protection Vehicle tires should be pointed straight ahead.

Temporary Traffic Control Distance Charts

Figure 6K-11