

# MnDOT Signing and TTC Updates

Ken E. Johnson, Assistant State Traffic Engineer

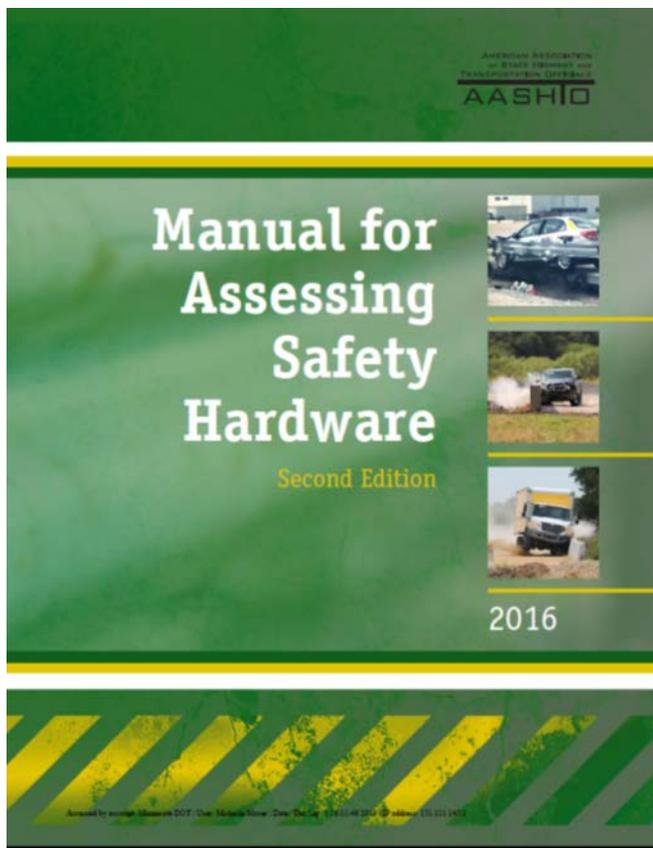
Office of Traffic Engineering

February 2020



# What we'll discuss today

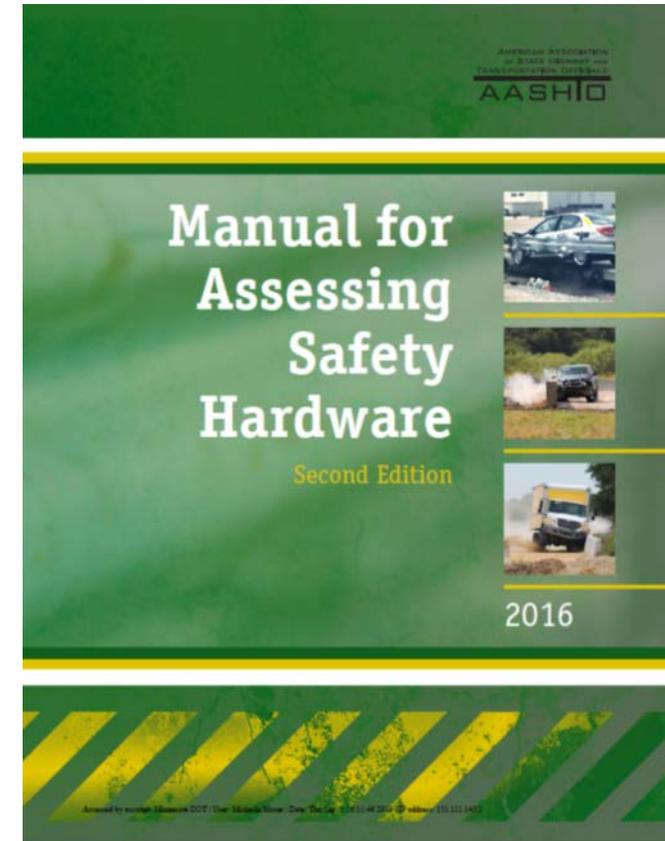
- Crashworthy Requirements
  - Background
  - Required Documentation
  - Sign Structures
  - TTC Devices
- Standard Signs and Markings Summary/Manual
- Updated Time and Traffic Boilerplates
- New Flagger Law
- Requirements for TTC Plans to be submitted to MnDOT



# Crashworthy Requirements

# What is a Crashworthy Device

- Manual on Uniform Traffic Control Devices (MUTCD) says: “ a roadside appurtenance that has been successfully crash tested in accordance with a national standard”
- Manual on Assessing Safety Hardware (MASH) 2016
- National Cooperative Highway Research Program (NCHRP 350)



# State Processes for Determining MASH Compliance

- MnDOT requires all roadside hardware used on the NHS, along with other State roadways, to be crashworthy.
- Crashworthiness is defined as being tested to current crash test standards.
- While crash testing determines a product's crashworthiness under a defined set of criteria, MnDOT does not use these tests as the sole determination of a product's fitness for use on state roadways.

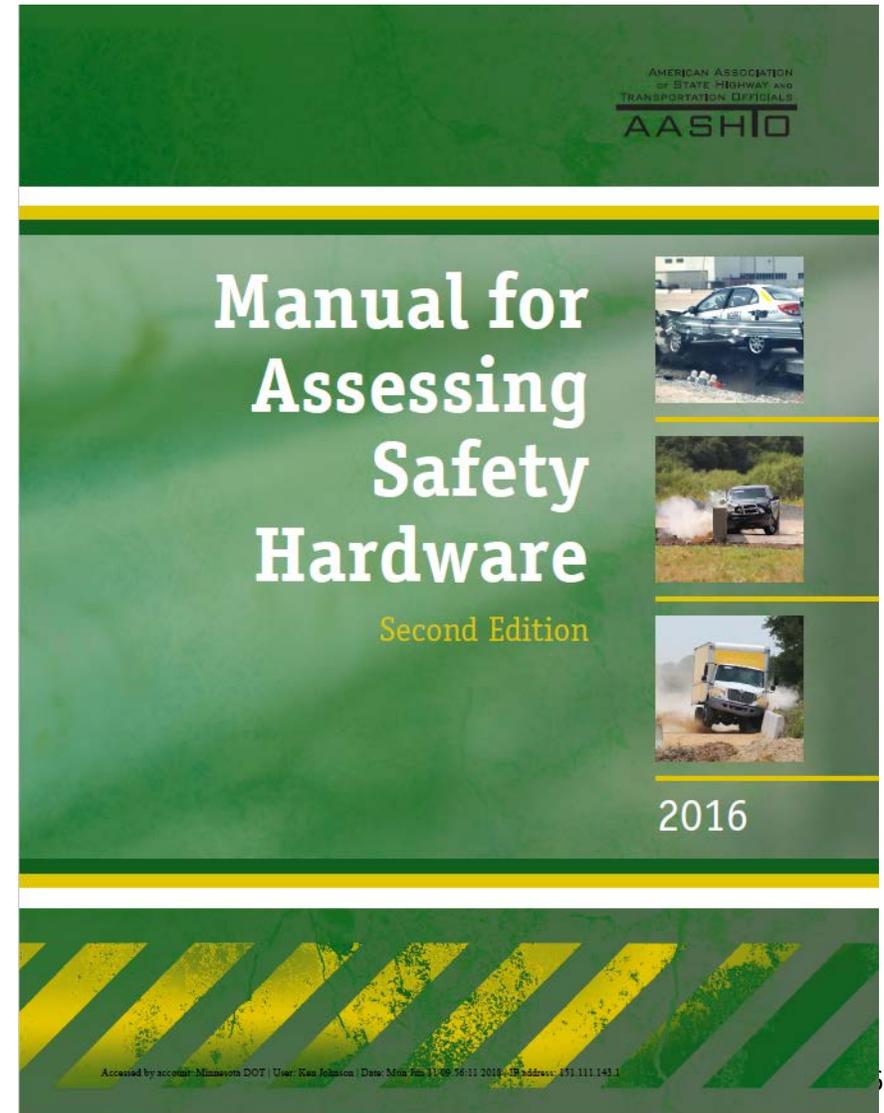
# Crashworthy Standard has been/is changing

National Cooperative Highway Research Program

## NCHRP Report 350

Recommended Procedures for the  
Safety Performance Evaluation  
of Highway Features

Transportation Research Board  
National Research Council





# Differences Between MASH and NCHRP-350

- Changes in test matrices
- Changes in test installation
- Changes in test vehicles
- Changes in evaluation criteria
  - Passing crash test is now contingent on windshield damage and occupant compartment damage
- Changes in test documentation

# AASHTO/FHWA Implementation Agreement



U.S. Department  
of Transportation  
Federal Highway  
Administration

## Memorandum

Subject: **INFORMATION:** AASHTO/FHWA  
Joint Implementation Agreement for  
Manual for Assessing Safety Hardware  
(MASH)

Date: JAN -7 2016

From: *Thomas D. Everett*  
Thomas Everett  
Director, Office of Program  
Administration

In Reply Refer To:  
HSST

Michael S. Griffith *Michael S. Griffith*  
Director, Office of Safety Technologies

To: Division Administrators  
Directors of Field Services  
Federal Lands Highway Division Directors

### Purpose

The purpose of this memorandum is to share information regarding the American Association of State Highway and Transportation Officials (AASHTO)/FHWA Joint Implementation Agreement for the AASHTO Manual for Assessing Safety Hardware (MASH). Recently, the agreement was successfully balloted by AASHTO's Standing Committee on Highways and approved by FHWA.

- For contracts on the National Highway System with a letting date after the dates below, only safety hardware evaluated using the 2016 edition of MASH criteria will be allowed for new permanent installations and full replacements:
  - December 31, 2017: w-beam barriers and cast-in-place concrete barriers
  - June 30, 2018: w-beam terminals
  - December 31, 2018: cable barriers, cable barrier terminals, and crash cushions
  - December 31, 2019: bridge rails, transitions, all other longitudinal barriers (including portable barriers installed permanently), all other terminals, sign supports, and all other breakaway hardware
- Temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of MASH. Such devices manufactured on or before this date, and successfully tested to NCHRP Report 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.

# Implementation Agreement for MASH-16

- Utilization of 2016 MASH-compliant hardware will be required on new construction and reconstruction projects on the **NHS** as of these dates:
  - January 1, 2018: Longitudinal w-beam barrier and cast-in-place concrete barrier
  - July 1, 2018: W-beam terminals
  - January 1, 2019: ~~Cable barriers, cable barrier terminals~~, and crash cushions
  - January 1, 2020: Bridge rails, transitions, all other longitudinal barriers, all other terminals, **sign supports**, other breakaway hardware, **cable barriers, cable barrier terminals**



# Implementation Agreement for MASH-16

## What about TTC devices?

“Temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of MASH. Such device manufactured on or before this date, and successfully tested to NCHRP Report 350 of the 2009 edition of MASH, may continue to be used throughout their normal service lives.”

## Midwest WZ Roundtable

(Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio & Wisconsin)

- Recommendation to State DOT’s Leadership

## MnDOT Tech Memo

Crashworthy Requirements of TTC Devices – effective August 1, 2019

## Technical Memorandum

To: Electronic Distribution Recipients

From: Nancy T. Daubenberger, P.E.   
Assistant Commissioner, Engineering Services

Subject: Crashworthy Requirements of Temporary Traffic Control Devices

### Expiration

This is a new Technical Memorandum and shall remain in effect until December 31, 2024 unless superseded prior to that date.

### Implementation

The requirements in this Technical Memorandum are applicable to any work on the State Highway System, including construction, maintenance and permitted projects. It will apply to construction projects let after December 31, 2019. It will apply to maintenance and permitted projects occurring after December 31, 2019.

### Purpose

The purpose of this Technical Memorandum is to establish timelines for the allowable use of crashworthy devices tested under NCHRP-350 and MASH-16, consistent with the *AASHTO/FHWA Joint Implementation Agreement for Manual for Assessing Safety Hardware (MASH)* memorandum.

### Introduction

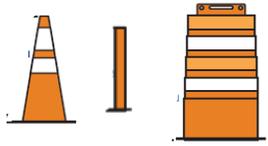
The *AASHTO Manual for Assessing Safety Hardware 2016* (MASH-16) is the new state of the practice for the crash testing of safety hardware devices. It updates and replaces the National Cooperative Highway Research Program (NCHRP) Report 350 testing standards. A MASH-16 hardware implementation agreement between AASHTO and the FHWA was issued in a [joint memorandum](#), dated January 7, 2016. This *AASHTO/FHWA Joint Implementation Agreement for Manual for Assessing Safety Hardware (MASH)* memorandum outlined the requirements for incorporating MASH-16 tested devices into new permanent installations and full replacements of roadside safety devices on the National Highway System (NHS). MnDOT will be implementing the change to MASH-16 tested devices for all trunk highways.

The implementation agreement includes the following about work zone devices:

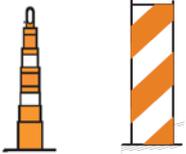
Temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of MASH. Such devices manufactured on or before this date, and successfully tested to NCHRP Report 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.

- Any work on the State Highway System
- Construction projects let after December 31, 2019
- Maintenance and permitted work occurring after December 31, 2019

# Crashworthy Requirements for TTC

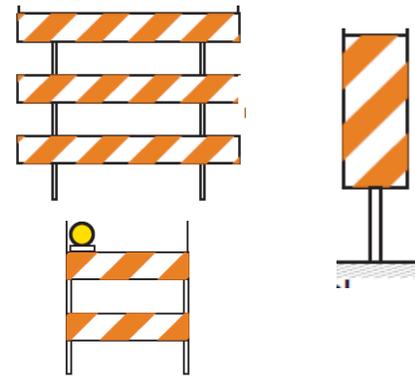


▸ Category 1 – vendors can self-certify as MASH-16 compliant



• Category 2 –

- devices manufactured after December 31, 2019 must be MASH-16 compliant
- NCHRP-350 devices purchased before 12/31/19 may be used until December 31, 2024 – this includes ground mounted sign supports
- Knee brace may no longer be installed after December 31, 2019
- **Update: knee brace allowed for temporary signs for project lettings through June 2020**



# Crashworthy Requirements for TTC



- Category 3 (except for temporary barrier) –
  - devices manufactured after December 31, 2019 must be MASH-16 compliant
  - NCHRP-350 devices purchased before 12/31/19 may be used until December 31, 2029

- Category 3 – temporary barrier

- Portable concrete barrier that meets MnDOT specifications is considered acceptable
- All other temporary barrier used after December 31, 2019 must be MASH-16 compliant
- MnDOT owned temporary barrier may be used for its useful life, MnDOT will only purchase MASH-16 compliant barrier after December 31, 2019



# Crashworthy Requirement

## Category 4

- Historically not considered crashworthy
- Now same test matrix as TMA
- MnDOT will perpetuate Category 4 requirements
  - Should be shielded when possible
  - Should be removed when not needed
  - Shall be delineated when deployed and not shielded



# Crashworthy documentation requirements

- Federal letter of eligibility
  - Websearch FHWA crashworthy devices
  - Letter of eligibility will only be granted to devices that have undergone the full suite of MASH-16 tests
  - MASH-16 current list
  - NCHRP-350 archived
- States now have the opportunity to assess if a minor modification is crashworthy under MASH-16

# MnDOT MASH Compliance Evaluation

MNDOT MASH COMPLIANCE EVALUATION



Date: September 12, 2019

System: Square Tube Three Wall Base

Standard Plan: 5-297.721

Date of Evaluation: September 12, 2019

## Device & Testing Criterion

System Type	Device Name/Variant	Testing Criterion	Test Level
Breakaway Sign Support	Telespar Sign Support	MASH 3-60, 3-61, & 3-62	MASH TL-3

- Existing hardware
- New hardware
- Significant modification to existing hardware
- Non-significant modification to existing hardware
- Initial (TTI) determination – MASH compliance
- Project specific request to evaluate hardware list item

## Literature Review

Report Name	Key Findings	Link
Texas Transportation Institute, "MASH-16 TL-3 Testing of the Telespar Sign Support Post," Test Report No. 690900-XSD4-9 May, 2019	The Telespar Sign support performed acceptably as a MASH TL-3 breakaway support structure	<a href="http://www.atc-mechanical.com/telespar/square-sign-post/">http://www.atc-mechanical.com/telespar/square-sign-post/</a>

# MnDOT MASH Compliance Evaluation

## MNDOT MASH COMPLIANCE EVALUATION

### Evaluation Results

The compliance conclusion is based on *(mark all that apply)*:

- FHWA Eligibility Letter
- Documentation from an accredited crash-test facility (3rd party expert opinion)
- MNDOT Engineering Judgement

#### Discussion

MNDOT considers the system MASH compliant based on similarities between the tested system and the MnDOT Square Tube Three Wall base system. Both systems use an oversized, embedded, perforated-steel base section into which the perforated riser post slides to create a sleeved connection. For the Telespar system, connection geometry is controlled by placement of a corner bolt that creates a positive connection between the base and post sections. For the MnDOT system, connection geometry is controlled by installation of a thru-bolt within the base section onto which the riser post sits. The resulting configuration does not create a positive connection between the upper and lower members.

Regarding geometry, the embedded ground mount tubing section of the MnDOT system is installed to a depth of approximately 48". This is roughly 18 inches deeper than the Telespar system. Similarly, the MnDOT ground mount is fabricated from three nested layers of perforated 12 gauge steel tube with the exterior tube having a 2.5" square dimension. The Telespar mount consists of a single perforated 12 gauge square steel tube having an outer dimension of 2.25". Projecting above the ground mount of the Telespar system is a perforated square steel post having a 2" exterior dimension and 14 gauge (0.078125") wall thickness. The post component of the MnDOT system is also a perforated square steel member with a 1.75" outside dimension and 14 gauge (0.078125") wall thickness.

The TTI testing results indicate a flexural failure of the post section occurs at the ground mount connection during vehicle impact. As such, comparison of the plastic section modulus gives an indication of the resistance and corresponding damage that may be expected from the MnDOT configuration. For the sections considered, the plastic modulus of the Telespar post is approximately 0.38 ci while that of the MnDOT post is approximately 0.28 ci. Comparing these values indicates the MnDOT post has roughly 74% of the Telespar post's capacity.

The tested configurations cited in the Texas Transportation Institute (TTI) report all utilize the same Telespar component sections. As such, the TTI tested configurations are considered applicable to the MnDOT standards based on the component comparisons referenced above.

Therefore, given the similarities between the MnDOT and Telespar structures, and recognizing that MnDOT's supports have no known examples of inadequate in-service performance, the systems are considered sufficiently similar such that the TTI testing results are applicable to the MnDOT configurations.

# MnDOT MASH Compliance Evaluation

## MNDOT MASH COMPLIANCE EVALUATION

### Conclusion

- MNDOT determines the system or variant to be MASH compliant
- MASH compliance is currently undetermined, however it is the only option

### Roadside Safety Key Expert Endorsement

X Jihshya Lin  
Digitally signed by Jihshya Lin  
Date: 2019.09.16 16:55:43 -05'00'

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Bridge Fabrication Methods Unit

X Josephine Tayse  
Digitally signed by Josephine Tayse  
Date: 2019.09.17 08:10:41 -05'00'

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State Signing Unit

X Michael Elle  
Digitally signed by Michael Elle  
Date: 2019.09.18 15:37:42 -05'00'

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Design Standards Unit

# MnDOT MASH Compliance Evaluation

- Products with MnDOT MASH Compliance Evaluations
  - I-beam
  - 3 Wall Base
- Products undergoing MnDOT MASH Compliance Evaluations for modifications
  - MASSH 400
  - Fin Base
  - Slip Base
  - Shear Base



# MnDOT Process for Determining MASH Compliance

- For NCHRP-350
  - FHWA Issued Letter of Eligibility
- For MASH-16
  - FHWA Issued Letter of Eligibility
    - Manufacturer submits testing data to FHWA.
    - Only tested device with no modifications allowed.
  - MnDOT MASH Compliance Evaluation
    - Testing facility completes tests and publish their opinions. Each state then needs to evaluate the opinion and then determine crashworthiness.
    - Modifications may be allowed, but needs to be evaluated.



## MASH-16 Crashworthy Sign Structures – Square Tube

# Why Square Tube?

- Knee-braced u-channel is not MASH-16 compliant
- MASH-16 crashworthy requirements required on National Highway System
- MnDOT requiring MASH-16 sign structures on all state highways
- MASH-16 compliant structures
  - U-channel – splice at ground, passed at 0<sup>0</sup>; splice above ground, no tests to date
  - Round posts – MnDOT Sign Crews do not prefer this option
  - Wood posts - MnDOT Sign Crews do not prefer this option
  - Square Tube – In process of testing, received some reports, awaiting others

# Sign Reaction When Hit



1. Bolts break and sign goes over vehicle  
Min. 7' from ground to bottom of sign
2. Post bends and vehicle drives over sign  
Min. 4' from ground to bottom of sign



# 3 Wall Base

- Small signs
  - Markers, Delineators, small chevrons
- Min 4' from ground to bottom of sign
- Drive into soil or bituminous
- Core or form into concrete
- Standard Plan Sheet
- MASH Compliance Evaluation
- Single post only



# Fin Base

- Sign size ~ 36" x 36"
- Min 4' from ground to bottom of sign
  - Based on crash test
- Typical installation – min 7' from ground to bottom of sign
- Drive into soil or bituminous
- Core or form into concrete
- Notes in tabulation
- Developing MASH Compliance Evaluation
- Single post only



# Shear Bolt Base

- Sign size ~ 36" x 36"
- Min 7' from ground to sign panel
- Mount on concrete
  - Min 4" depth of concrete
  - Slope >8%, then core or form
    - Use base on driven post
- Notes in Tabulations
- Single post only



# Slip Base 2-1/2"

- Sign size ~ 60" x 60" on single post
- 7' Min from ground to panel
- Drive into soil
- Mount onto concrete
  - Min 6" depth of concrete
  - Slope >8% or <6" of concrete, then core or form
    - Use base on driven post
- Notes in Tabulations
- Multi-post not omnidirectional



# Slip Base – 4”

- Option for smaller I-beam signs
- 7' min from ground to panel
- Drive base into soil
- Multi-post design requires a hinge at sign
- Not omnidirectional



# I-beam

- Current design is MASH crashworthy from 0°
- Standard plan
- Very little modification from previous
- MASH Compliance Evaluation



# Types of Square Tube Structures

Base Type	Riser Post Size	Min. Height from Ground to Bottom of Panel (crashworthy)	Mounting surface
3 Wall	1-3/4"	4' (bends)	Soil or core in concrete
Fin	2"	4' (bends)	Soil or core in concrete
Shear Bolt	2" (possible insert)	7' (breaks)	Concrete
Slip Base	2-1/2" (2-3/16" Insert)	7' (breaks)	Soil or concrete
Slip Base	4"	7' (breaks)	Soil

# Square Tube Sign Structures

- Mounting height of 4' – Roundabout Directional Arrow, Chevrons, etc.
  - 3 walled base
  - Fin-base
- Intersections need to be omnidirectionally crash worthy
  - 1 post for 3 walled base, Fin Base, Shear Bolt, and Slip Base (2 ½")
  - 50' of intersection



# Square Tube APL

## Approved/Qualified Products

Products Home

Contacts

### Sign structures

All products shown are MASH-16, Test Level 3 compliant for 0 degree impacts.

Sign Structure					
Product	Manufacturer	Riser Post	Mounting Surface	Omni-directional	Approval Date
Omni-Directional Anchor Base (sleeve)	<a href="#">Xcessories Squared, Inc.</a>	2" Square Tube	Soil	Single Post only	Provisional: 12/9/19
Redi-Torque System	<a href="#">Xcessories Squared, Inc.</a>	2-1/2" Square Tube	Soil or Concrete	Single Post only	Provisional: 12/9/19
MASSH-400	<a href="#">Xcessories Squared, Inc.</a>	4" Square Tube	Soil or Concrete	No	Provisional: 12/9/19

NCHRP 350, Test Level 3 compliant devices may be found [here](#).

#### Guidance

- [Specifications and qualification process](#) (PDF)
- [Usage guidelines](#)
- [Application form](#) (PDF)

#### Contact

Tiffany Kautz  
Traffic Engineering  
[tiffany.kautz@state.mn.us](mailto:tiffany.kautz@state.mn.us)  
☎ 651-234-7388

## Traffic Engineering

Traffic Engineering Home

Publications

Training

Approved/Qualified Products

Organizations

Contacts

## Work Zones - Temporary Traffic Control

### Temporary Traffic Control (TTC) products and services

- [TTC manuals and guidelines](#)
- [TTC design tools](#)
- [TTC device standards](#)
- [Training](#)

### Other resources

- [Work zone safety committees](#)
- [Work zone safety tips](#)
- [Work zone safety awareness program](#)
- [Accommodating pedestrians in work zones](#)

A Temporary Traffic Control (TTC) zone is an area of a roadway where road user conditions are changed because of a work zone or incident by the use of TTC devices, flaggers, law enforcement or other authorized personnel.

The type of operation planned, space requirements, time duration, and roadway characteristics for a specific TTC Zone will determine the appropriate procedures and preparation needed for the work zone.

Safety in the work zone is the primary consideration to be addressed in a TTC plan. A work zone may be as small as a single worker stopping alongside the roadway, to a mobile maintenance operation, to a flagger controlled lane closure, to a reduction of lanes on a multi-lane roadway and up to detoured traffic for a full roadway closure. The TTC plan must provide a safe work place and a safe route for **all road users** (including motorists, pedestrians and bicyclists).

# Temporary Sign Design

# MnDOT Temporary Traffic Control Resources

## Traffic Engineering

Traffic Engineering Home Publications Training Approved/Qualified Products Organizations Contacts

### Work Zones - Temporary Traffic Control

#### Temporary Traffic Control (TTC) products and services

- [TTC manuals and guidelines](#)
- [TTC design tools](#)
- [TTC device standards](#)
- [Training](#)

#### Other resources

- [Work zone safety committees](#)
- [Work zone safety tips](#)

A Temporary Traffic Control (TTC) zone is an area of a roadway where road user conditions are changed because of a work zone or incident by the use of TTC devices, flaggers, law enforcement or other authorized personnel. The type of operation planned, space requirements, time duration, and roadway characteristics for a specific TTC Zone will determine the appropriate procedures and preparation needed for the work zone. Safety in the work zone is the primary consideration to be addressed in a TTC plan. A work zone may be as small as a single worker stopping alongside the roadway, to a mobile maintenance operation, to a flagger controlled lane closure, to a reduction of lanes on a multi-lane roadway and up to detoured traffic for a full roadway closure. The TTC plan must provide a safe work place and a safe route for **all road users** (including motorists, pedestrians and bicyclists).

Other questions?

- Websearch – MnDOT work zones
- Subscribe for updates

## Updates

To receive updates and revisions, please subscribe to the [email updates for Temporary Traffic Control Resources](#).

# TTC Design Tools – new page

## Traffic Engineering

[Traffic Engineering Home](#) [Publications](#) [Training](#) [Organizations](#) [Contacts](#)

### Work Zones - Temporary Traffic Control design tools

[Work Zones - Temporary Traffic Control homepage](#)

This page replaces the [former Temporary Traffic Control Plan Template Sheets webpage](#) which will be removed by the end of 2020.

The following are resources for the Temporary Traffic Control (TTC) designer to develop a TTC plan.

#### Sample temporary traffic control (TTC) plan

The Sample TTC Plan is representative of what a completed temporary traffic control plan should include. A typical TTC Plan includes the following sheets (when used): TTC title sheet, pay item tabulation sheet, traffic control tabulation sheet, special sign details, advanced signing, traffic control narrative, detours, pedestrian and bicycle treatments, TTC staging, TTC typicals, and TTC layouts.

Relevant Standard Plates shall be included in the Standard Plate table of the overall plan. Relevant Standard Plans should be included with the other Standard Plans used in the overall plan.

- Sample TTC plan ([PDF DGN](#))

#### Temporary traffic control templates

The TTC plan will specify TTC devices and include plan sheets that indicate how and where the TTC devices are placed for each stage of the project. These devices include channelizing devices, temporary signing, temporary striping, etc and are used to direct and assist drivers in safely moving through the construction area.

#### Downloadable files

**PLEASE NOTE:** The CADD files were created in Microstation Version 8 format; levels, colors and some legend symbols may not be up to [current CADD standards](#). These files will be updated on a continuous basis. It is recommended that a designer retrieves the most current version of any detail before beginning the TTC design process.

- Files available in Microstation format (DGN) or Adobe Reader format (PDF)
- To remove **DESIGNER NOTES** in the DGN files, turn off the **CAPT BLK** level
- The latest sheet revision date (**MM.DD.YY**) is shown
- Please report any errors or suggested changes to the MnDOT Office of Traffic Engineering at [traffic.dot@state.mn.us](mailto:traffic.dot@state.mn.us)

#### Temporary sign design resources

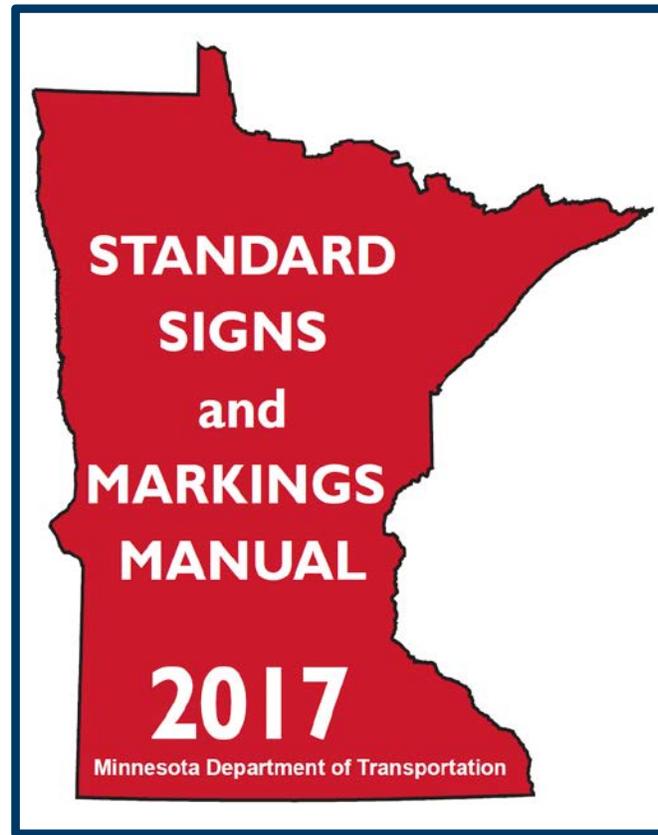
Due to changes in crashworthy requirements, TTC plans should include temporary ground mounted sign designs that utilize square tube posts. The [Crashworthy Requirements for Temporary Traffic Control Devices Tech Memo](#) required that the Minnesota Type “C” and “C” Braced Leg U-Channel (knee brace) sign support not be used in plans let after December 31, 2019. The allowed use of knee brace u-channel structures for temporary signs has been

#### Temporary sign design resources

Due to changes in crashworthy requirements, TTC plans should include temporary ground mounted sign designs that utilize square tube posts. The [Crashworthy Requirements for Temporary Traffic Control Devices Tech Memo](#) required that the Minnesota Type “C” and “C” Braced Leg U-Channel (knee brace) sign support not be used in plans let after December 31, 2019. The allowed use of knee brace u-channel structures for temporary signs has been extended, but shall not be included in plans with letting dates after June 30, 2020.

Designers are encouraged to use the following resources to implement square tube temporary sign structures as soon as possible, but are required to use them for projects with lettings after June 30, 2020. The PDF files are provided as resources and/or to show examples. The Designer should use the DGN and SGN files for temporary traffic control plan development.

- Temporary Sign Tabulation template ([PDF DGN](#))
- Temporary Sign Tabulation template (Sample) ([PDF DGN](#))
- Temporary Square Tube Ground Mounted Sign Installation typical detail ([PDF DGN](#))
- Temporary Sign Wind-loading Chart for Square Tube ([PDF](#))
- Temporary Sign Post Spacing Chart for Square Tube ([PDF](#))
- G20-X2 Sign Design for Square Tube ([PDF DGN SGN](#)) (The current design of G20-X2 in SignCAD should not be used on square tube structures. SignCAD and other relevant sign resource documents will be updated within the next few months.)
- Typical Temporary Sign Framing and Installation Details typical detail ([PDF DGN](#)) (This detail shows the knee brace u-channel design. It should not be used in projects that utilize the square tube temporary sign structures. It shall not be used for any project with a letting date past June 30, 2020.)



Standard Signs and Markings Summary  
Standard Signs and Markings Manual

# Standard Sign and Markings Summary



1966 Font

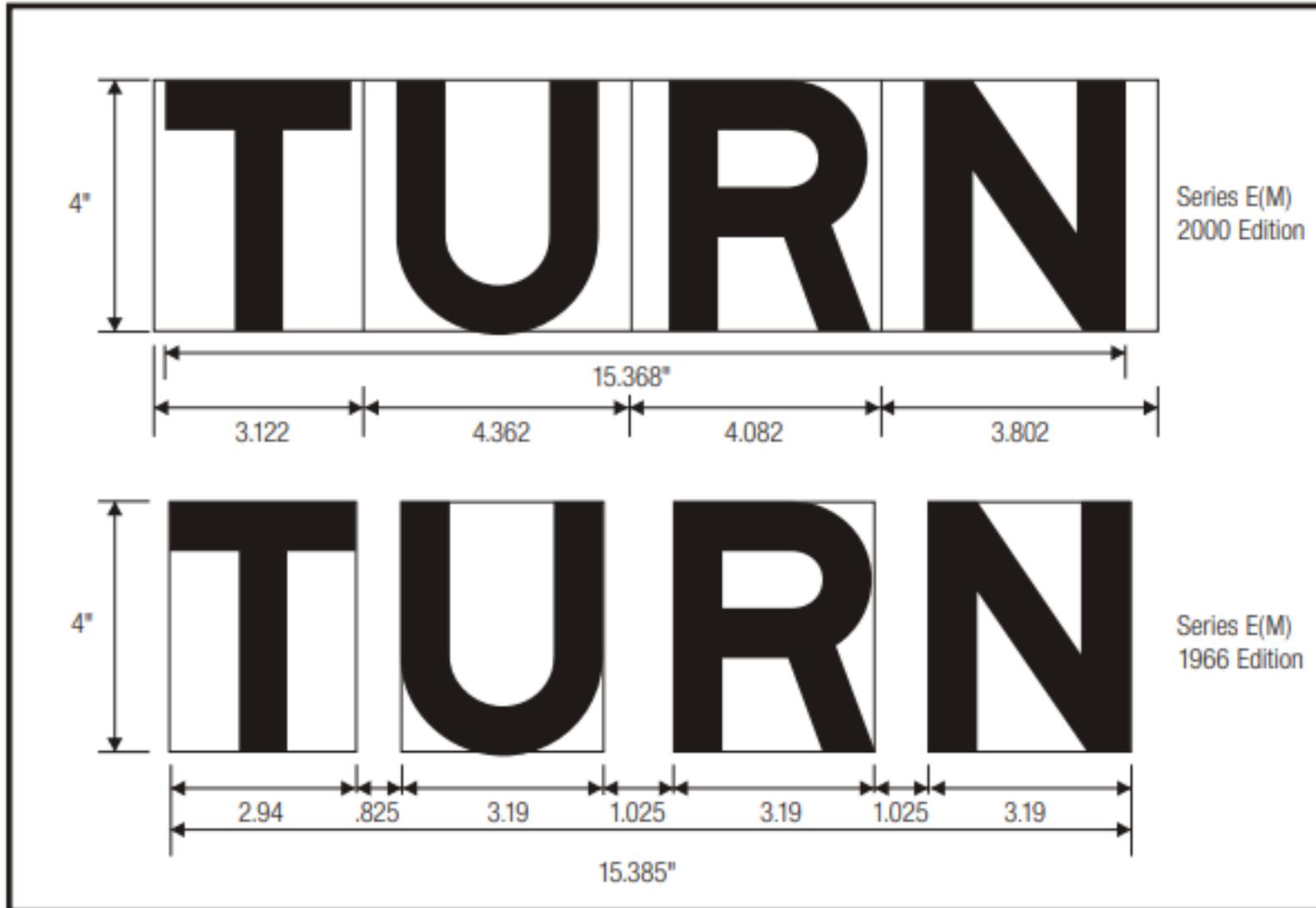


2K Font

# Changes for 2020 versions

- Update designs to latest federal font – 2K
- Use federal designs if available
  - Will reduce size of Minnesota's SSMM and number of signs contractors will need to inventory
  - Fabricators are not only regional
- Changing a lot of sign codes (old sign codes will be referenced)
  - Be more consistent with feds
- Re-evaluating all sign sizes

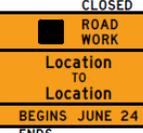
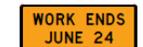
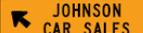
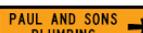
# Sign CAD 2k Font



## G Series

No. Drawing	Color	Use & Size	No. Drawing	Color	Use & Size
<b>G20-1</b> 	Black on Orange	CR-SL 60 x 24 CR-ML 84 x 36 E, F 84 x 36	<b>G20-X7</b> 	Black on Orange	E, F 48 x 48
<b>G20-2a</b> 	Black on Orange	48 x 24	Variable arrow angle		
<b>G20-4</b> 	Black on Orange	36 x 18	<b>G20-X8</b> (R, T or L)	Black on Orange	54 x Var. 66 x Var. 78 x Var. 84 x Var. 96 x Var. 102 x Var.
<b>G20-5aP</b> 	Black on Orange	CR-SL 24 x 18 CR-ML 24 x 18 E, F 36 x 24 O 48 x 36			
<b>G20-X1</b> CROSSING BRIDGE RAMP Closure Notice 	Black on Orange	M 36 x 30 CR-SL 54 x 48 CR-ML, E 72 x 60 F 90 x 78			
<b>G20-X2</b> Work Zone Advance Notice 	Black on Orange	M 66 x 60 CR-SL 96 x 84 CR-ML, E 132 x 108 F 168 x 132	<b>G20-X9</b> 	Black on Orange	30 x 36
<b>G20-X3</b> 	Black on Orange	60 x 24	Variable arrow angle		
Mount under G20-1			<b>G20-X10</b> 	Black on Orange	48 x 60
<b>G20-X4</b> (R, L or T) Construction Zone Business Signage   	Black on Orange	72 x 18	<b>G20-X11</b> 	Black on Orange	48 x 24 78 x 30
<b>G20-X5</b> Contractor Identification Signage X5 	Black on Orange	60 x 24 60 x 30	<b>G20-X12</b> 	Black on Orange	60 x 18 84 x 24
X5a 		30	To be used over W21-X4A		
X5b 		30	<b>G20-X13</b> 	Black on Orange	42 x 24
<b>G20-X6</b> (R, L or T) Business Access Signage 	Black on Orange	CR-SL 36 x 24 CR-ML, E 48 x 36 O 66 x 48	<b>G20-X14</b> 	Black on Orange	96 x 48
			<b>G20-X15</b> Ramp Closure Advance Notice 	Black on Orange	48 x 54
			<b>G20-X16</b> 	Black on Orange	48 x 18
			<b>G20-X17</b> 	Black on Orange	96 x 48

## G Series

Sign Number	Old Sign Number	Sign Picture	Color	Use	Sign Size (inches)	MnDOT Stock #
<b>G20-1</b> MnDOT SSM Design			Black on Orange	CR-SL	60 x 24	27609
				CR-ML, E, F	84 x 36	34033
<b>G20-2</b> MnDOT SSM Design	<b>G20-2a</b>		Black on Orange	CR-SL, ML	36 x 18	57809
				E, F	48 x 24	27610
<b>G20-4</b>			Black on Orange		36 x 18	24669
<b>G20-5aP</b>			Black on Orange	CR-SL, ML	24 x 18	55954
				E, F	36 x 24	55955
				O	48 x 36	55956
<b>G20-X1</b> MnDOT SSM Design			Black on Orange	B-P	36 x 30	TRAIL 57960 STREET 57961 BRIDGE 51110 RAMP 51111 ROAD 51067 DETOURED 51112
		Advanced Long Term Notice		RA	54 x 48	34034
				CR-SL, ML	72 x 60	34035
				E, F	90 x 78	34036
<b>G20-X2</b> MnDOT SSM Design			Black on Orange	M	66 x 60	56037
		Work Zone Advanced Notice		CR-SL, ML	96 x 84	34037
				E, F	174 x 114	58003
<b>G20-X3P</b> MnDOT SSM Design	<b>G20-X3</b>		Black on Orange		60 x 24	34040
		Mount under G20-X1				
<b>G20-X4</b> MnDOT SSM Design		  	Black on Orange		72 x 18	34041
		Construction Zone Business Signage				

- Sign Design and Installation Courses

- Designers
- Installers
- Construction/Maintenance





## Temporary Barrier Guidance Manual

December 2018

# Temp Barrier Guidance Manual

- Part of TEM, TTC Designers must use this document for State Highway System
- Work Zone Clear Zone
  - Fixed objects
  - Longitudinal drop-offs
- Placement and Deflection Distance
- Length of Need Calculations
- PCB Design Details and Requirements
- Living Document – will be added to

# New Time and Traffic Boilerplates

- 2563 Temporary Traffic Management
  - Instead of 1404 Maintenance of Traffic and 2563 Traffic Control
  - Follows new format of Spec Book (.1 Description, .2 Materials, etc)
  - Prepping for 2020 Spec Book
  - Primarily meant for State Highway Projects
    - Crashworthy requirements – MASH, allows some NCHRP-350 devices per sunset dates
    - **Local agencies will need to keep this in mind if they use MnDOT boilerplates and specs**

# New Time and Traffic Boilerplates - Pedestrians

- New TPAR (Temporary Pedestrian Access Route) Pay Items and Boilerplate Special Provisions
  - Temporary Pedestrian Ramp
  - Temporary Truncated Domes
  - Pedestrian Channelizer
  - Audible Message Device (AMD)
  - Temporary Walkway Surface
- Requirement for AMD if pedestrians are detoured
- To assist in developing Pedestrian TTC Plan

# MINNESOTA FLAGGING HANDBOOK



m1 DEPARTMENT OF  
TRANSPORTATION

January, 2018

m1 DEPARTMENT OF  
TRANSPORTATION



## The New Flagger Law What you need to know January 2020

Ken E Johnson – Office of Traffic Engineering

Kathy Schaefer – MN Local Technical Assistance Program

Jackie Brown – Office of Construction and Innovative Contracting

# MnDOT Traffic Topics Session – January 2020

## Traffic Engineering

Traffic Engineering Home

Publications

Training

Approved/Qualified Products

Organizations

Contacts

## Traffic Topics

### Free monthly webinars open to the public

Join us for our one hour presentations on topics related to traffic or watch live online. Presentations are held at the Water's Edge office (1500 West County Rd B2, Roseville) in conference rooms A and C on the third Tuesday of every month at 2 p.m. Go in the main building entrance and let the receptionist know you are there for the Traffic Topics webinar. The presentations are given by MnDOT staff and guest presenters.

### Upcoming webinars

March 17, 2020, 2:00 p.m. - 3:00 p.m.

### Past webinars

Ken E. Johnson, Kathy Schaefer, Jackie Brown

The new flagger law: what you need to know...

Wednesday, January 22, 2020, 2:00 p.m. - 3:00 p.m.

[Announcement](#) (PDF)

View the recorded webinar: <https://youtu.be/Qu0WggPvNj0>

Do you have an idea for our upcoming Traffic Topics?

Is there something that you'd like us to discuss? [Submit your ideas!](#)

[Join our webinar distribution list.](#)

- Websearch – MnDOT Traffic Topics

# What was covered

## 169.06 SIGNS, SIGNALS, MARKINGS.

**Subdivision 1. Uniform system.** The commissioner shall adopt a manual and specifications for a uniform system of traffic-control devices consistent with the provisions of this chapter for use upon highways within this state. Such uniform system shall correlate with and so far as possible conform to the system then current as approved by the American Association of State Highway Officials. The manual and specifications must include the design and wording of minimum-maintenance road signs. The adoption of the manual and specifications by the commissioner as herein provided is specifically exempted from chapter 14, including section 14.386.

**Subd. 2. Placement and maintenance on trunk highway.** (a) The commissioner shall place and maintain such traffic-control devices, conforming to the manual and specifications, upon all state trunk highways as the commissioner shall deem necessary to indicate and to carry out the provisions of this chapter or to regulate, warn, or guide traffic. The commissioner may construct and maintain signs at the entrance of each city, which sign shall have placed thereon the name of the city and the population thereof. The commissioner may construct and maintain other directional signs upon the trunk highways and such signs shall be uniform. The commissioner may authorize variations from the manual and specifications for the purpose of investigation and research into the use and development of traffic-control devices. When such authorized variation pertains to the regulation of traffic, notice of the intended regulatory purpose shall be published in a qualified newspaper of general circulation in the area where the research is being conducted.

(b) No other authority shall place or maintain any traffic-control device upon any highway under the jurisdiction of the commissioner except by the latter's permission.

**Subd. 3. Placement and maintenance by local authority.** Local authorities in their respective jurisdictions shall place and maintain such traffic-control devices upon highways under their jurisdiction as they may deem necessary to indicate and to carry out the provisions of this chapter or local traffic ordinances, or to regulate, warn, or guide traffic. All such traffic-control devices hereafter erected shall conform to the state manual and specifications.

**Subd. 4. Obedience to traffic-control signal or authorized persons; presumptions.** (a) The driver of any vehicle shall obey the instructions of any official traffic-control device applicable thereto placed in accordance with the provisions of this chapter, unless otherwise directed by a police officer or by a flagger authorized under this subdivision, subject to the exceptions granted the driver of an authorized emergency vehicle in this chapter.

(b) No provision of this chapter for which official traffic-control devices are required shall be enforced against an alleged violator if at the time and place of the alleged violation an official device is not in proper position and sufficiently legible to be seen by an ordinarily observant person. Whenever a particular section does not state that official traffic-control devices are required, such section shall be effective even though no devices are erected or in place.

(c) Whenever official traffic-control devices are placed in position approximately conforming to the requirements of this chapter, such devices shall be presumed to have been so placed by the official act or direction of lawful authority, unless the contrary shall be established by competent evidence.

(d) Any official traffic-control device placed pursuant to the provisions of this chapter and purporting to conform to the lawful requirements pertaining to such devices shall be presumed to comply with the requirements of this chapter, unless the contrary shall be established by competent evidence.

- Updates to the law
- Requirements, including training
- MnDOT's Flagger training program
- How to identify vehicles and drivers

# MN Statute 169.06 Subd 4a

Subd. 4a. Obedience to work zone flagger; violation, penalty.

- (a) A flagger in a work zone may stop vehicles, hold vehicles in place, and direct vehicles to proceed when it is safe.
- (b) A person convicted of operating a motor vehicle in violation of a speed limit in a work zone, or any other provision of this section while in a work zone, **shall be required to pay a fine of \$300**. This fine is in addition to the surcharge under section 357.021, subdivision 6.

# MN Statute 169.06 Subd 4a

Subd. 4a. Obedience to work zone flagger; violation, penalty.

- (c) If a motor vehicle is operated in violation of paragraph (a), **the owner of the vehicle**, or for a leased motor vehicle the lessee of the vehicle, **is guilty of a petty misdemeanor and is subject to a fine** as provided in paragraph (b). **The owner or lessee may not be fined under this paragraph if (1) another person is convicted for that violation, or (2) the motor vehicle was stolen at the time of the violation.** This paragraph does not apply to a lessor of a motor vehicle if the lessor keeps a record of the name and address of the lessee.

# MN Statute 169.06 Subd 4a

Subd. 4a. Obedience to work zone flagger; violation, penalty.

- (f) A peace officer may issue a citation to the operator of a motor vehicle if the peace officer has probable cause to believe that the person has operated the vehicle in violation of paragraph (a). **A citation may be issued even though the violation did not occur in the officer's presence.** In addition to other evidentiary elements or factors, a peace officer has probable cause under this subdivision if:
- (1) **a qualified work zone flagger** has provided a report of a violation of paragraph (a) that **includes a description and the license plate number of the vehicle used to commit the offense, and the time of the incident;**
  - (2) **the person is operating the vehicle described in the report;** and
  - (3) **it is within the four-hour period following the time of the incident,** as specified in the report.

# MN Statute 169.06 Subd 4a

Subd. 4a. Obedience to work zone flagger; violation, penalty.

(g) A work zone flagger is qualified to provide a report under paragraph (f) if each flagger involved in the reporting has **completed training that includes information on flagging operations, equipment, traffic laws, observation and accurate identification of motor vehicles, and delegation of duties** involving a report under paragraph (f).

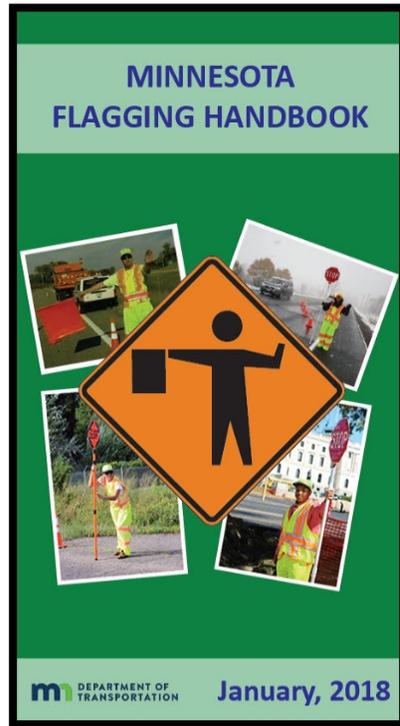
# Required Flagger Training Summary

## Flagger must be trained in:

- ✓ Flagging operations
- ✓ Equipment
- ✓ Traffic laws
- ✓ Identification of vehicles
- ✓ The process and requirements for reporting a violation



# FLAGGER TRAIN THE TRAINER

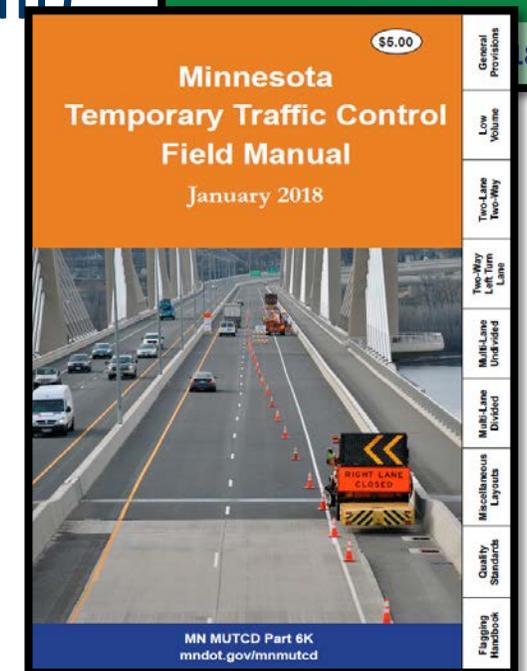
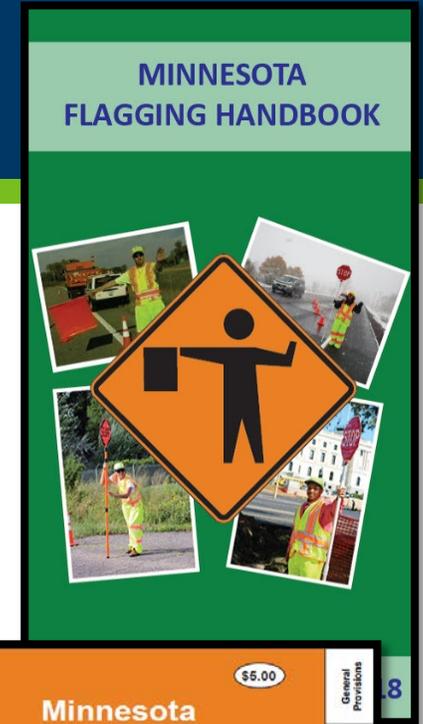


**Office of Construction and Innovative Contracting**

<http://www.dot.state.mn.us/const/wzs/training.html>

# What Does the Class Contain?

- Flagger Responsibilities.
- Flagging FM Layouts, Special Provision 2563 and amended MN Statute (the Work Zone Flagger bill) effective August 1, 2019.
- Safe Practices/Proper Attire.
- Demonstration of Proper Procedures.



# What does MnDOT hope to accomplish?

- **Training consistency & flexibility.**
- **All flaggers receive a training session before flagging.**
- **Improved safety of motorists & workers.**



<http://www.dot.state.mn.us/const/wzs/training.html>

# Reporting a Flagging Violation

- Call 911 (supervisor or lead worker)
- Notify the dispatcher that this is a **non-emergency** and that it's about a **work zone flagging violation**



# Reporting a Flagging Violation

- The 911 dispatcher will send to the appropriate enforcement dispatcher
- Enforcement must ticket within 4 hours of the incident





# Reporting a Flagging Violation

- If a person challenges the citation, the flagger is very likely to be called to testify
- The prosecutor will subpoena the flagger to appear in court as a witness
- The **owner of the vehicle** (or the lessee of a leased vehicle) is guilty of a petty misdemeanor and is subject to a fine of \$300
- The owner may avoid the fine if another person is convicted for the violation (hopefully the actual driver)

## Requirements for Temporary Traffic Control Plans Submitted to MnDOT

*From the Office of Traffic Engineering, MnDOT, State of Minnesota*

Version: 1.00  
Effective Date: January 3, 2020  
Approval: Brian Sorenson, PE  
State Traffic Engineer

Brian Sorenson  
Digitally signed by Brian Sorenson  
Date: 2020.01.03 15:25:04 -0600

### Applicability

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Work zone safety is a priority for MnDOT. Each year work zone crashes result in injury and death of vehicle occupants and workers. Work zones often change normal traffic flow, which can be challenging for the motorist and can increase workers' exposure to traffic. Engineers must design work zones in accordance with standards of the Minnesota Manual on Uniform Traffic Control Devices ("MN MUTCD") and MnDOT best practices in order to provide a safe environment for the traveling public and the workers.

These requirements apply to permit applicants, contractors, and other agencies submitting temporary traffic control (TTC) plans for work on the State Highway System.

### Requirements

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MnDOT will require a Professional Engineer's approval and signature on temporary traffic control (TTC) plans submitted to MnDOT. This includes, but is not limited to, plans for long-term work (lasting more than 3 days), long-term TTC plans submitted pursuant to a MnDOT contract, and plans for permitted work on the State Highway System not using a layout from the most current edition of the Minnesota Temporary Traffic Control Field Manual ("Field Manual").

See the next section, titled "Exemptions" describing exemptions from this standard.

### Exemptions

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## Per MnDOT's interpretation of

- Statutes & rules related to engineering practice
  - PE signature required on plans that impact the safety, health, & welfare of the public
- MN MUTCD requirements
  - Plans should be developed utilizing Engineering Judgment
  - 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.

# Requirements for TTC Plans Submitted to MnDOT

- Professional Engineer's approval and signature required for work on the State Highway System, includes:
  - Plans for long term work (greater than 3 days)
  - Long-term TTC plans submitted on a MnDOT contract
  - Permitted work not using a layout from the Field Manual
- Exemptions:
  - Work uses field manual layouts for work of 3 days or less, including the faithful replication of the layouts on another media
  - Detour for MnDOT Permitted Special Event (that was approved by a local government agency)
  - If very complex, the District Traffic Engineer may still require a PE signature
- Per MnDOT's Traffic Engineering Manual. Also on website.

# Thank you again!

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