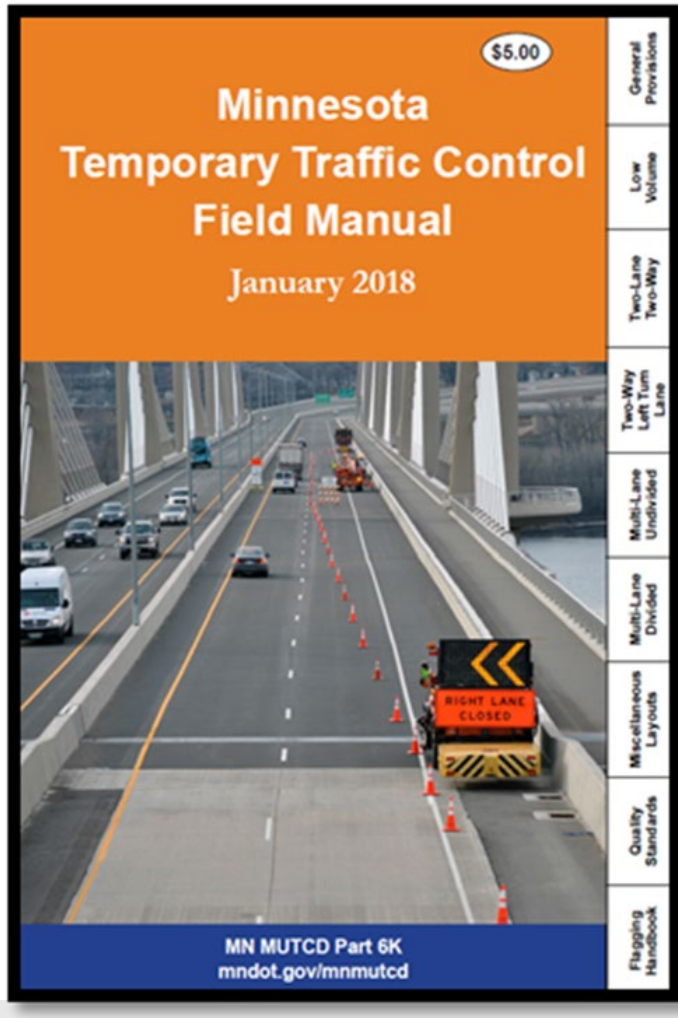
Field Manual Update

November 2018



Ken E. Johnson

State Work Zone, Pavement Marking & Traffic Devices Engineer

Spring 2018

DEPARTMENT OF TRANSPORTATION

What we'll answer today

- What is the Field Manual?
- Who was involved with the update?
- Important elements and key changes

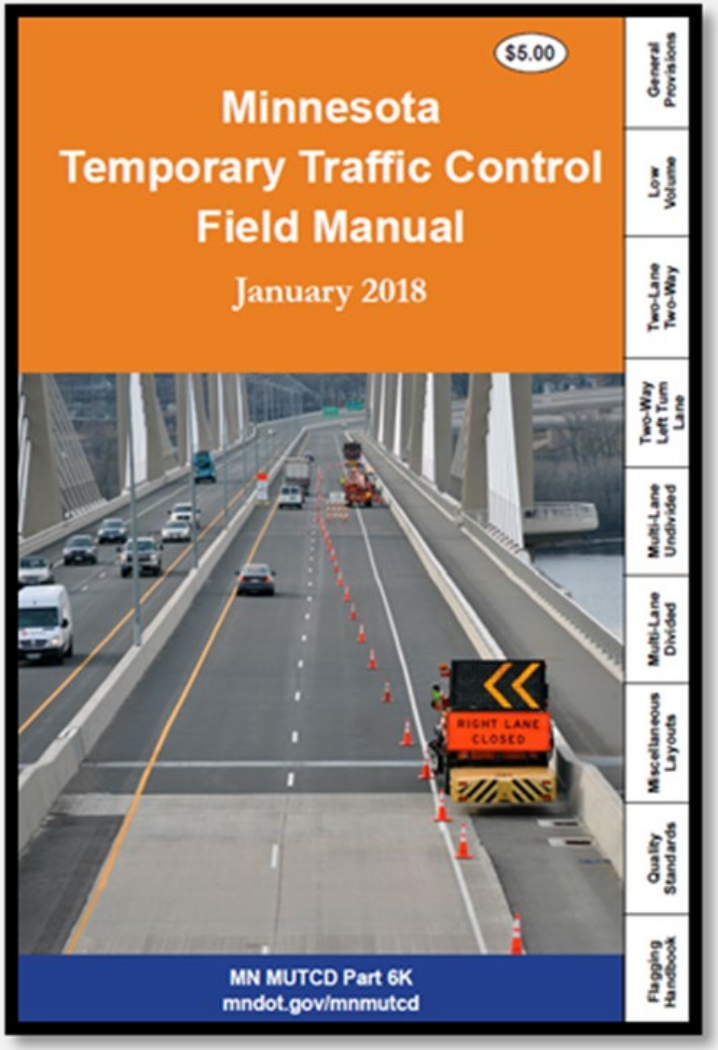
DEPARTMENT OF TRANSPORTATION

What is the Field Manual?

MN MUTCD

- Only engineering related manual required by statute
- Traffic control requirements for all roads open to the public
- Governed by the Minnesota Committee on Uniform Traffic Control Devices
- mndot.gov/mnmutcd
- Part 6 is **Temporary Traffic Control**

Field Manual



- Part 6K of the MN MUTCD
- Temporary Traffic Control requirements for 3 days or less
  - Or daily lane closures
- Beyond that – Temporary Traffic Control Plan needed

Field Manual 13.0 – Previous Versions

Field Manual Rewrite

- Started April 2016
- Participants

  MnDOT CO and Districts (Traffic, Construction, Maintenance)
  Washington County
  Hennepin County
  City of Eagan
  City of Bloomington
  City of Minneapolis
  City of Rochester
  State Aid
  Northland Chapter of the American Traffic Safety Services Association
  MN LTAP CTAP

New Sections!!

- ***Low Volume***
- ***Two-Way Left Turn Lane***
- Standards and Specs renamed ***General Provisions***
- ***Reordered layout numbers***

DEPARTMENT OF TRANSPORTATION

General Provisions Key Changes

Page Numbering

Engineering Judgment - the evaluation of available pertinent information, and the application of appropriate principles, standards, guidance, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.

Expressway - any multi-lane, divided highway for through traffic with partial control of access and generally with at-grade intersections.

Following Distance - the distance in a mobile operation between the shadow vehicl- and the work vehicle. It is used to provide advance warning to traffic that sc
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6K-iv

Freewa
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High S
hour or higher.

Lane Closure - a closure of one or more lanes of the roadway to traffic. Work operations that restrict adjacent lane width should consider various lane closure alternatives depending upon volume and speeds on the roadway.

Lane Width - for traffic control purposes, a minimum lane width of 10 feet shall be provided.

Lateral Buffer Space - the space that separates the traffic space from the work space. It is typically the extra space provided between traffic and workers, excavations, pavement edge drop-offs, or an opposing lane of traffic. Traffic lanes may be closed to provide for lateral buffer space. See the Longitudinal Drop-off Guidelines (pages 6K-xxi thru 6K-xxiii) of this manual for more information.

Longitudinal Buffer Space - the distance between the transition area and the work space. If a driver does not see the advance warning or fails to negotiate the transition area, a buffer space provides room to stop before the work space. Typical Longitudinal Buffer Spaces (**B**) are included in the TTC Distance Charts.

Decision Sight Distance (D)

The total distance traveled during the length of time required for a driver to:

- Detect an unexpected or otherwise difficult-to-perceive information source or hazard in a roadway environment that may be visually cluttered,
- Recognize the hazard or its potential threat,
- Select an appropriate speed and path, and
- Initiate and complete the required maneuver safely and efficiently.

In the Field Manual, the Decision Sight Distance (**D**) is used to determine the mi
flagge
minim
Mobile
(**D**) are

6K-d

Divided R
A high
media
wide e
multi-l

Drivable
Capabl

Downstream Taper

The taper at the end of the activity area which guides traffic back into its original lane. When used, this taper is a minimum length of approximately 100 feet with a 20-foot spacing between channelizing devices.

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. The following durations are defined in overlapping intervals. Temporary Traffic Control layouts for longer durations may always be used for shorter durations, especially when roadway attributes such as traffic volume and speed, and the work space location may warrant higher levels of traffic control.

- **Mobile** - when an operation is continuously moving or stopped in one location for periods of 15 minutes or less. The Temporary Traffic Control (TTC) devices are typically vehicle-mounted. The work area should change by at least the Decision Sight Distance (**D**) for it to be considered a change in location.
- **Short Duration** - when an operation stays in one location during daylight conditions from 15 minutes to 1 hour.

Compliance Levels

- Shall
  - Standard
  - You are required to do (mandatory condition)
- Should
  - Guidance
  - You are advised or recommended to do, engineering judgment required to deviate
- May
  - Optional
  - You are allowed to do, sometimes used to list conditions from which a Standard or Guidance statement can be modified

Page 6K - a

Individual & General Responsibilities

Page 6K - k

(Individual)

- Be trained for the work you are doing

(General)

- Protect work space
- Safely direct traffic
- Keep devices clean and in position
- Remove devices when no longer needed
- Keep road authority notified
- Keep proper records
- ***Day and night inspections***

New Definitions

- **New or Modified Definitions:**
  - **Advance Warning Following Distance (F)**
  - **Alternate Pedestrian Routes (APR) & Temporary Pedestrian Access Route (TPAR)**
  - **Clear Zone**
  - **Deadheading**
  - **Drivable**
  - **Fixed Object**
  - **Flashing Arrow Board**
  - **Lane Width**
  - **Pilot Car**
  - **Road Authority**
  - **Spotter**
  - **TMA (Truck/Trailer Mounted Attenuator)**

Page 6K- b to j

TTC Enhancements

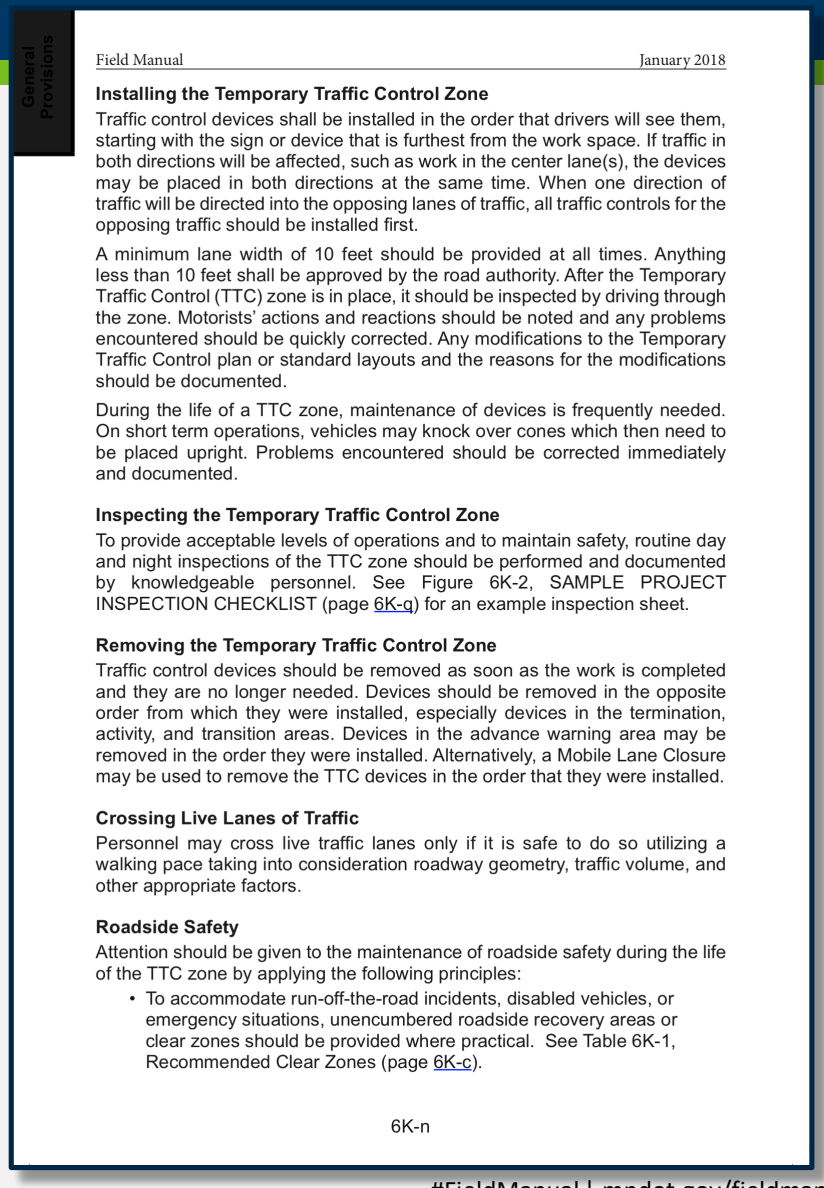
- ***Additional Personnel***
- Additional or Enhanced Devices
- Upgrading Devices
- ***Buffer or Additional Lane Closure***
- ***Closing Shoulders and/or Protection Vehicles***
- Increase Distances
- Lighting
  - ***Sequential Lighting***
- Work Zone Speed Limit

Page 6K - m

New Guidance in General Provisions

- ***Inspecting the TTC Zone***
  - ***Routine day and night inspections***
- Removing the TTC Zone
  - Previous – only remove in opposite order of installations
  - Now
    - ***Advance Warning Area may be removed in order of installation***
    - ***Mobile Lane Closure***

Page 6K - n



General Provisions

Field Manual January 2018

Installing the Temporary Traffic Control Zone

Traffic control devices shall be installed in the order that drivers will see them, starting with the sign or device that is furthest from the work space. If traffic in both directions will be affected, such as work in the center lane(s), the devices may be placed in both directions at the same time. When one direction of traffic will be directed into the opposing lanes of traffic, all traffic controls for the opposing traffic should be installed first.

A minimum lane width of 10 feet should be provided at all times. Anything less than 10 feet shall be approved by the road authority. After the Temporary Traffic Control (TTC) zone is in place, it should be inspected by driving through the zone. Motorists' actions and reactions should be noted and any problems encountered should be quickly corrected. Any modifications to the Temporary Traffic Control plan or standard layouts and the reasons for the modifications should be documented.

During the life of a TTC zone, maintenance of devices is frequently needed. On short term operations, vehicles may knock over cones which then need to be placed upright. Problems encountered should be corrected immediately and documented.

Inspecting the Temporary Traffic Control Zone

To provide acceptable levels of operations and to maintain safety, routine day and night inspections of the TTC zone should be performed and documented by knowledgeable personnel. See Figure 6K-2, SAMPLE PROJECT INSPECTION CHECKLIST (page 6K-q) for an example inspection sheet.

Removing the Temporary Traffic Control Zone

Traffic control devices should be removed as soon as the work is completed and they are no longer needed. Devices should be removed in the opposite order from which they were installed, especially devices in the termination, activity, and transition areas. 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 to do so utilizing a walking pace taking into consideration roadway geometry, traffic volume, and other appropriate factors.

Roadside Safety

Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:

- To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical. See Table 6K-1, Recommended Clear Zones (page 6K-c).

6K-n

New Guidance in General Provisions

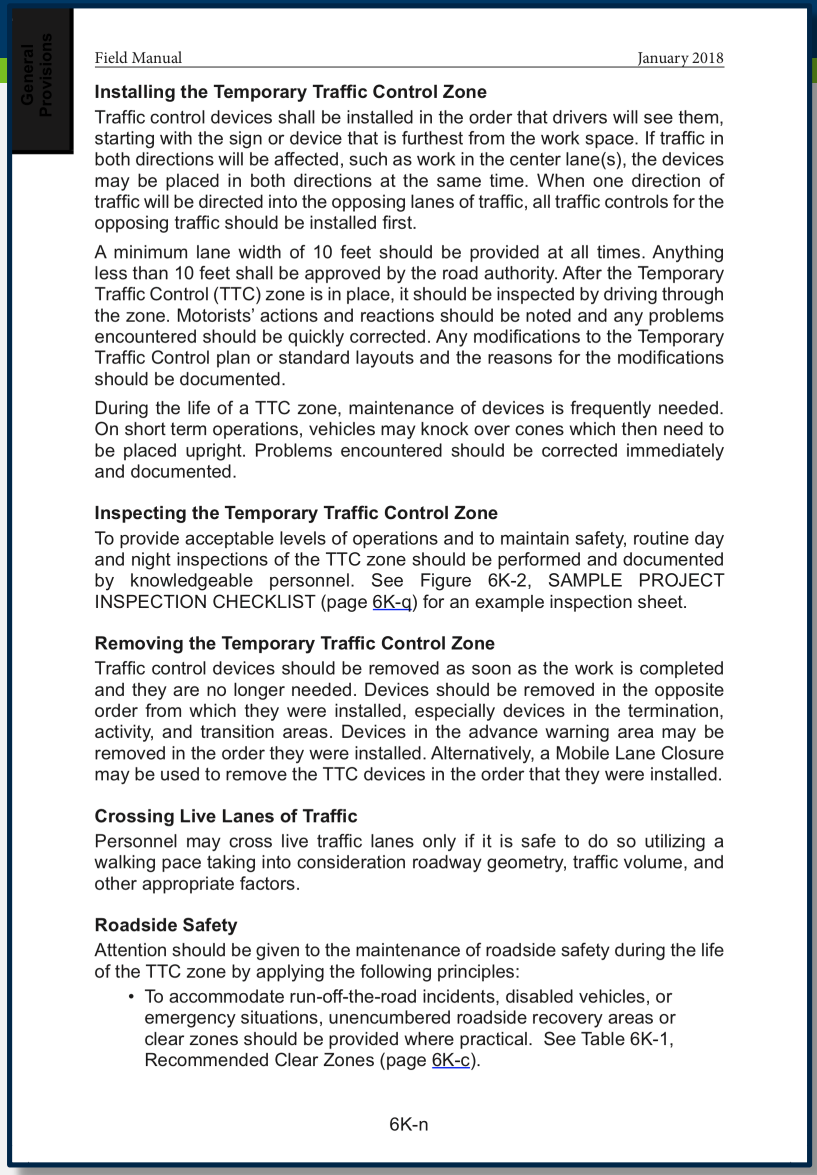
- ***Crossing Live Lanes of Traffic***
  - ***Personnel may cross live traffic lanes only if it is safe to do so utilizing a walking pace taking into consideration roadway geometry, traffic volume, and other appropriate factors.***

Page 6K - n

New Guidance in General Provisions

- ***Roadside Safety***
  - ***Provide clear zones where practical***
    - ***See Table 6K-1, Recommended Clear Zones***
  - ***Work equipment, worker vehicles, materials, and debris stored to reduce probability of run-off-road vehicles***
  - ***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 not practical, delineate***

Page 6K – n to o



General Provisions

Field Manual January 2018

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Personnel may cross live traffic lanes only if it is safe to do so utilizing a walking pace taking into consideration roadway geometry, traffic volume, and other appropriate factors.

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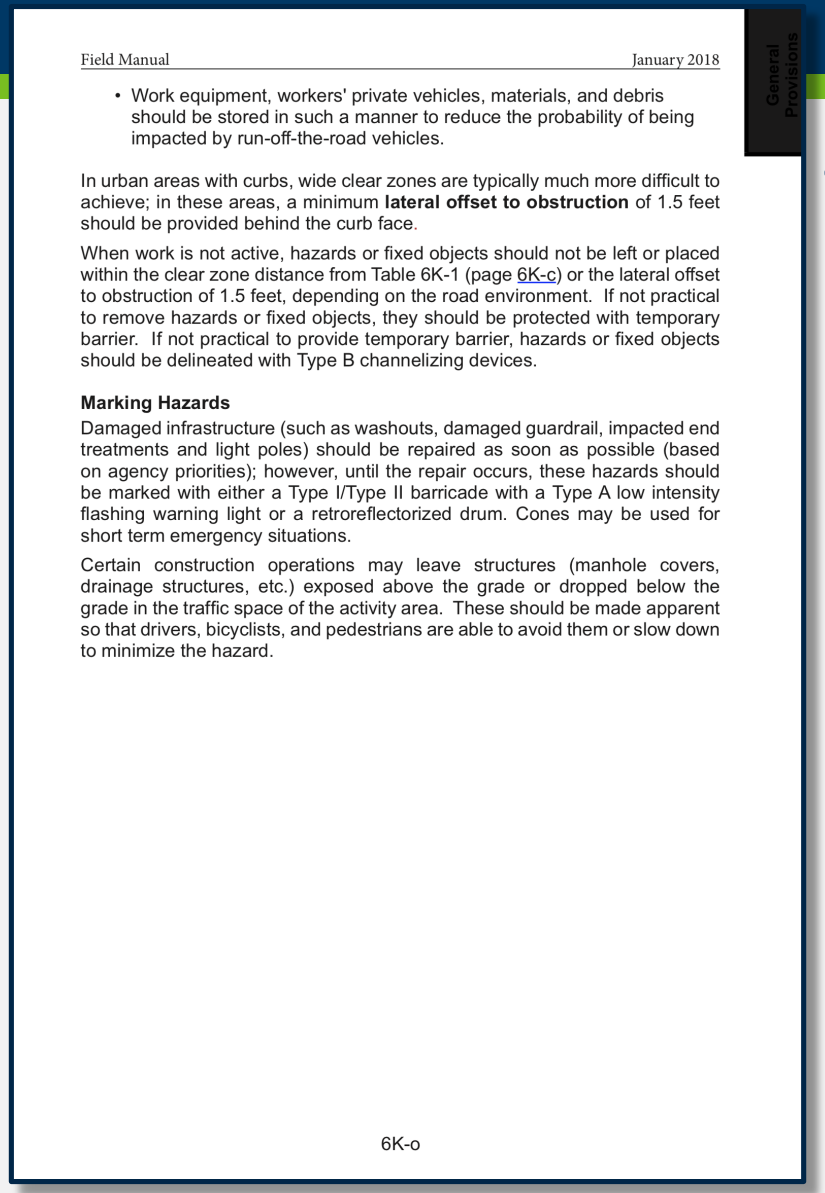
- To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical. See Table 6K-1, Recommended Clear Zones (page 6K-c).

6K-n

New Guidance in General Provisions



Field Manual January 2018

General Provisions

- Work equipment, workers' private vehicles, materials, and debris should be stored in such a manner to reduce the probability of being impacted by run-off-the-road vehicles.

In urban areas with curbs, wide clear zones are typically much more difficult to achieve; in these areas, a minimum **lateral offset to obstruction** of 1.5 feet should be provided behind the curb face.

When work is not active, hazards or fixed objects should not be left or placed within the clear zone distance from Table 6K-1 (page 6K-c) or the lateral offset to obstruction of 1.5 feet, depending on the road environment. If not practical to remove hazards or fixed objects, they should be protected with temporary barrier. If not practical to provide temporary barrier, hazards or fixed objects should be delineated with Type B channelizing devices.

Marking Hazards

Damaged infrastructure (such as washouts, damaged guardrail, impacted end treatments and light poles) should be repaired as soon as possible (based on agency priorities); however, until the repair occurs, these hazards should be marked with either a Type I/Type II barricade with a Type A low intensity flashing warning light or a retroreflectorized drum. Cones may be used for short term emergency situations.

Certain construction operations may leave structures (manhole covers, drainage structures, etc.) exposed above the grade or dropped below the grade in the traffic space of the activity area. These should be made apparent so that drivers, bicyclists, and pedestrians are able to avoid them or slow down to minimize the hazard.

6K-o

- ***Marking Hazards***
  - ***Repair damaged infrastructure as soon as possible***
  - ***Until repair possible, mark with Type I/Type II barricade with flashing warning light or drum***
  - ***Cones allowed for short term emergency***
  - ***Structures above grade – make apparent***

Page 6K – o

Temporary Traffic Control Devices

- Reorganized
  - Crashworthy requirement moved to beginning
  - Trailer Mounted Devices
    - ***Added layout reference (Layout 7)***
  - High-Vis Clothing
    - See next slide
  - Flashing Warning Lights (no changes)
  - Vehicle Warning Lights
    - Added "***... shall be visible for 360 degrees around the vehicle at a min height of 3.5 feet and a radius of 60 feet or greater***"

Page 6K – r

High-Vis Clothing

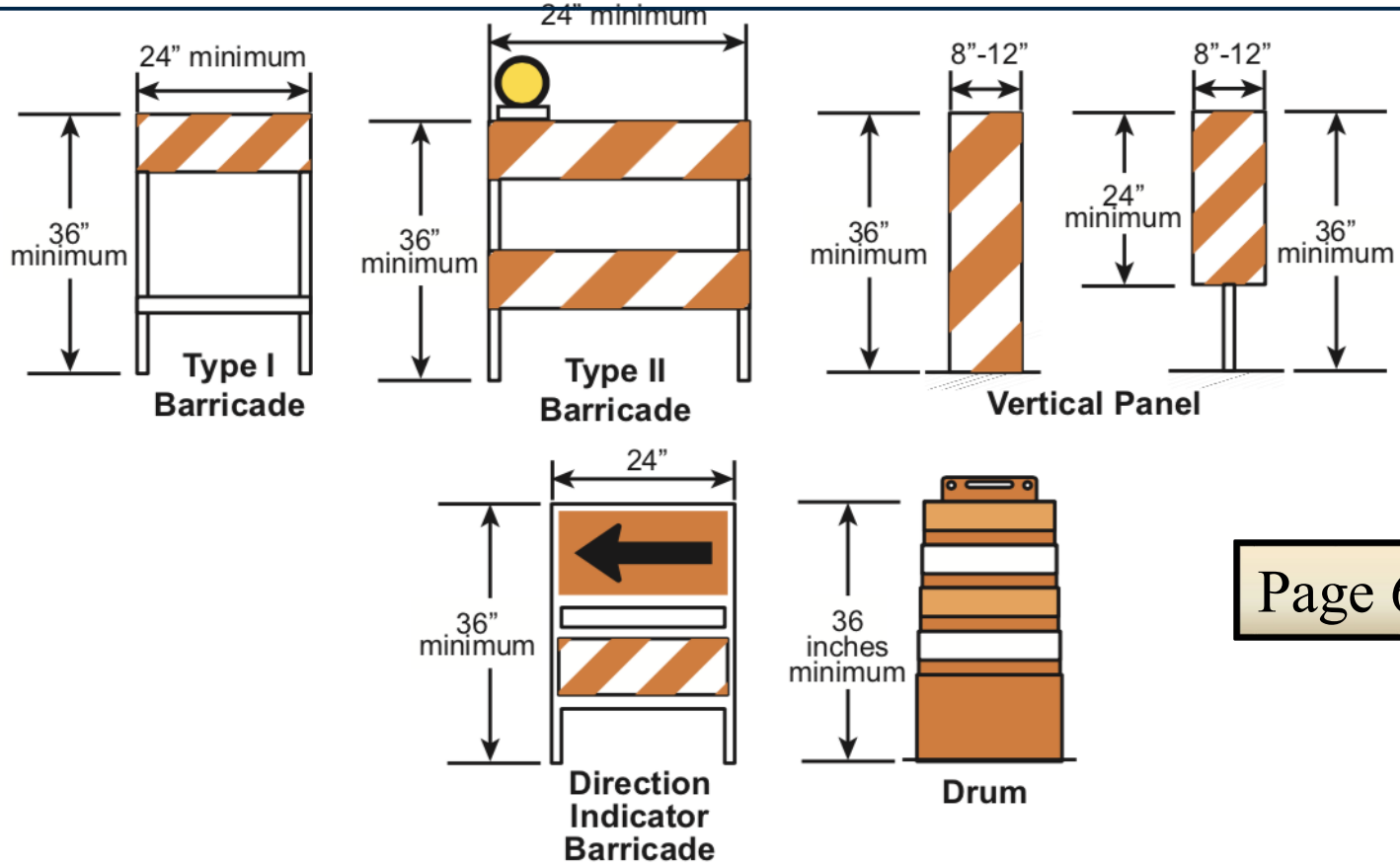
- ANSI/ISEA 107-2004, ***107-2010, or 107-2015 Type R***
  - Class 2 or 3
- Flaggers need high-vis vest & Class E pants ***at all times***
- ***All workers – high-vis hat should be worn if hard hat not required***

Page 6K – r

Channelizers

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.

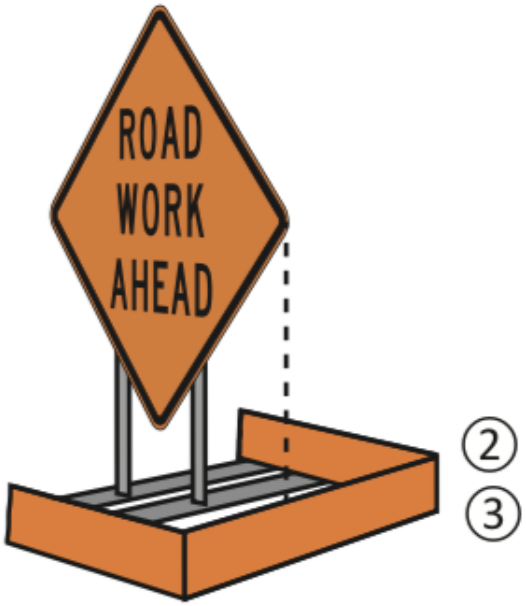


Page 6K – t

Work Zone Signing

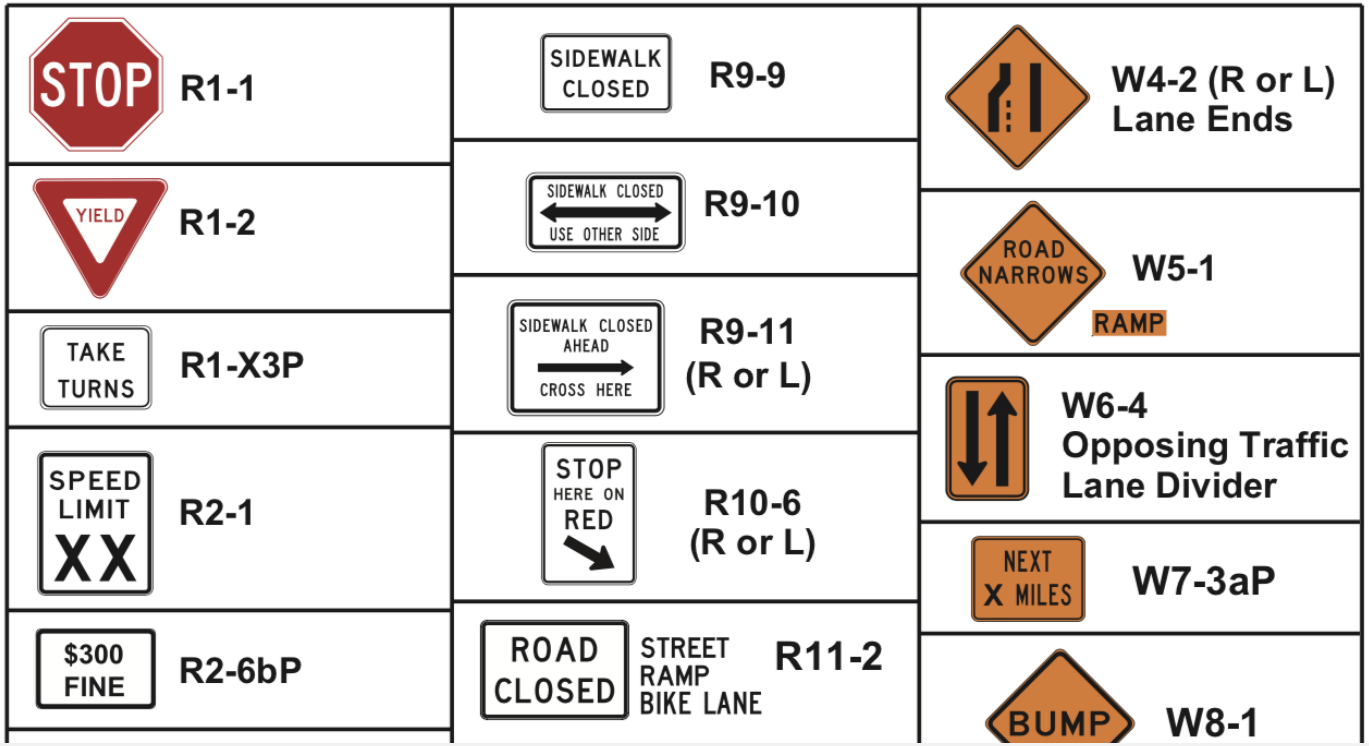
- Biggest change – “***Any portable sign stand or barricade placed in a pedestrian walkway that could be a hazard to a visually impaired pedestrian should have a detectable edge to guide the pedestrian around the hazard.***”

Page 6K – u



Detectable Edge
for Portable Sign Stand

Sign Codes Quick Reference



- ***Included all signs in Field Manual***
- ***Any non-word sign is named per MN MUTCD***

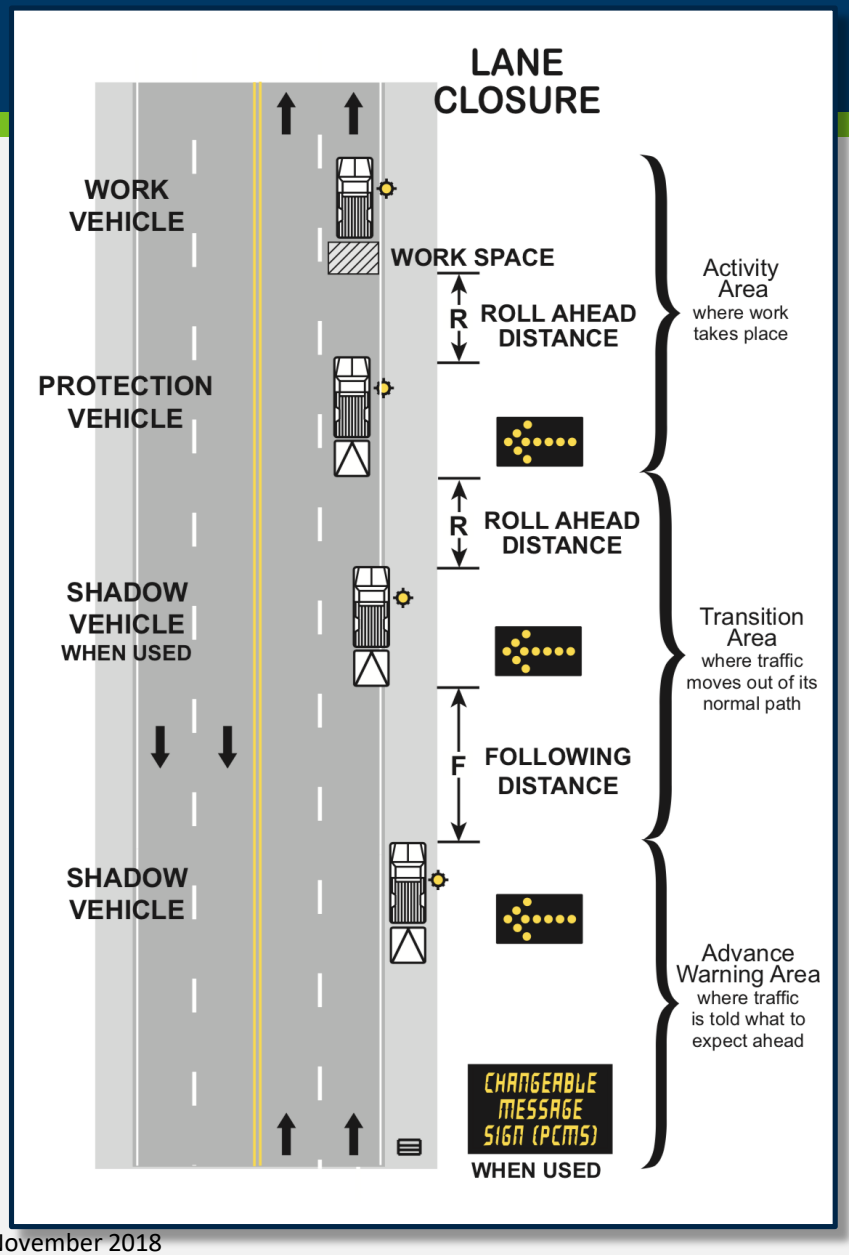
Page 6K – w to y

Portable Changeable Message Signs

- Modified requirements for Type B PCMS
  - ***High speed - font size 18”***
  - ***May allow 5 characters per line***
- ***Tables with allowed abbreviations and not allowed abbreviations***

Page 6K – ab to ah

Mobile TTC Zone Components



- ***Modified distance***
  - ***Between Shadow Vehicle and Protection Vehicle – used to be F/2***

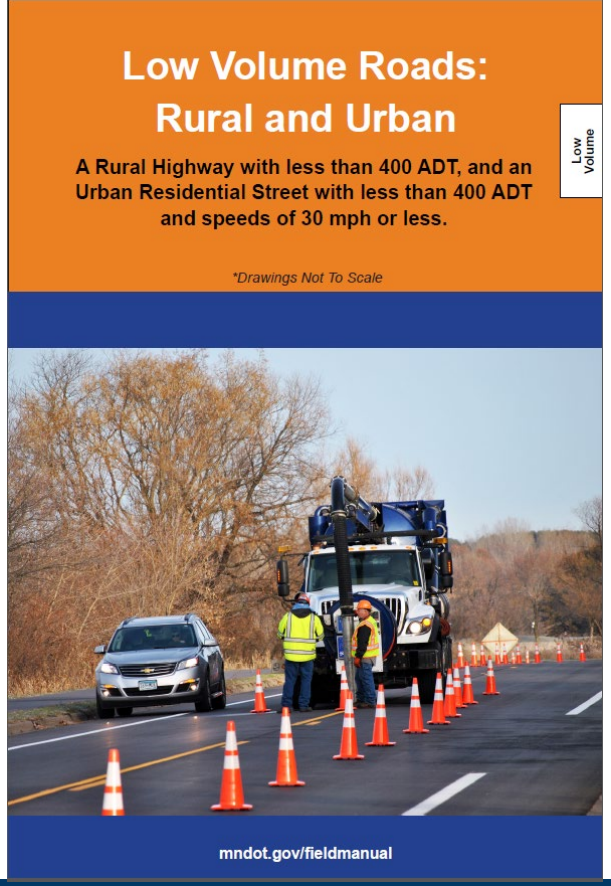
Temporary Traffic Control Distance Charts

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 = 25 ft.	100	550	200	100	75	200
35-40		325	700	325	175	125	305
45-50	G = 50 ft.	600	900	600	300	200	425
55		750	1200	700	350	250	500
60-65		1000	1400	800	400	275	650
70-75		1200	1600	900	450	300	820

TTC Distance Charts

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 15 MPH max**	**Stationary Operation**	**Moving Operation 15 MPH max**
0-30	**G = 25 ft.**	100 - 550	100	100	75	100
35-40		325 - 700	100	100	75	100
45-50	**G = 50 ft.**	600 - 900	125	175	100	150
55		750 - 1200	125	175	100	150
60-65		1000 - 1400	175	225	150	175
70-75		1200 - 1600	175	225	150	175

Shadow and Protection Vehicle wheels should be pointed straight ahead.



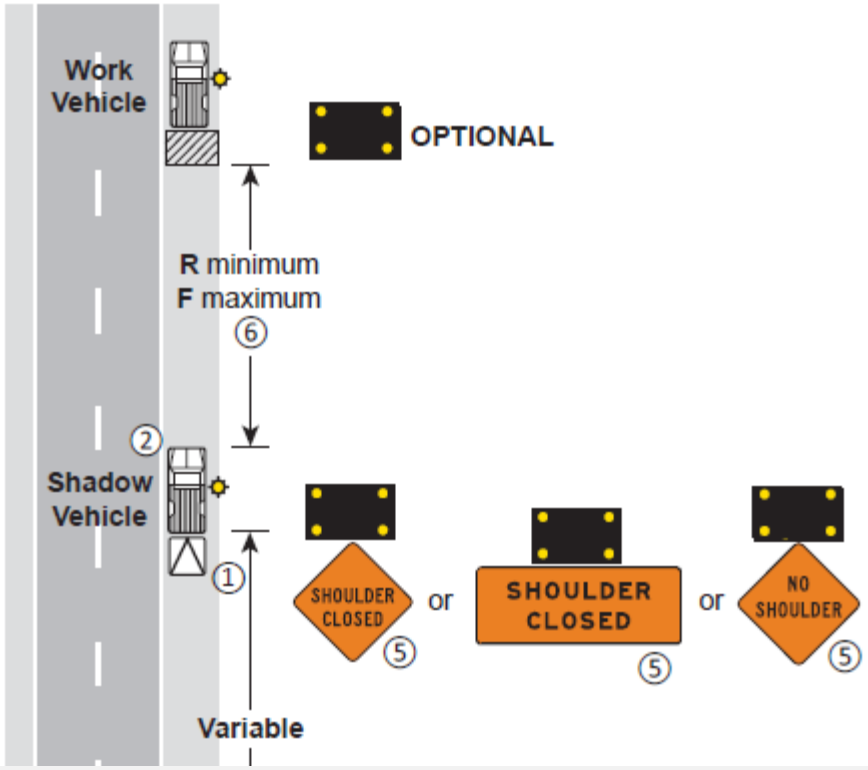
DEPARTMENT OF TRANSPORTATION

Layouts Key Changes

Specific vs. General Notes

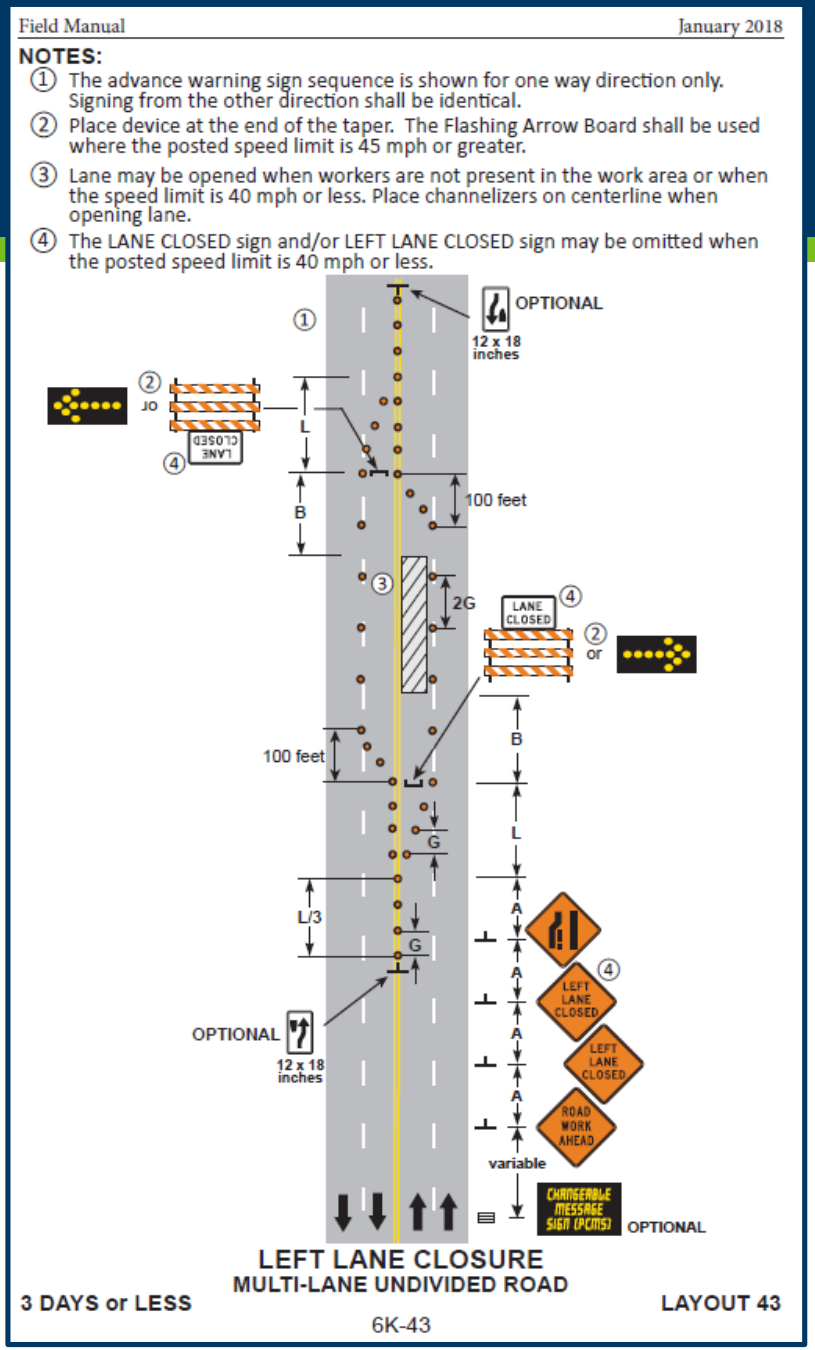
NOTES:

1. Any Shadow Vehicle or Protection Vehicle operating totally or partially in a traffic lane should be equipped with a TMA.
2. The Shadow Vehicle or Protection Vehicle may encroach into the traffic lane when the shoulder is too narrow to drive on.
3. Any vehicle not displaying a Flashing Arrow Board shall display high-intensity rotating, flashing, oscillating, or strobe lights.
4. The PCMS shall be used for nighttime operations.
5. When the PCMS is used, the SHOULDER CLOSED or NO SHOULDER sign becomes optional.
6. The distance between the work area and the Shadow Vehicle should be adjusted between **R** and **F** based on traffic volume and sight distance.

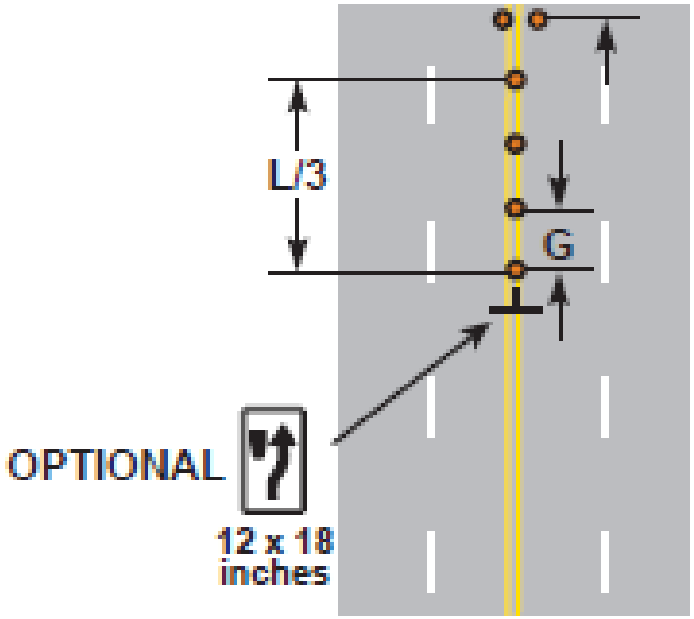


- Specific note- see drawing
- General note – applies overall

Additional Positive Guidance



- Added to many layouts
- Additional channelizers (L/3)
- Keep Right sign

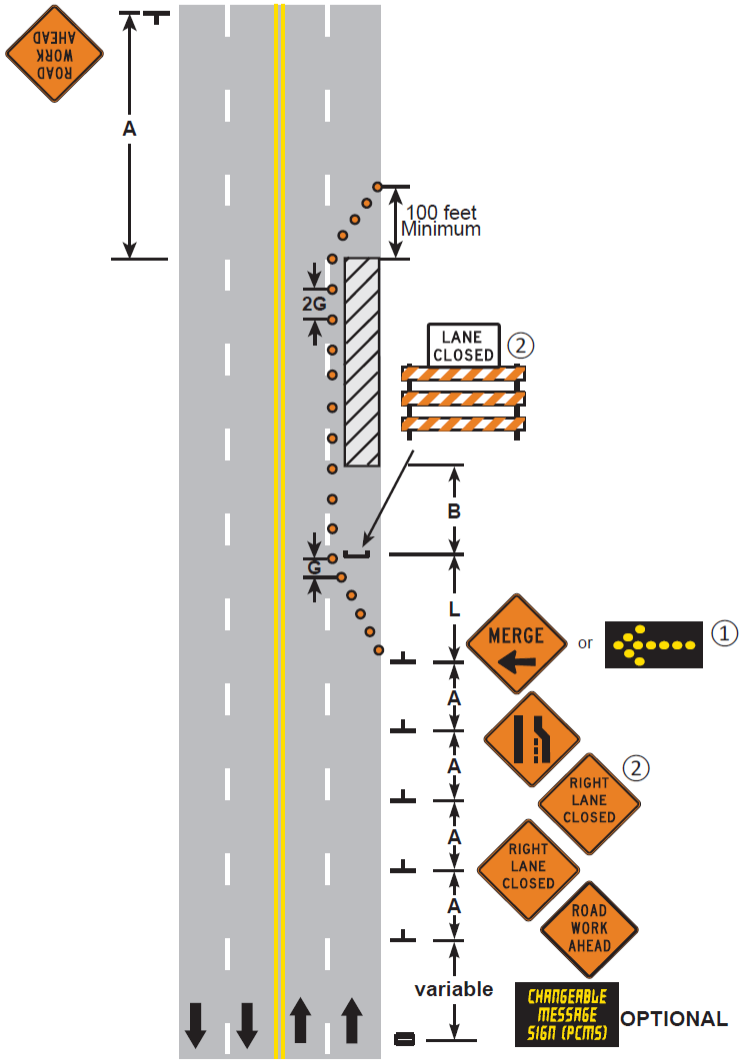


Lane Closure

- One Direction Large Arrow can no longer be used for merging tapers

NOTES:

1. The Flashing Arrow Board shall be used where the posted speed limit is 45 mph or greater, and shall be placed on the shoulder. If there is no shoulder, or the shoulder is too narrow, place at the end of the taper in lieu of the Type III barricade assembly.
2. The RIGHT LANE CLOSED sign and/or LANE CLOSED sign may be omitted when the posted speed limit is 40 mph or less.
3. If there is a shoulder, close the shoulder using a shoulder taper.



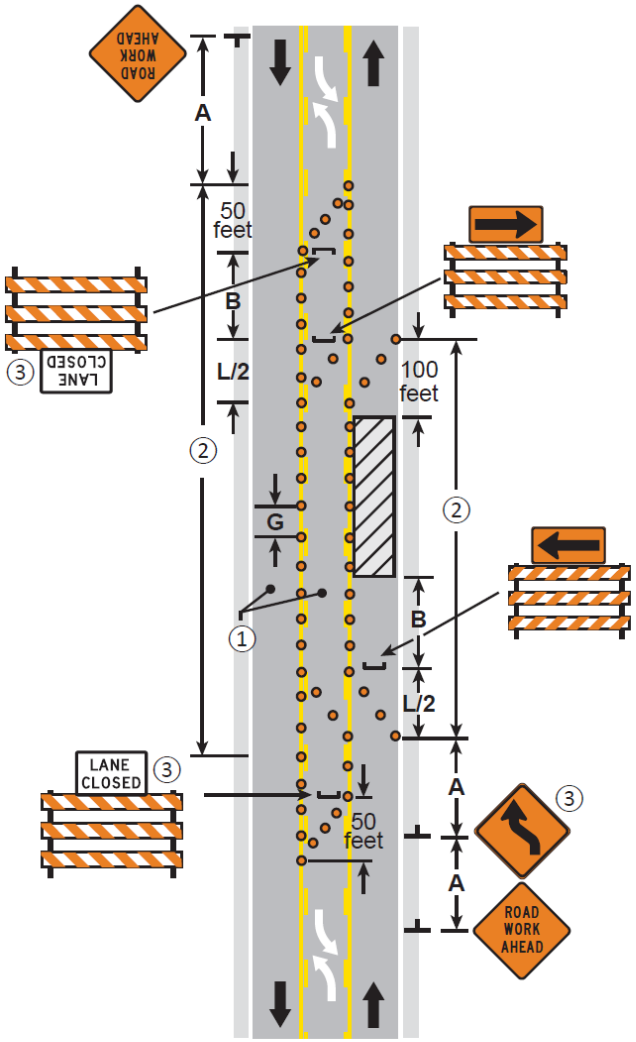
RIGHT LANE CLOSURE
MULTI-LANE UNDIVIDED ROAD

3 DAYS or LESS **LAYOUT 42**

6K-42

NOTES:

1. The minimum paved lane width from channelizing devices to edge of pavement or outside edge of paved shoulder or face of curb shall be 10 feet.
2. Parking, stopping, and left turning movements may be prohibited along the work space and taper. Reduce spacing of channelizing devices as needed in order to prevent turns.
3. The LANE CLOSED sign and/or Reverse Curve sign may be omitted when the posted speed limit is 40 mph or less.



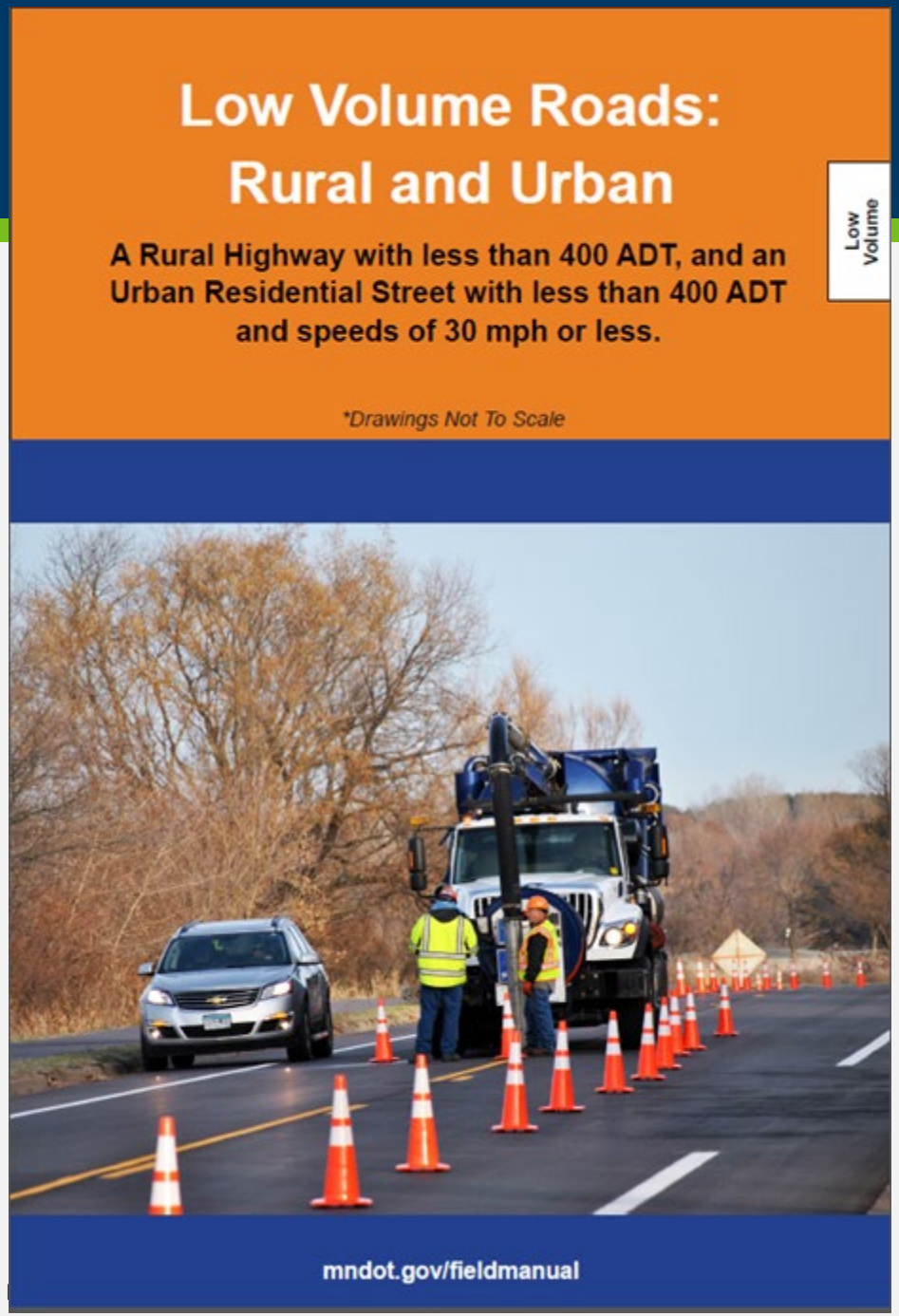
LANE CLOSURE - 3 Lane Section
TWO-WAY CONTINUOUS LEFT TURN LANE

3 DAYS or LESS **LAYOUT 38**

Shifting taper

- One Direction Large Arrow can only be used for shifting taper

Low Volume Layouts



- Reduced number of devices allowed by MN MUTCD Parts 5 & 6
- Reviewed and approved by MCUTCD
- Particularly on roads with speeds ≤ 30 MPH

Low Volume Indexes

Layout Selection Matrix by Maintenance Activity

The following are examples of situations where layouts may be used. Layouts may be used for other operations.

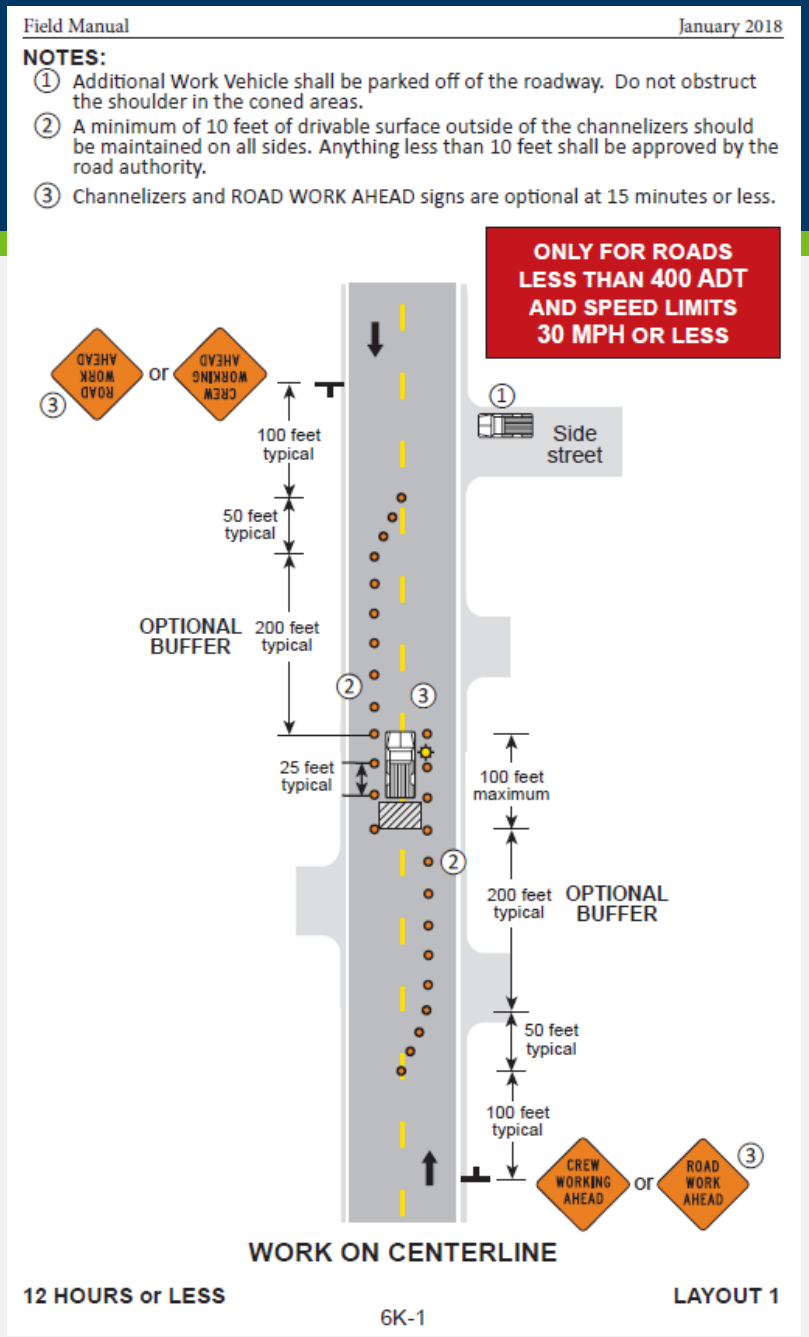
URBAN

	MAINTENANCE ACTIVITY	WORK DURATION: MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less
On Road	Asphalt Pavement Patching	11	4*	4*
	Concrete Pavement Patching			4*
	Pothole Patching	11	4*	
	Crack Filling		4*	4*, 16*
	Crack Sealing - Route and Seal			4*, 16*
	Surface Treatment			4*, 16*
	Sweeping - Residential	11		
	Utility Repair - Centerline	1	1	1, 2
	Utility Repair - Center of Intersection	3	3	3
	Road Closure (e.g. water main break)	31	31	31, 32
	Road Closure (for Special Event)	5	5	5
	Utility Maintenance (partial road closure)			4*
Roadside	Mowing	10		
	Tree/Brush Removal	10, 11	4*	4*
	Debris Removal - Routine (e.g. litter pickup)	8, 9	8, 9	
	Debris Removal - Large Item (e.g. couch, roadkill)	11		
	Utility Repair - Shoulder	8, 9	8, 9	8
	Sign Repair	8, 9, 11	8, 9	
	Snow Cleanup	8, 9, 11	8, 9	

* This layout may be used for nighttime operations only if the flagging stations are occupied and illuminated with auxiliary lighting such as floodlights or balloon lighting except in emergency situations.

- Matrices based on Maintenance Activities
  - Developed in LRRB Sponsored Project
  - Urban and Rural

Work on Centerline (12 hours or less)



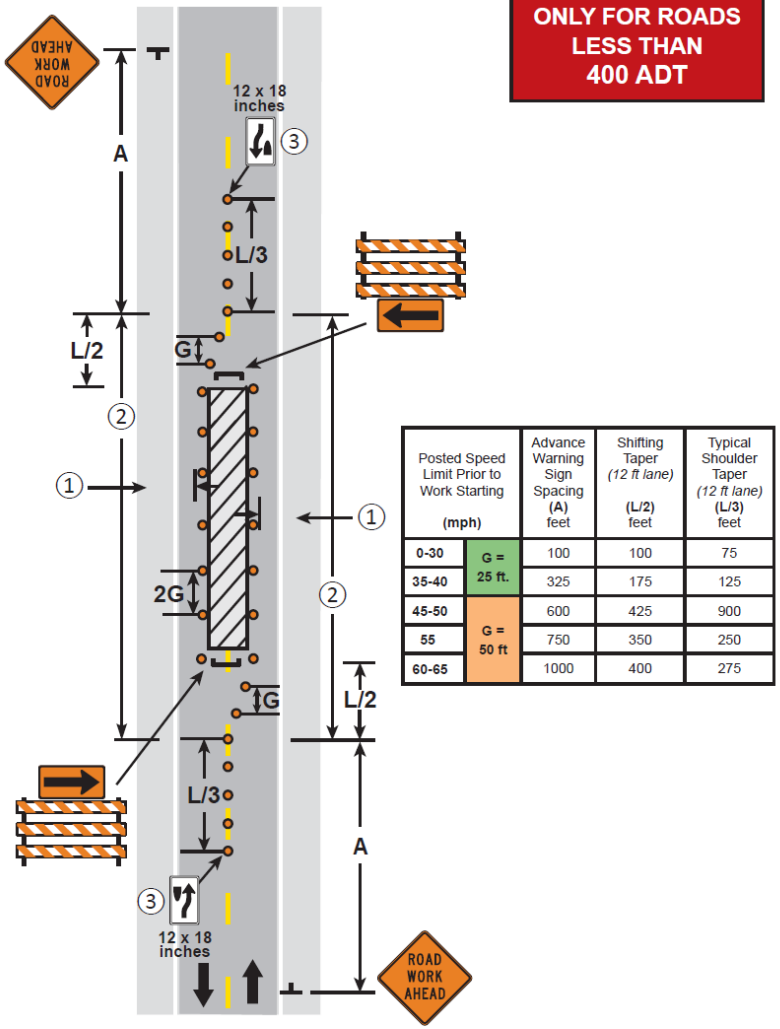
- New layout – “mobile/short duration” operation allowed up to 12 hours
- See notes
- Channelizers and ROAD WORK AHEAD signs optional at 15 minutes or less

Work Space in Center of Road (3 days or less)

NOTES:

1. Minimum drivable surface outside of the channelizing devices shall be 10 feet.
2. Parking and stopping should be prohibited along the work area and tapers.
3. Keep Right sign may be omitted if posted speed limit is 40 mph or less.

ONLY FOR ROADS LESS THAN 400 ADT



Posted Speed Limit Prior to Work Starting (mph)		Advance Warning Sign Spacing (A) feet	Shifting Taper (12 ft lane) (L/2) feet	Typical Shoulder Taper (12 ft lane) (L/3) feet
0-30	G = 25 ft.	100	100	75
35-40		325	175	125
45-50	G = 50 ft	600	425	900
55		750	350	250
60-65		1000	400	275

WORK SPACE IN CENTER OF ROAD
TWO-LANE, TWO-WAY ROAD

3 DAYS or LESS **LAYOUT 2**

6K-2

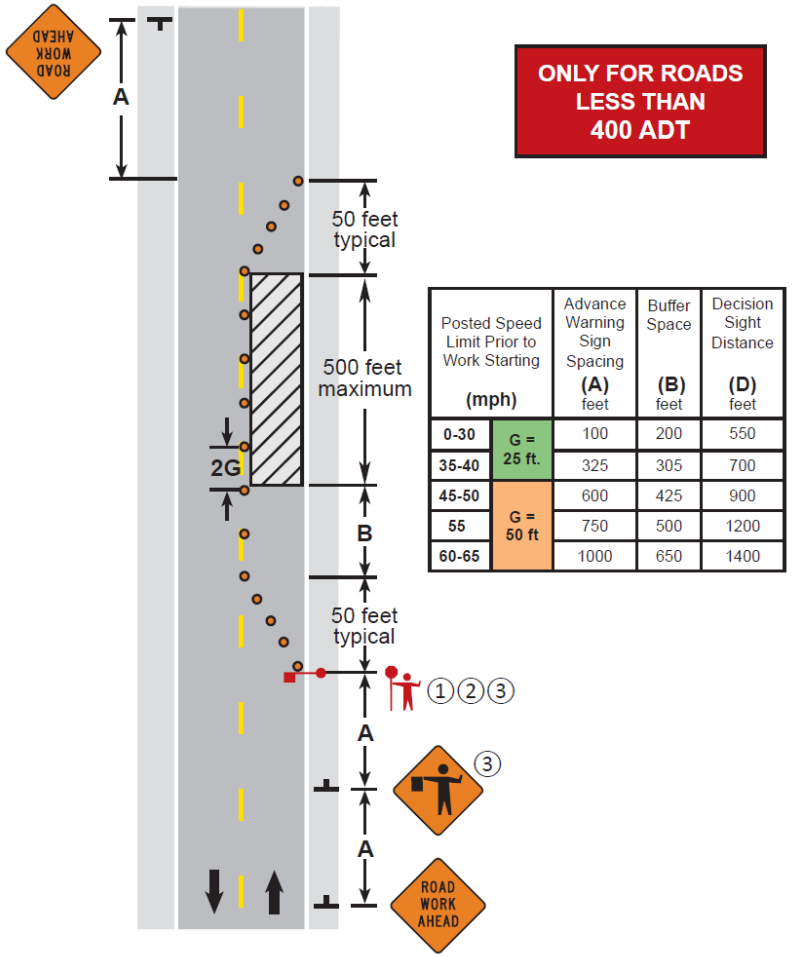
- New layout
- Fewer devices and longer term than Layout 28
- Distance chart added to layout

Lane Closure, One Flagger (3 days or less)

- Existed in previous Field Manual

NOTES:

1. The approach sight distance to the flagger shall be at least the Decision Sight Distance (**D**).
2. If the flagger's ability to see oncoming motorists beyond the work space is less than the Decision Sight Distance (**D**), two flaggers shall be used - See Layout 16.
3. The Flagger and Flagger Ahead sign may be omitted if the operation is during daylight hours, 12 hours or less, and traffic is able to self-regulate.
4. If the work space must be left unattended at night use Layout 14.



Posted Speed Limit Prior to Work Starting (mph)		Advance Warning Sign Spacing (A) feet	Buffer Space (B) feet	Decision Sight Distance (D) feet
0-30	G = 25 ft.	100	200	550
35-40		325	305	700
45-50	G = 50 ft	600	425	900
55		750	500	1200
60-65		1000	650	1400

LANE CLOSURE, ONE FLAGGER
TWO-LANE, TWO-WAY ROAD

3 DAYS or LESS **LAYOUT 4**

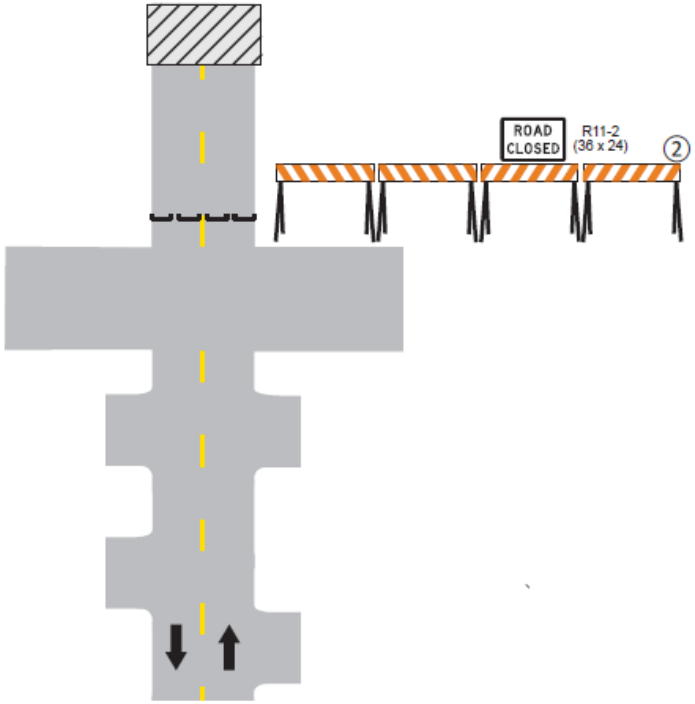
6K-4

Road Closure Special Events

NOTES:

1. The road authority shall be contacted prior to closure and may provide requirements related to detours and/or additional temporary traffic control.
2. Install Type I barricades at the last driveway or intersection beyond which there is no public access. Barricades shall span the entire roadway including traversable shoulders. All signs and barricades used at night shall be retroreflective.

ONLY FOR ROADS LESS THAN 400 ADT AND SPEED LIMITS 30 MPH OR LESS



ROAD CLOSURE
SPECIAL EVENTS

12 HOURS or LESS

LAYOUT 5

6K-5

- New layout
- Special events
  - Parade
  - Block Party
- Modified language in Part 6F allowing Type I & II Barricades to close roads

Work Vehicle Parked on Shoulder

NOTES:

1. The Work Vehicle should be pulled over as far off the roadway as possible, and shall display and operate a 360-degree flashing beacon.

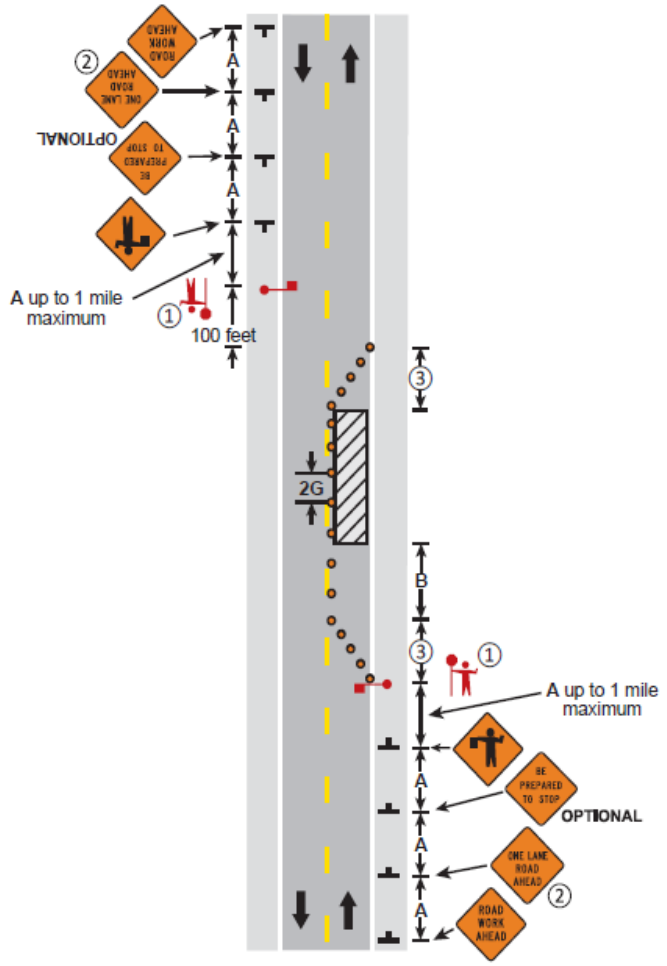
WORK VEHICLE PARKED ON SHOULDER

1 HOUR or LESS **LAYOUT 6**

- New layout
- Layout 8 simplified

NOTES:

1. The approach sight distance to the flagger shall be at least the Decision Sight Distance (**D**).
2. The ONE LANE ROAD AHEAD sign may be omitted when the posted speed limit is 40 mph or less.
3. The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices.
4. If anticipating operational problems, the use of a Pilot Car (see Layout 18) may improve operations and safety.



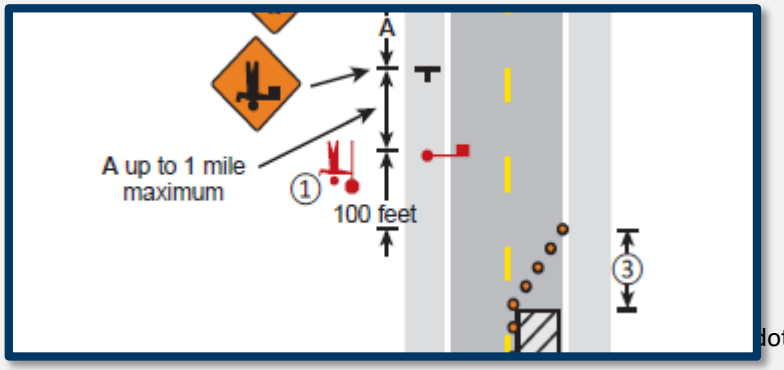
LANE CLOSURE, TWO FLAGGERS
TWO-LANE, TWO-WAY ROAD

3 DAYS or LESS **LAYOUT 16**

6K-16

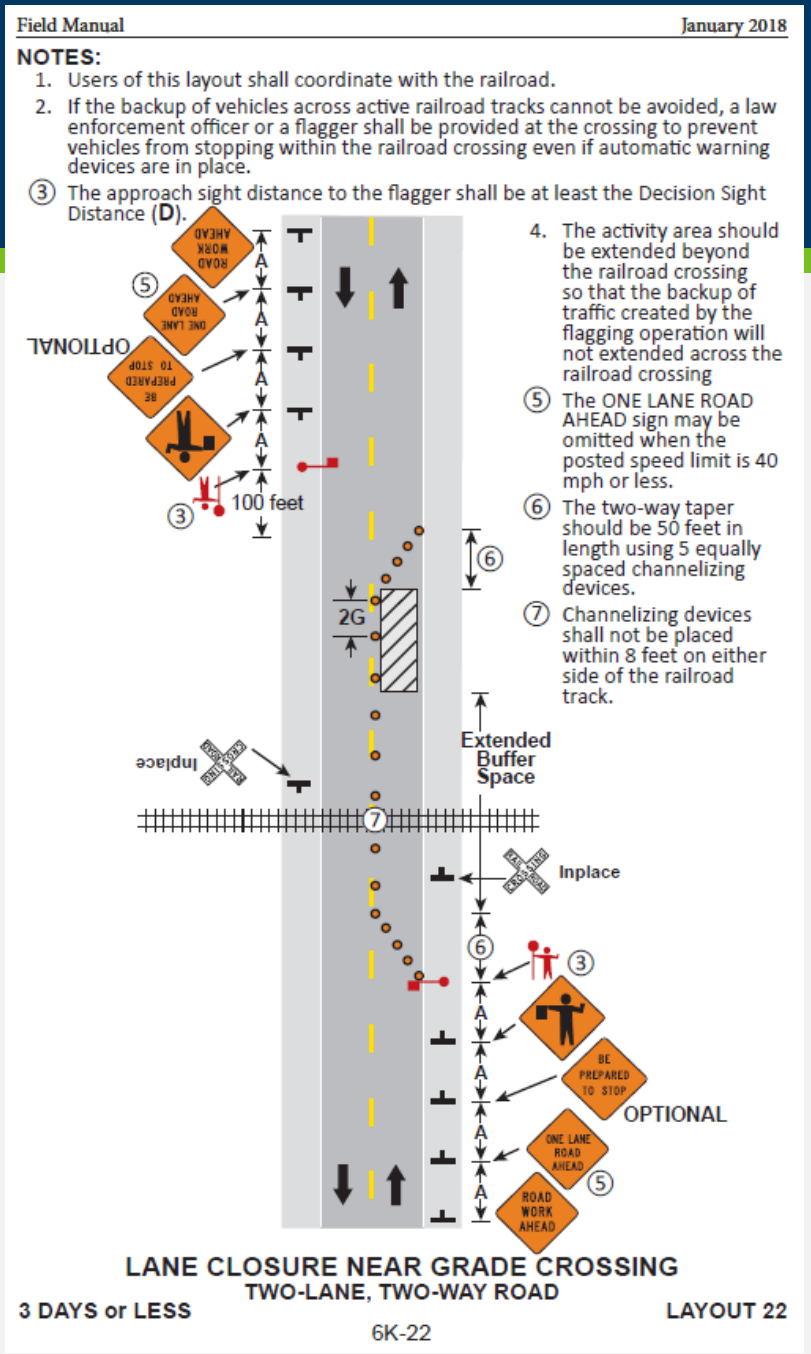
Flagging Layouts

- Typical Flagging – Layout 16
- Moved all flagging related layouts to Two-Lane, Two-Way
  - Flagging Crossroads and Blind Curves (19)
  - Flagging Station Options (23)
- Modified distance between downstream flagging taper and flagger



Flagging near Railroad

- Shall coordinate with railroad.
- Channelizing devices shall not be placed within 8 feet on either side of the railroad track.



Field Manual January 2018

NOTES:

1. Users of this layout shall coordinate with the railroad.
2. If the backup of vehicles across active railroad tracks cannot be avoided, a law enforcement officer or a flagger shall be provided at the crossing to prevent vehicles from stopping within the railroad crossing even if automatic warning devices are in place.

③ The approach sight distance to the flagger shall be at least the Decision Sight Distance (**D**).

4. The activity area should be extended beyond the railroad crossing so that the backup of traffic created by the flagging operation will not extended across the railroad crossing

⑤ The ONE LANE ROAD AHEAD sign may be omitted when the posted speed limit is 40 mph or less.

⑥ The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices.

⑦ Channelizing devices shall not be placed within 8 feet on either side of the railroad track.

LANE CLOSURE NEAR GRADE CROSSING
TWO-LANE, TWO-WAY ROAD

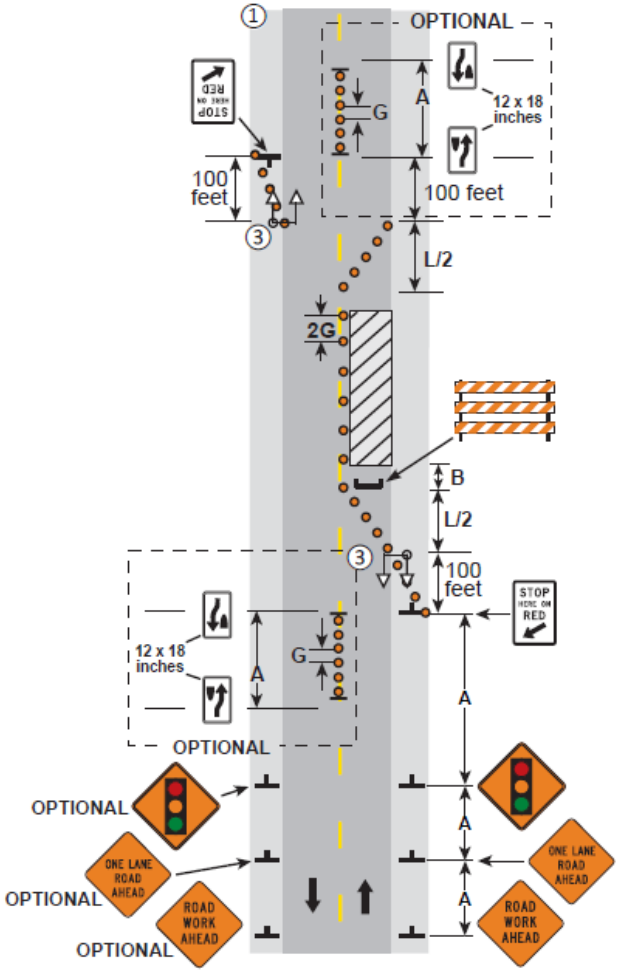
3 DAYS or LESS LAYOUT 22

6K-22

Portable Signals

NOTES:

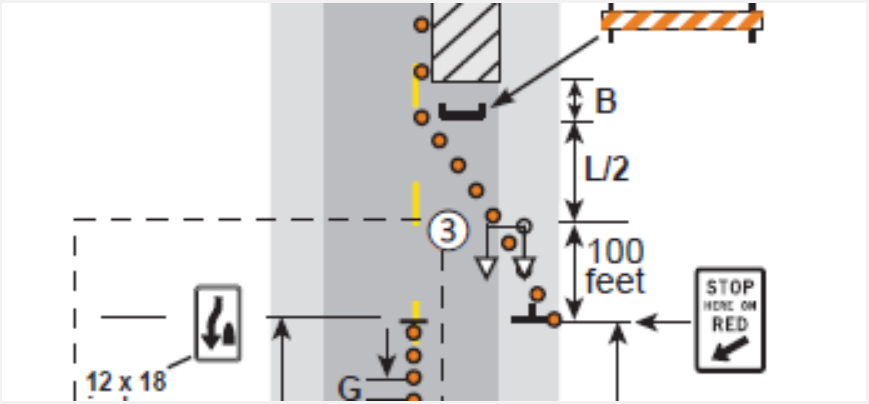
1. Approach signs are the same in both directions.
2. Signal timing and signal head locations shall be established by qualified personnel and approved by the road authority.
3. Two signal heads shall be installed per approach. The first shall be installed on the right shoulder. The second signal head may be installed on either the left shoulder or mounted overhead on the same structure as the first signal head.



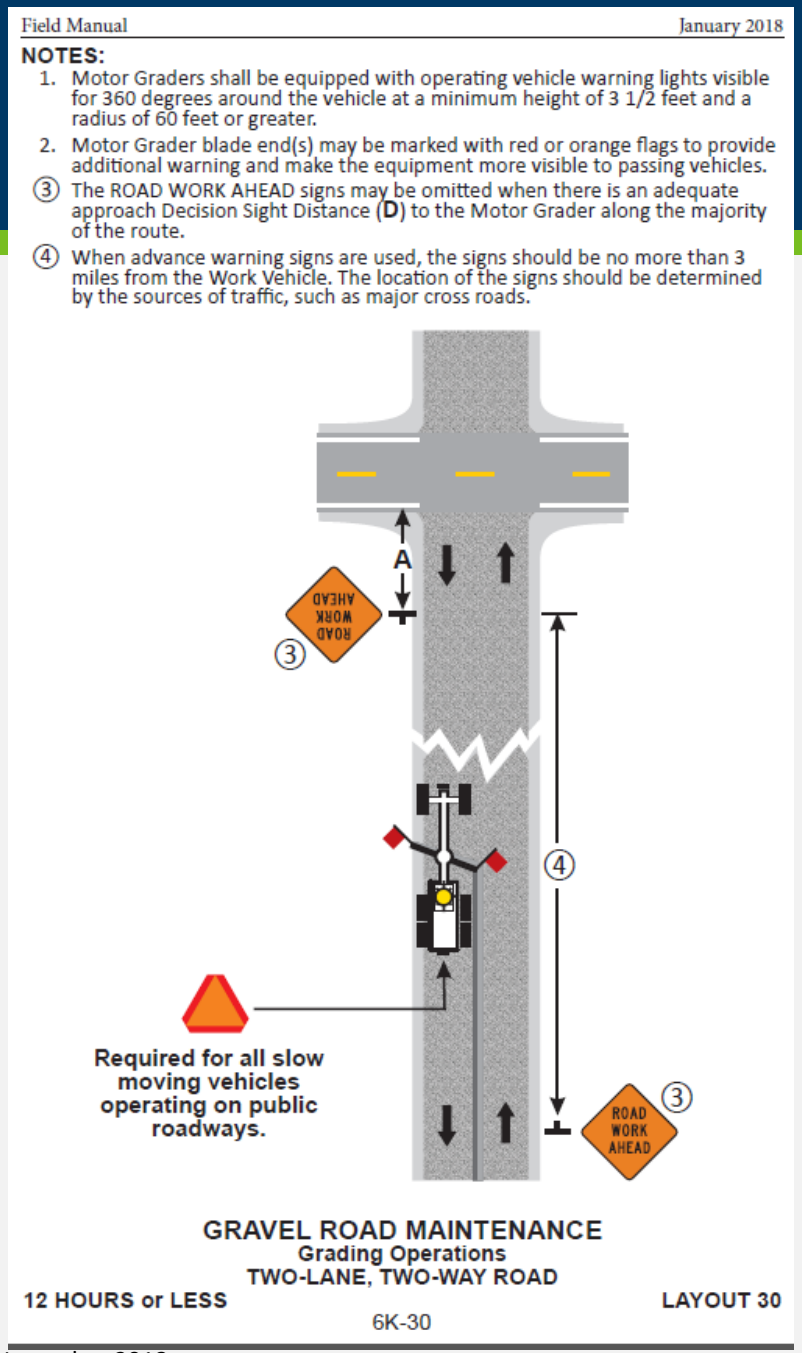
LANE CLOSURE WITH PORTABLE SIGNALS
TWO-LANE, TWO-WAY ROAD
3 DAYS or LESS **LAYOUT 25**

6K-25

- Use shifting tapers, not flagging tapers



Layouts moved to 2L, 2W



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NOTES:

1. Motor Graders shall be equipped with operating vehicle warning lights visible for 360 degrees around the vehicle at a minimum height of 3 1/2 feet and a radius of 60 feet or greater.
2. Motor Grader blade end(s) may be marked with red or orange flags to provide additional warning and make the equipment more visible to passing vehicles.
3. The ROAD WORK AHEAD signs may be omitted when there is an adequate approach Decision Sight Distance (**D**) to the Motor Grader along the majority of the route.
4. When advance warning signs are used, the signs should be no more than 3 miles from the Work Vehicle. The location of the signs should be determined by the sources of traffic, such as major cross roads.

GRAVEL ROAD MAINTENANCE
Grading Operations
TWO-LANE, TWO-WAY ROAD

12 HOURS or LESS **LAYOUT 30**

6K-30

- Gravel Road Maintenance (30)
- Temporary Road Closure (31)
- Road Closure (32)
- Crossroad and Confirmation Signing (35)
- Turn Lane Closures (33, 34)
  - Not moved

TWLTL Section

Two-Way, Continuous Left Turn Lane

A roadway with a center lane between opposing lanes of traffic that allows traffic from either direction to make left turns off the roadway.

*Drawings Not To Scale

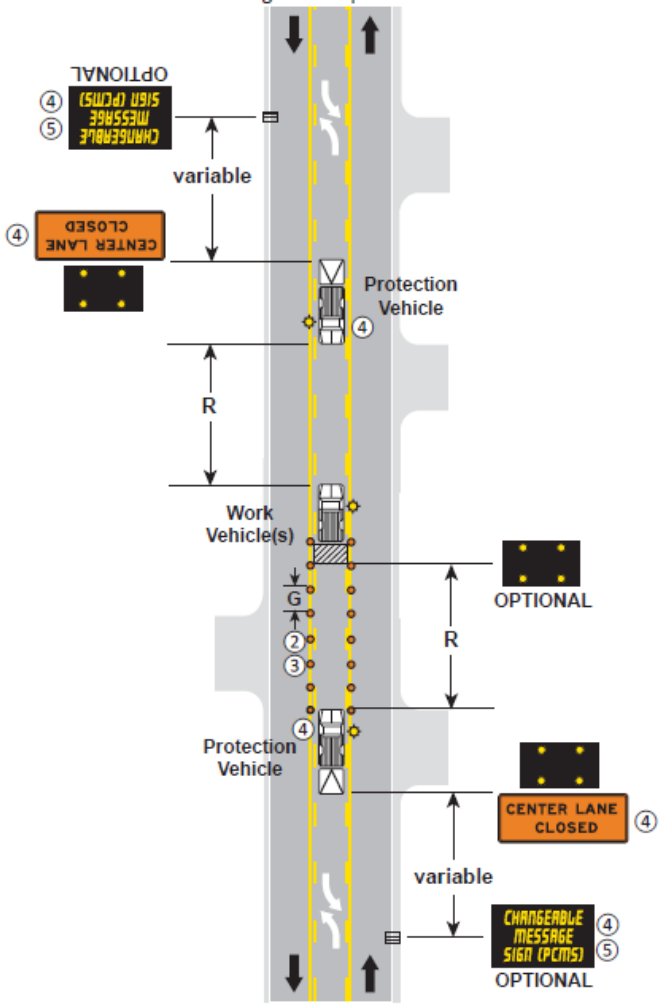
mndot.gov/fieldmanual

- Brand new section of Field Manual
  - Pulled from Undivided Multi-Lane
  - New layouts
  - More of these types of roads
- See Pic – TWLTL Mobile Lane Closure

Mobile/Short Duration

NOTES:

1. Protection Vehicles operating totally or partially in a traffic lane should be equipped with a TMA.
2. Channelizers may be omitted if the operation moves at least the Decision Sight Distance (D) every 15 minutes (mobile operation).
3. Reduce channelizing device spacing as needed to prevent turns.
4. If PCMSs are not used, Protection Vehicles shall have CENTER LANE CLOSED signs.
5. The PCMS shall be used for nighttime operations.



MOBILE/SHORT DURATION LANE CLOSURE
TWO-WAY CONTINUOUS LEFT TURN LANE
1 HOUR or LESS **LAYOUT 36**

6K-36

- New Layout
- Mobile/Short Duration Change throughout document
  - Beyond 15 minutes – additional devices
- 1 protection vehicle faces work vehicle

Multi-Lane Undivided Roads

A roadway having two or more lanes of traffic traveling in the same direction with no physical barriers separating the opposing traffic lane.

**Drawings Not To Scale*

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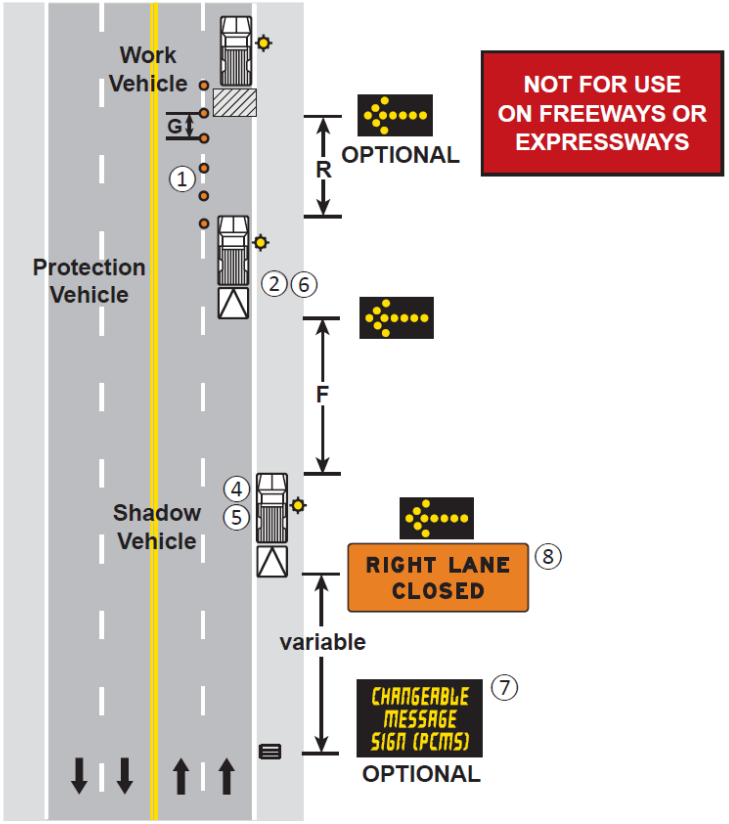
New Merging Taper

Mobile/Short Duration

NOTES:

1. Channelizing devices may be omitted if the operation moves at least the Decision Sight Distance (**D**) every 15 minutes or less (mobile operation).
2. May use additional Protection Vehicle (not shown on layout) to close shoulder in advance of Work Vehicle.
3. Any Shadow Vehicle or Protection Vehicle operating totally or partially in a traffic lane should be equipped with a TMA.
4. The Shadow Vehicle may encroach into the traffic lane when the shoulder is too narrow to drive on.
5. The Shadow Vehicle may be omitted when the posted speed limit is 40 mph or less.
6. If the Shadow Vehicle is not used and there is no PCMS, the Protection Vehicle must have a RIGHT LANE CLOSED sign.
7. The PCMS shall be used for nighttime operations.
8. When the PCMS is used, the RIGHT LANE CLOSED sign becomes optional.



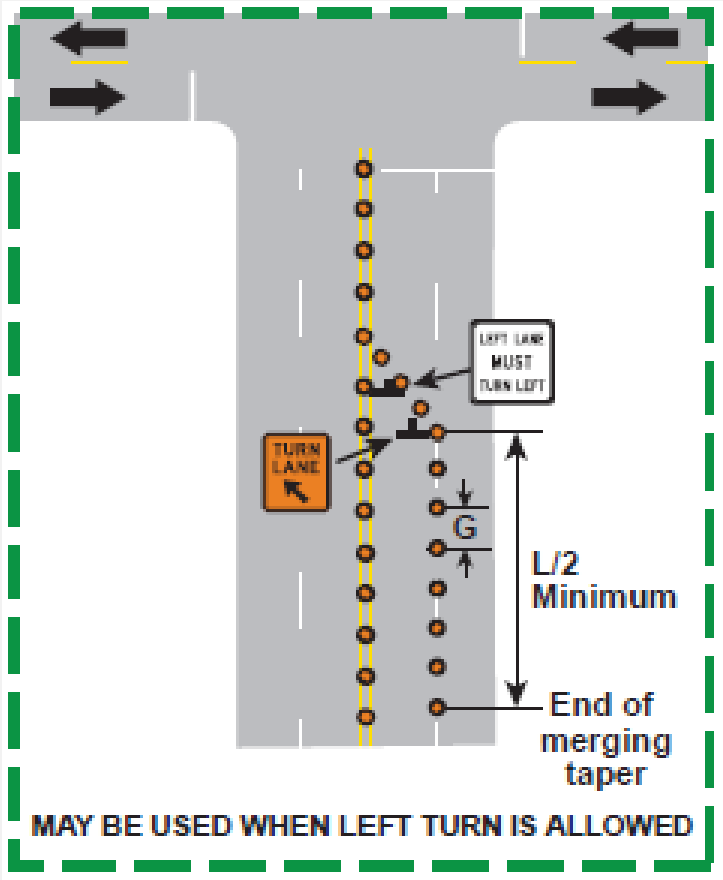
MOBILE/SHORT DURATION LANE CLOSURE
MULTI-LANE UNDIVIDED ROAD
1 HOUR or LESS **LAYOUT 41**

6K-41

- Modified significantly
  - Prior
    - If arrow board not on work vehicle, protection vehicle required
    - Shadow vehicle required
  - New
    - Protection vehicle required
    - Shadow vehicle may be omitted on low speed roadways
  - Does not increase number of needed vehicles, may reduce

First Layout with Inset

- 2 signs in turn lane



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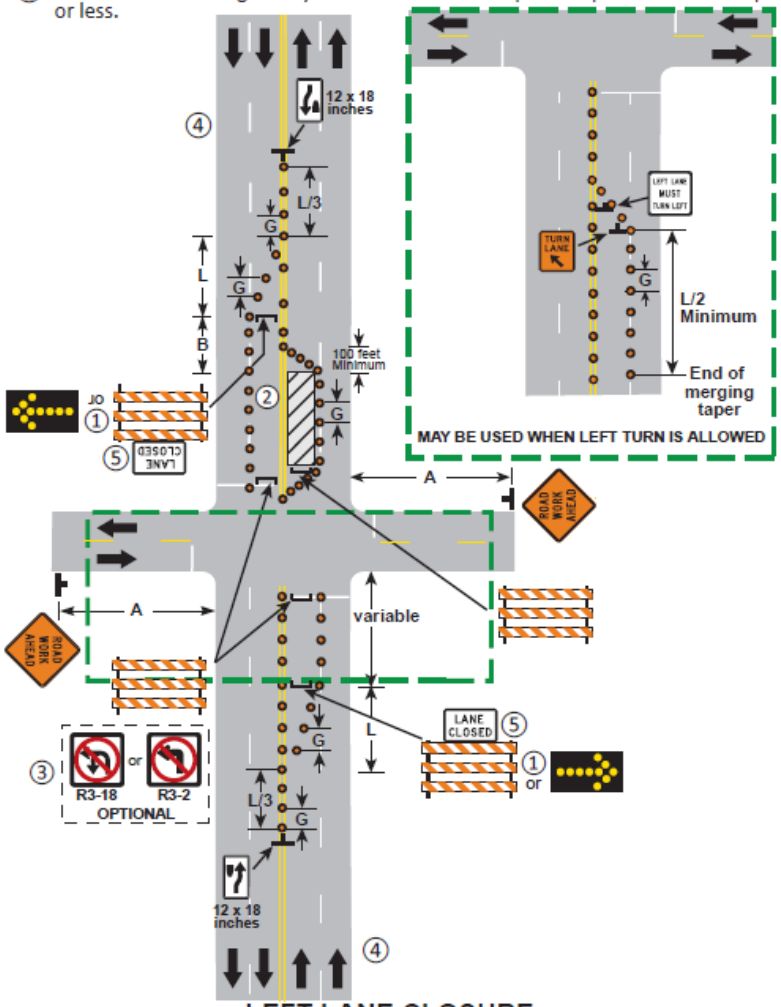
NOTES:

1. Place device at the end of the taper. The Flashing Arrow Board shall be used where the posted speed limit is 45 mph or greater.
2. The lane closure may be omitted when the workers are not at the work site.
3. Optional R3-18 or R3-2 signs may be placed on sign stand or top of barricades on side closest to traffic. Signs are required if turns are prohibited.
4. See Layout 43 for required placement of advance warning signs.
5. The LANE CLOSED signs may be omitted when the posted speed limit is 40 mph or less.



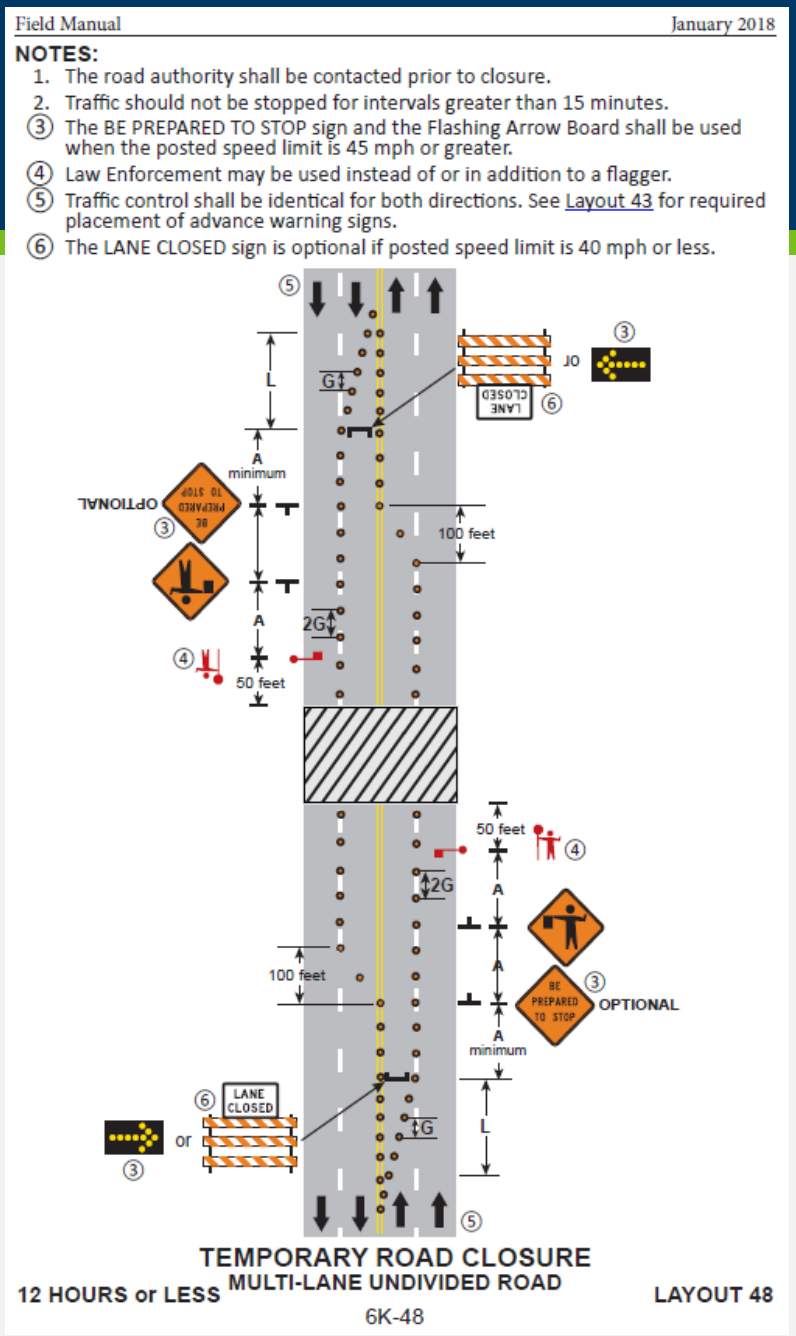
LEFT LANE CLOSURE
Work Space at Intersection
MULTI-LANE UNDIVIDED ROAD

3 DAYS or LESS

LAYOUT 46

6K-46

Temporary Road Closure



- New layout
- Up to 12 hours, **but see General Note 2**
- Applies to most temporary road closures

Multi-Lane Divided Road

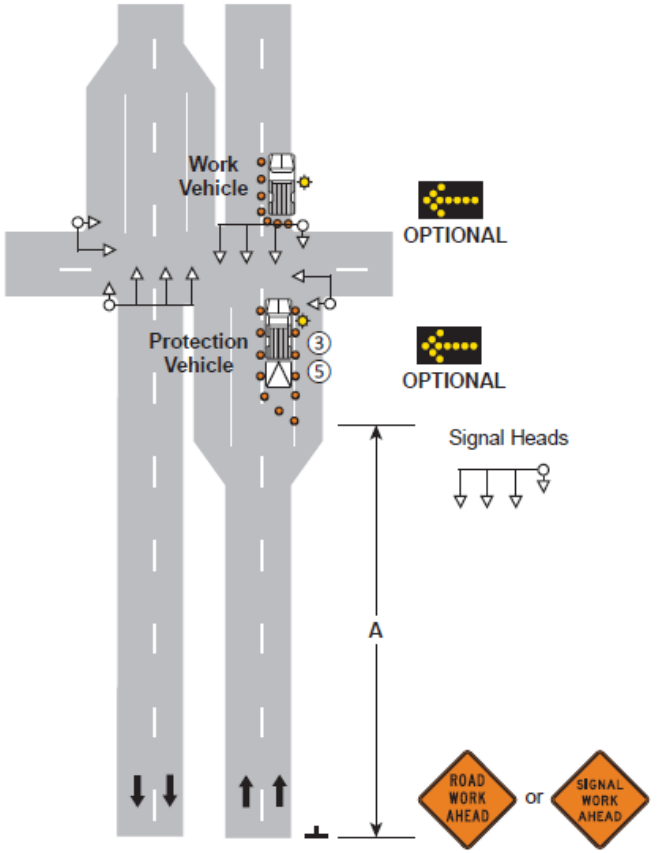
Two separate roadways where opposing traffic is separated by a median.

**Drawings Not To Scale*

Multi-Lane Divided

NOTES:

1. The operation shall not remain in one location for more than 15 minutes.
2. If the work space is not visible for at least the Decision Sight Distance (**D**), the appropriate stationary layout shall be used.
3. The traffic control signal should be put in an ALL-RED flash mode to facilitate traffic control at the work site. The Protection Vehicle may be omitted when signal is placed in ALL-RED flash mode. Channelizing devices may be omitted if a Protection Vehicle with a Flashing Arrow Board and TMA is used.
4. There should be little or no encroachment into the cross-street traffic path.
5. If signals are not placed in ALL-RED flash, the Protection Vehicle should be equipped with a TMA and a Flashing Arrow Board.
6. The Work Vehicle shall be equipped with operating vehicle warning lights visible for 360 degrees around the vehicle at a minimum height of 3 1/2 feet and a radius of 60 feet or greater.



LANE CLOSURE
At Far Side of Signalized Intersection
15 MINUTES or LESS **LAYOUT 63**

6K-63

Lane Closure at Far Side of Signal

- Typical signal maintenance layout
- Added protection vehicle if signal not placed in ALL-RED flash mode.
  - See Specific Notes 3 and 5

Miscellaneous Layouts

Layouts for Continuously Moving and Miscellaneous Operations.

**Drawings Not To Scale*

Miscellaneous Layouts

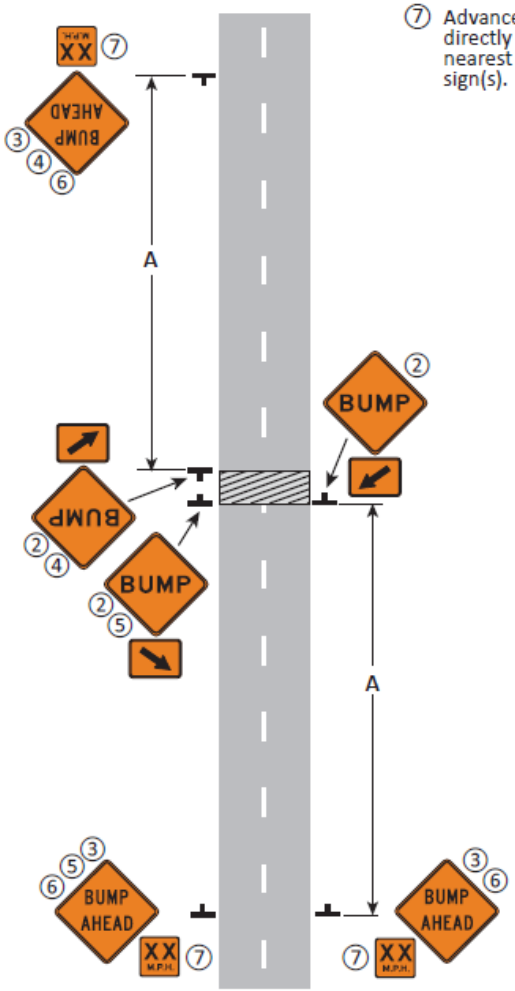
mndot.gov/fieldmanual

Typical Bump/Dip Signing

- Modified significantly
- New language in MN MUTCD Parts 2 and Part 6
- See Specific Note 6

NOTES:

1. Multiple bumps should use ROUGH ROAD sign.
2. When a dip, use DIP signs.
3. May use STEEL PLATE AHEAD sign when bump is caused by steel plate.
4. Use on two-lane, two-way roadways.
5. For multi-lane divided or one-way road only.
6. The BUMP AHEAD signs may be omitted if the posted advisory speed is 10 mph or less than the posted regulatory speed.
7. Advance plaques shall be placed directly below or on the lower side nearest traffic of the BUMP AHEAD sign(s).



TYPICAL BUMP/DIP SIGNING

3 DAYS or LESS **LAYOUT 80**

6K-80

Workers Present Speed Limit

NOTES:

1. Contact the road authority for requirements to implement a Workers Present Speed Limit.

② All inplace speed limit signs shall be covered when Workers Present Speed Limit is implemented.

3. Workers Present Speed Limit assemblies shall be removed, covered, or modified to the existing posted speed limit when workers are not present directly adjacent to traveled lanes.

4. Workers Present Speed Limit assemblies may be placed in the buffer or work space as long as the assemblies are not blocked by vehicles or devices.

5. As workers proceed through the work area, the assembly shall be no greater than 1 mile in advance of the work crew. For Workers Present Speed Limits where the posted speed limit is 40 mph or less, the assembly should be no greater than 1/2 mile in advance of the work crew.

⑥ The Reduced Speed Ahead sign shall be used when the Workers Present Speed Limit is more than 10 mph below the posted speed limit.

⑦ The Flashing Arrow Board shall be used where the posted speed limit is 45 mph or greater and placed on the shoulder. If there is no shoulder, or the shoulder is too narrow, place at the end of the taper in lieu of the Type III barricade assembly.

⑧ The LANE CLOSED and/or the Lane Ends sign may be omitted when the posted speed limit is 40 mph or less.

⑨ A black on white END WORK ZONE SPEED LIMIT sign (R2-12) shall be placed within a mile of the last work crew (within 1/2 mile if speed limit is 40 mph or less) to indicate the end of the higher fines area.

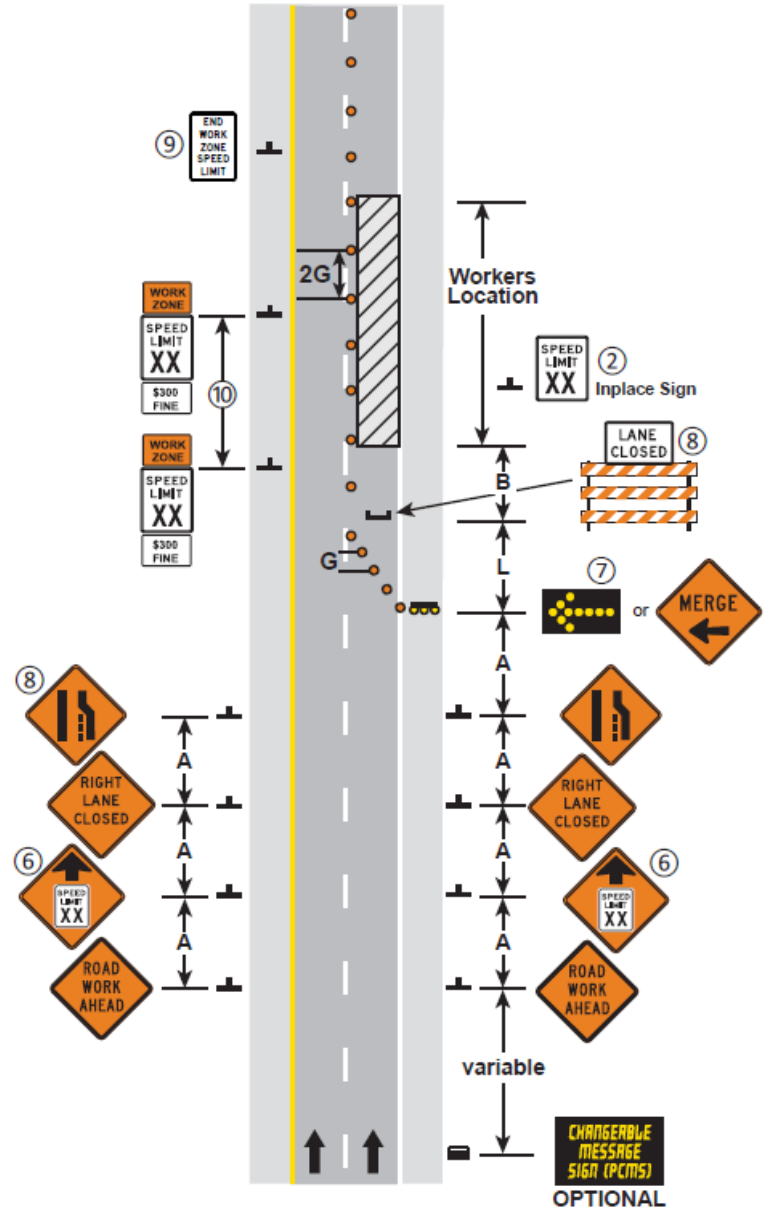
⑩ When workers are present adjacent to the traveled lanes throughout the work area, confirmatory Workers Present Speed Limit assemblies may be placed according to the spacing table below.

Typical Spacing for Workers Present Speed Limits	
Workers Present Speed Limit (mph)	Assembly Spacing (mile)
≤ 40	1/2
≥ 45	1

WORKERS PRESENT SPEED LIMIT
LAYOUT 83a

3 DAYS or LESS **LAYOUT 83a & b**

6K-83a

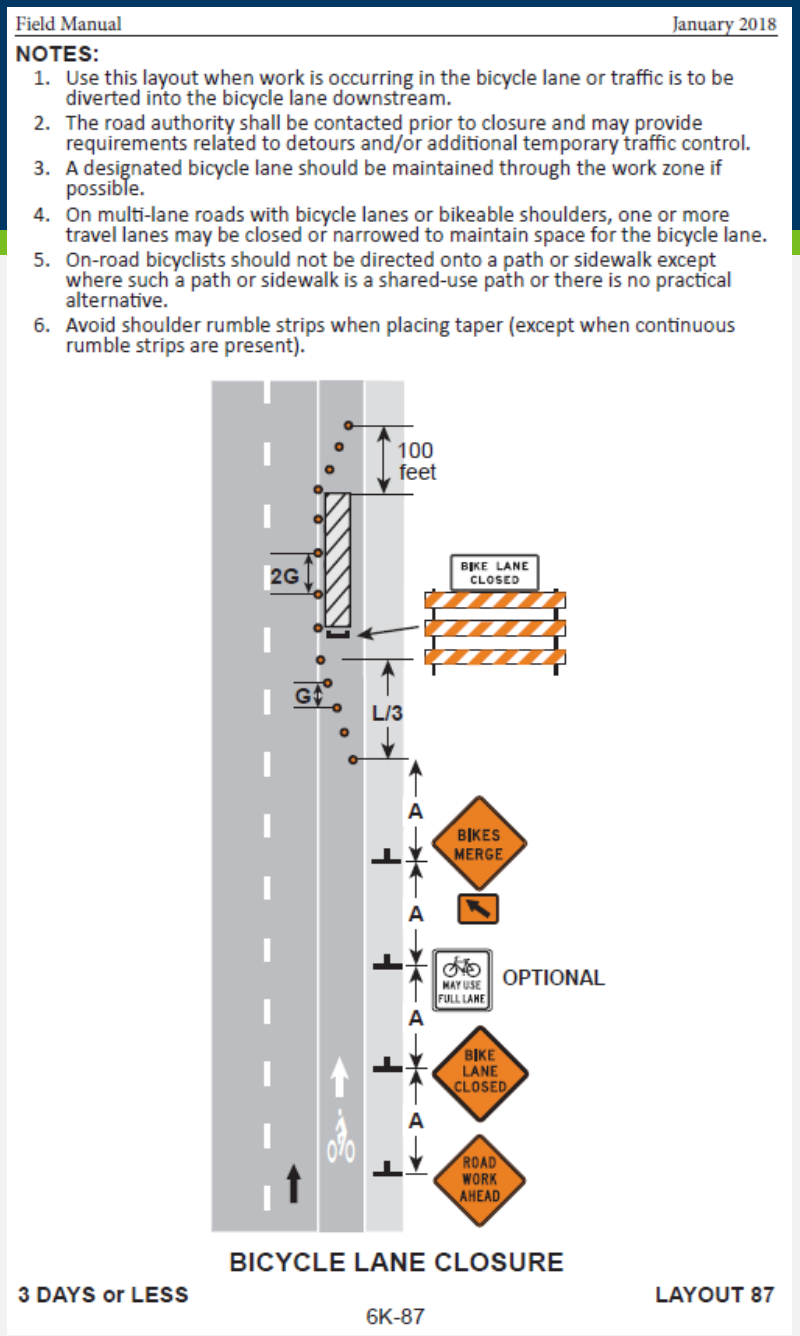


WORKERS PRESENT SPEED LIMIT
LAYOUT 83b

3 DAYS or LESS **LAYOUT 83a & b**

6K-83b

Bike Lane Closure



Field Manual January 2018

NOTES:

1. Use this layout when work is occurring in the bicycle lane or traffic is to be diverted into the bicycle lane downstream.
2. The road authority shall be contacted prior to closure and may provide requirements related to detours and/or additional temporary traffic control.
3. A designated bicycle lane should be maintained through the work zone if possible.
4. On multi-lane roads with bicycle lanes or bikeable shoulders, one or more travel lanes may be closed or narrowed to maintain space for the bicycle lane.
5. On-road bicyclists should not be directed onto a path or sidewalk except where such a path or sidewalk is a shared-use path or there is no practical alternative.
6. Avoid shoulder rumble strips when placing taper (except when continuous rumble strips are present).

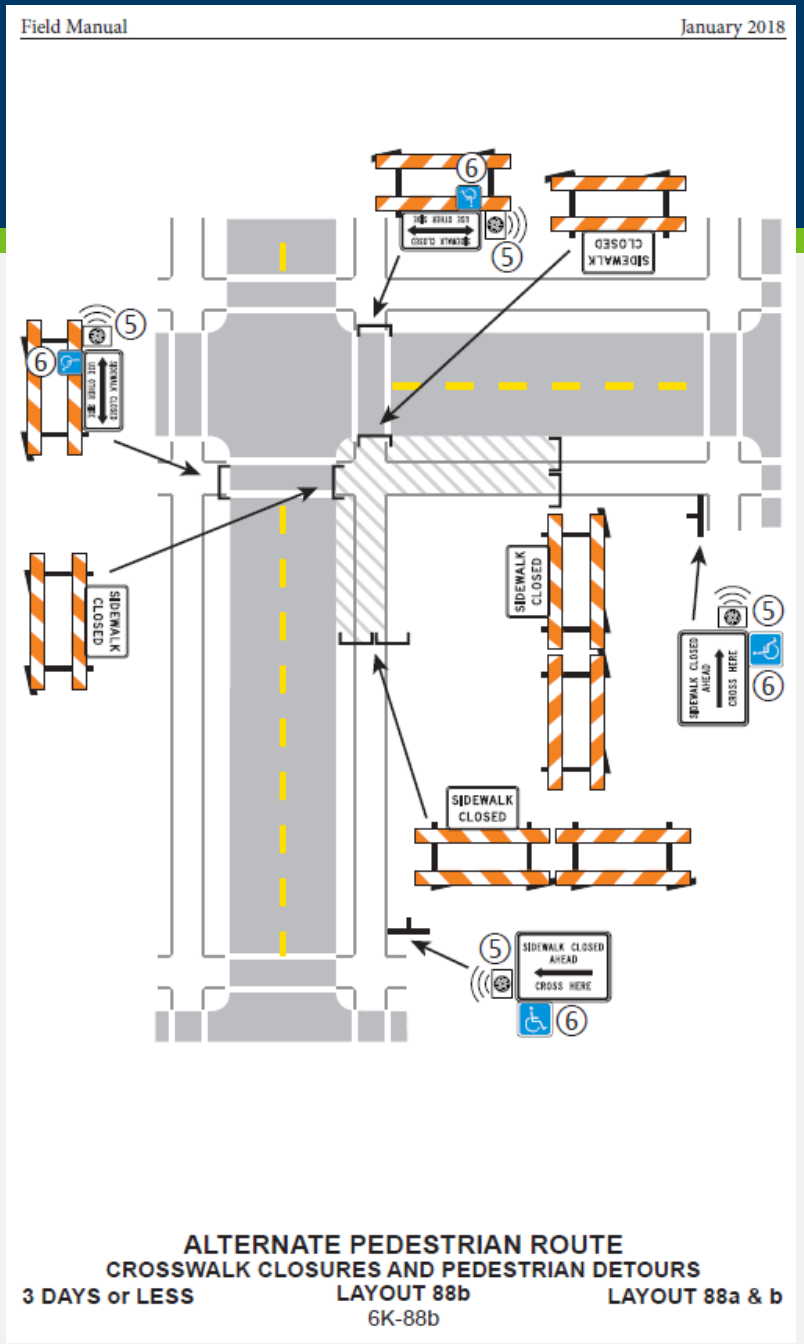
BICYCLE LANE CLOSURE

3 DAYS or LESS **LAYOUT 87**

6K-87

- Brand new layout
- MN statute only allows vehicles to cross bike lane lines to park or turn right
- Close Bike Lane when:
  - Working in bike lane or
  - See General Note 1

APR Layouts



- Added General Note 2

When a sidewalk is closed but workers are present to halt operations and provide safe passage through the work site, the devices shown are not required. Pedestrians may be delayed for a short period of time for project personnel to move equipment and material to facilitate passage. Project personnel may also assist pedestrians in navigating the work zone.

MINNESOTA FLAGGING HANDBOOK

DEPARTMENT OF TRANSPORTATION

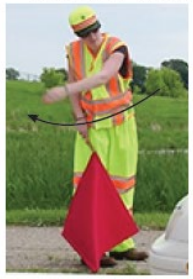
January, 2018

Flagging Handbook

The Use of Hand Signaling Devices by a Flagger

To Stop Traffic

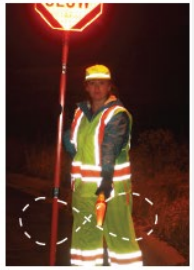
To Release Traffic



To Alert and Slow Traffic

Preferred Flagging Method Using a Paddle.

Preferred Flagging Method Using a Flag.



Nighttime Flagging with Glow Cone.

6K-120

Flagger Name

Flagger Signature

Date Trained

MnDOT Qualified Flagger Trainer Name

Trainer Qualification Number

DEPARTMENT OF TRANSPORTATION

t.gov/fieldmanual

Additional Training

- MN LTAP Circuit Training and Assistance Program
  - WZ Safety, Temporary Traffic Control, and Flagging Course
- MN State Aid for Local Transportation webpage
  - Link to **Field Manual Resource webpage**
  - Videos of the above training
- Field Manual Webpage
  - Field Manual Update presentation

Additional Training

- FHWA WZ Safety Grant (Free for public agencies)
  - ATSSA Traffic Control Technician – Dec 10
    - Individuals working in the field installing and removing TTC Devices
  - ATSSA Traffic Control Supervisor – Dec 11-12
    - Individuals determining which layouts to use and what modifications are needed. Plan reading, interpretation, and supervisions skills are included.
    - websearch ATSSA Training – look for courses in Minnesota

Questions?

Ken E. Johnson, PE

State Work Zone, Pavement Marking and Traffic Devices Engineer

651-234-7386

ken.johnson@state.mn.us

TOWARD ZERO DEATHS