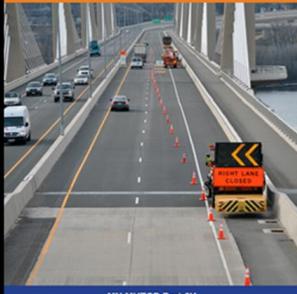


# Work Zone Safety Using the Field Manual

Fall 2018

\$5.00

**Minnesota  
Temporary Traffic Control  
Field Manual**  
January 2018



MN MUTCD Part 6K  
mndot.gov/mnmutcd

Ken E. Johnson  
State Work Zone, Pavement Marking & Traffic Devices Engineer



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## What we'll answer today

- What is the Field Manual?
- Who is involved?
- How to use to improve WZ Safety
- Where to get more training



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What is the Field Manual?

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## MN MUTCD

- Only engineering related manual required by statute
- Traffic control requirements for all roads open to the public
- Recommendations by the Minnesota Committee on Uniform Traffic Control Devices
- Adopted by the Commissioner of Transportation
- [mndot.gov/mnmutcd](http://mndot.gov/mnmutcd)
- Part 6 is **Temporary Traffic Control**



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# TEMPORARY TRAFFIC CONTROL FUNDAMENTALS



## MN MUTCD Chapter 6B TTC Fundamental Principles



- Construction, maintenance, utility, and incident zones can all benefit from TTC
- Special plans preparation and coordination may be required
- Following the fundamental principles of Part 6 will
  - assist road users
  - help protect workers

Uniform treatment leads to uniform response.

## MN MUTCD Chapter 6B

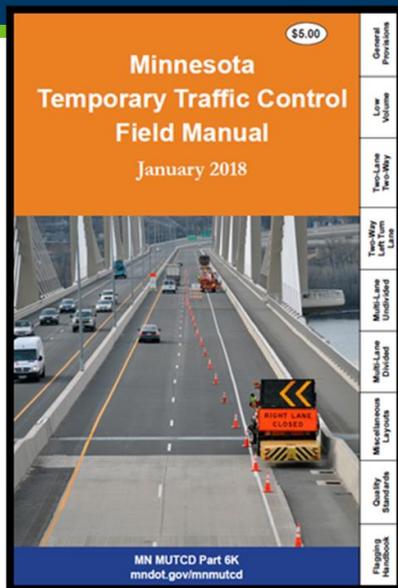
### • Seven fundamental principles of TTC

1. General plans or guidelines should be developed to provide safety for users and workers
2. Road user movement should be inhibited as little as practical
3. Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner
4. Routine day and night inspections of TTC elements should be performed
5. Attention should be given to the maintenance of roadside safety
6. Training appropriate to the job
7. Maintain good public relations

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## 1. Plan should be developed



A TTC plan should be prepared and understood by all responsible parties before the site is occupied.

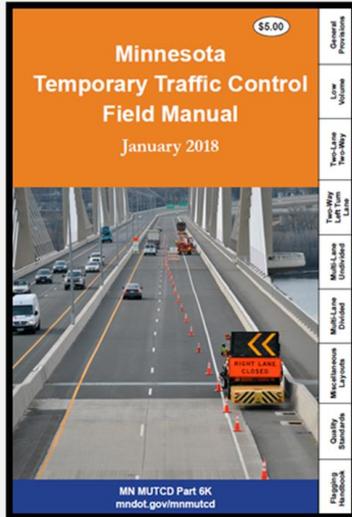
Any changes should be reviewed and approved by agency

Consistency - reduces user confusion

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# 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

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## Field Manual 13.0 – Previous Versions



Fall 2

ual

## 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

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## Minnesota Temporary Traffic Control Field Manual January 2018



## New Sections!!

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

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No job is so important  
in maintenance or  
construction, and  
no service so  
urgent, that we  
cannot take time  
to perform our  
work safely.

**m** MINNESOTA



## General Provisions Key Changes

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## 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***

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## 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

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## New Guidance in General Provisions

### Inspecting the TTC Zone

- Routine day and night inspections

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#### 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-c) 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.



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## 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

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6K-n

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## New Guidance in General Provisions

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- 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 weathouts, 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

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## • 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

## High-Vis Clothing

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



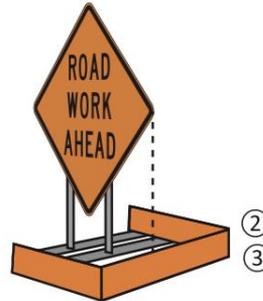
Page 6K – r

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## 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.



**Detectable Edge**  
for Portable Sign Stand

Page 6K – u

## TTC Distance Charts

### 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	100	550	200	100	75	200
35-40	325	700	325	175	125	305
45-50	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

### Low Volume Roads: Rural and Urban

A Rural Highway with less than 400 ADT, and an Urban Residential Street with less than 400 ADT and speeds of 30 mph or less.

\*Drawings Not To Scale

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Layouts

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### TWO-LANE, TWO-WAY ROADS

Intermediate Volume Up to 1500 ADT	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Lane Closure	11			
Flagger Control		20*		15*
STOP Sign Control			14	
Work in Center of Road		27*		
All ADTs	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Work Vehicle Parked on Shoulder	8			8
Work on Shoulder	9			8
Work off Shoulder			8	
Work off Roadway	10			
Shoulder or Parking Lane Closure			8	
Partial Shoulder Closure for Trailer Mounted Devices			7	
Lane Closure	12, 13*			
2 Flagger Control			16*	
Moving Work Spaces		17*		
Near Intersection			20*, 21*	
Near Railroad Xing			22*	
Pilot Car Operation			19*	
Flagging Crossroads and Blind Curves			19*	
Automated Flagger Assistance Device (AFAD)			24*	
Portable Signal Control			25	
Flagging Station Enhancements			23	
Work in Center of Road		28*		
Lane Shift			29	
Turn Lane Closures			33, 34	
Temporary Road Closure (15 minute intervals)		31*		
Temporary Road Closure			32	
Sidewalk Closure			88, 89	
Bike Lane Closure			87	
Gravel Road Maintenance		30		
Crossroad and Confirmation Signing			35	

See Low Volume Roads section for ADTs less than 400.  
\* This layout may be used for nighttime operations only if the flagging stations are occupied and illuminated with portable lights.

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## Choosing Layouts

Primarily based on:

- Traffic Volume
- Nature of Impact
- Duration of Impact

Often have to combine layouts

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### 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		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.

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## Low Volume Indexes

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

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### Low Volume Layouts

**NOTES:**

- ① Additional Work Vehicle shall be parked off of the roadway. Do not obstruct the shoulder in the coned areas.
- ② A minimum of 10 feet of drivable surface outside of the channelizers should be maintained on all sides. Anything less than 10 feet shall be approved by the road authority.
- ③ Channelizers and ROAD WORK AHEAD signs are optional at 15 minutes or less.

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

**WORK ON CENTERLINE**

12 HOURS or LESS

6K-1 LAYOUT 1

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## 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

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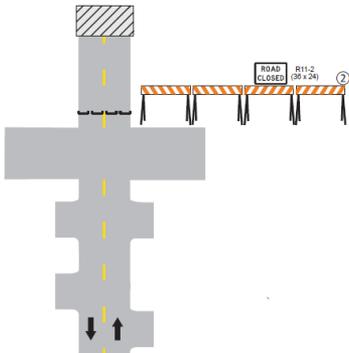
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**NOTES:**

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.

## Road Closure Special Events

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



ROAD CLOSURE SPECIAL EVENTS LAYOUT 5

12 HOURS or LESS 6K-5

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

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**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



WORK VEHICLE PARKED ON SHOULDER LAYOUT 6

1 HOUR or LESS 6K-6

- Brand new layout
- Layout 8 simplified

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# Workers Present Speed Limit

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**NOTES:**

1. Contact the road authority for requirements to implement a Workers Present Speed Limit.
2. All in-place 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 1/2 mile 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**

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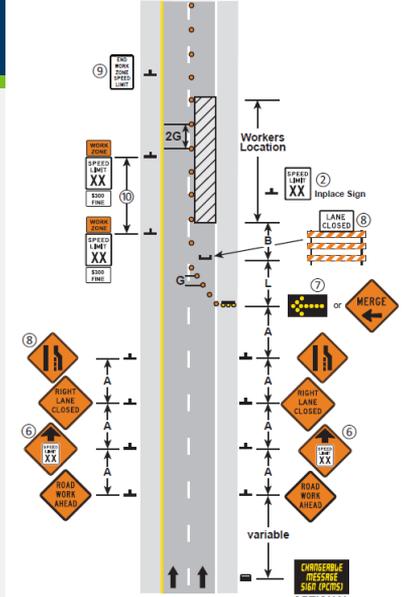
3 DAYS or LESS

6K-83a

LAYOUT 83a & b

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**WORKERS PRESENT SPEED LIMIT LAYOUT 83b**

3 DAYS or LESS

6K-83b

LAYOUT 83a & b

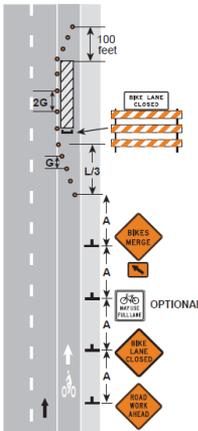
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**NOTES:**

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).

# Bike Lane Closure



**BIKE LANE CLOSURE LAYOUT 87**

3 DAYS or LESS

6K-87

LAYOUT 87

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- 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

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**ALTERNATE PEDESTRIAN ROUTE**  
CROSSWALK CLOSURES AND PEDESTRIAN DETOURS  
3 DAYS OR LESS LAYOUT 88b LAYOUT 88a & b  
6K-88b

Fall 2018

## 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.

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## Quality Standards

Methods to determine whether the various traffic control devices are Acceptable, Marginal, or Unacceptable.

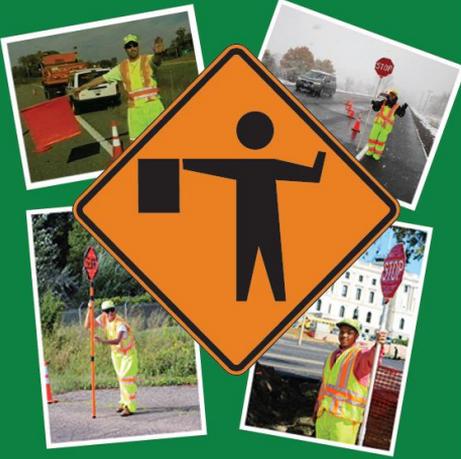
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## Quality Standards

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## MINNESOTA FLAGGING HANDBOOK



**m** 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 **m** DEPARTMENT OF TRANSPORTATION

## 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

**HANG UP!**

Lives At Stake. Orange Cones. No Phones.



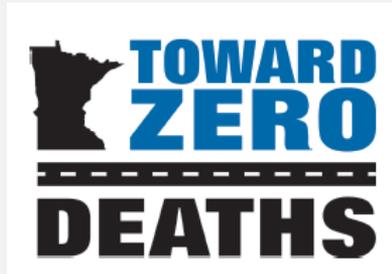
Questions?

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