DEPARTMENT OF TRANSPORTATION

Crashworthiness

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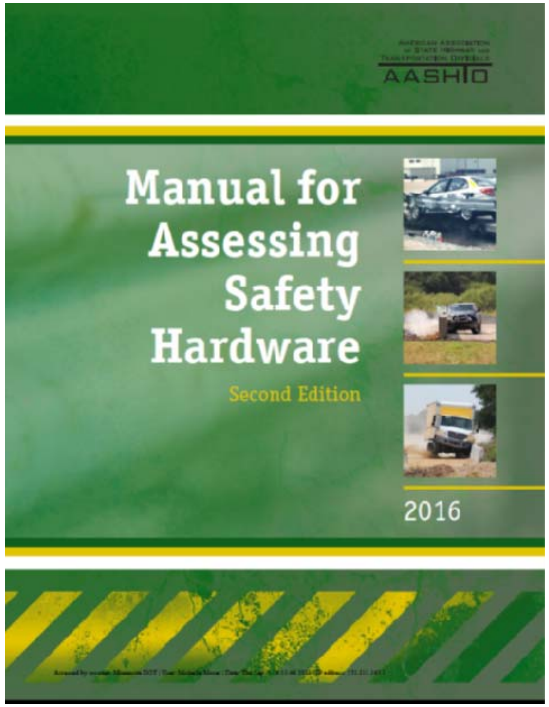
What is a Crashworthy Device

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



Joint Implementation Memo and Dates

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 Everett
Director, Office of Program Administration

Michael S. Griffith
Director, Office of Safety Technologies

In Reply Refer To: HSST

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.

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

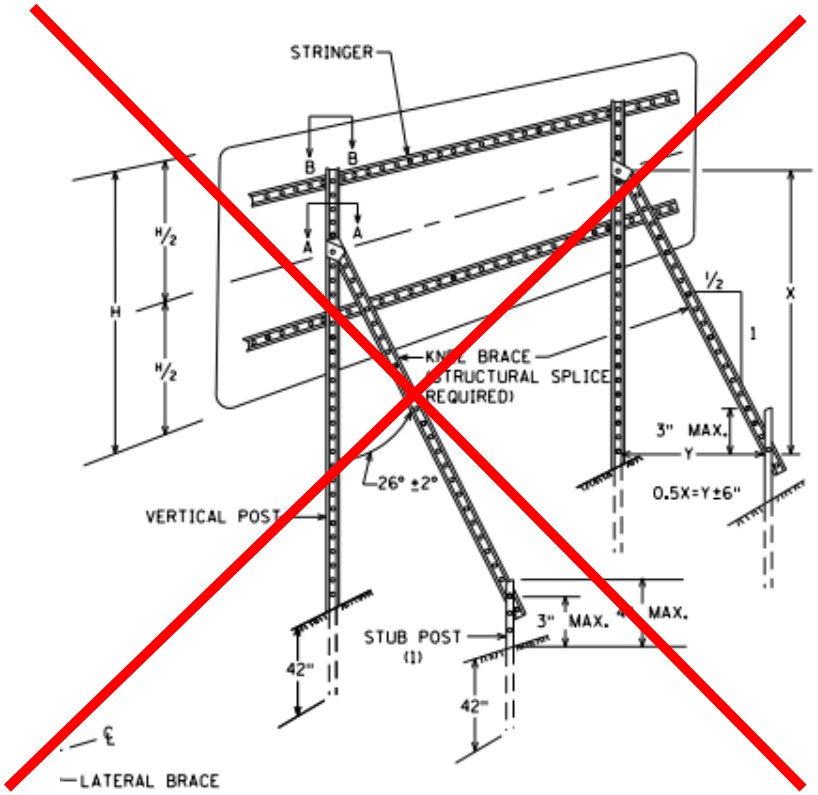
Sign Reaction When Hit

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

U-Channel Knee Brace Design

- Knee Brace Design will no longer be allowed in plans with a letting date past:
  - Permanent signing December 31st, 2019
  - Temporary signing June 30th, 2020.
- Was grandfathered into NCHRP 350 from NCHRP 230 and was only crashworthy from one direction then.
- Side and Rear hits unlikely to pass MASH.



MASH-16 – U-Channel

- All traffic control devices installed after December 31st, 2019 have to be MASH-16 crashworthy.
- U-channel sign structures have not been tested and OTE does not know when it will be tested.
- The knee brace design will not be tested.
- For work zone temporary applications, the MnDOT u-channel structural splice design will be available for use through December 31st, 2024 to allow contractors to use their current supply through its useful life. The knee brace will not be allowed.
  - This will also apply to MnDOT Maintenance for emergency and temporary installations (1 season or less)

Temporary Traffic Control Implementation

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

- Recommendation to State DOT's Leadership

MnDOT Tech Memo

Crashworthy Requirements of TTC Devices – effective August 1, 2019

Tech Memo

DEPARTMENT OF TRANSPORTATION

Minnesota Department of Transportation
Engineering Services Division
Technical Memorandum No. 19-03-T-01
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

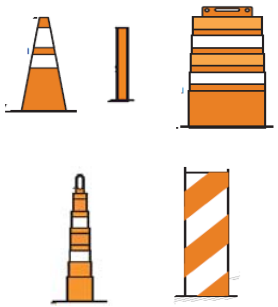
The ***AASHTO Manual for Assessing Safety Hardware 2016*** (MASH-16) is the new state of the practice for the crash testing of safety hardware devices. It updates and replaces the National Cooperative Highway Research Program (NCHRP) Report 350 testing standards. A MASH-16 hardware implementation agreement 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.

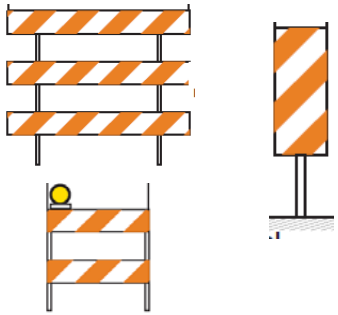
- Any work on the State Highway System
- Construction projects let after December 31, 2019
- Maintenance and permitted work occurring after December 31, 2019

TTC Crashworthy Requirements



Category 1 – manufacturers 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 June 30, 2020



TTC Crashworthy Requirements

- 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

TTC Crashworthy Requirements

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 Designs

- MnDOT APL/QPL site:
- http://www.dot.state.mn.us/products/temporarytrafficcontrol/index.html

- MnDOT Work Zones site:

  http://www.dot.state.mn.us/trafficeng/workzone/

- FHWA site:
- http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/

Thank you again!

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