

# Manual for Assessing Safety Hardware (MASH)

*The AASHTO Manual for Assessing Safety Hardware (MASH) is the new state of the practice for the crash testing of safety hardware devices for use on the National Highway System (NHS). It updates and replaces NCHRP Report 350.*

Testing criteria for highway roadside hardware have been in place since 1962. NCHRP Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*, has been the accepted method for safety hardware device testing and acceptance since 1993.

MASH presents uniform guidelines for crash testing permanent and temporary highway safety features and recommends evaluation criteria to assess test results. This manual is recommended for highway design engineers, bridge engineers, safety engineers, researchers, hardware developers, crash test laboratories, and others concerned with safety features used in the highway environment.

## Why was change needed?

The need for updated crash test criteria was based primarily on changes in the vehicle fleet. Vehicles have increased in size and light truck bumper heights have risen since the NCHRP Report 350 criteria were adopted in 1993 (see chart in this flier for details).

## How does this affect guidelines in the Roadside Design Guide?

MASH does not supersede any guidelines for the design of roadside safety hardware, which are contained in the AASHTO *Roadside Design Guide*.

## What about products currently in development based on NCHRP 350?

Any new or revised highway safety hardware under development as of October 15, 2009, when the MASH was published, may continue to be tested using the criteria in NCHRP Report 350. However, FHWA will not accept or review requests for new or revised highway safety hardware tested using NCHRP 350 criteria which are received after January 1, 2011.

## Why did the TL-3 test speed not increase above 100km/hr (62.2 mph)?

The FHWA Office of Safety considers that a 100 km/hr test is representative of worst case run-off-road crashes. Early on in the panel discussions related to the update of NCHRP Report 350, there was considerable discussion about the need to crash test at speeds over 100 km/h given that the posted speed limit of some highways is now above 65 mph. Based on data available to the research team it was concluded that, regardless of posted speeds, most impacts with fixed objects occurred at somewhat reduced speeds, likely due to pre-crash application of brakes.

### Key Points

1. All new testing will be done following MASH evaluation techniques.
2. Hardware accepted under NCHRP Report 350 is appropriate for replacement and new installation. Retesting is not required.
3. As of January 1, 2011, all new products must be tested using MASH crash test criteria for use on the National Highway System (NHS).



Source: FHWA

## When does our State have to switch to MASH-tested hardware?

There is no such deadline. The AASHTO / FHWA MASH Implementation Plan states that all highway safety hardware accepted prior to adoption of MASH using criteria contained in NCHRP Report 350 may remain in place and may continue to be manufactured and installed. Hardware tested under MASH should be considered for use within your State as it becomes available, but there is no requirement to replace hardware that has been accepted under Report 350.



Source: FHWA

## Significant Changes between NCHRP 350 and MASH

Topic	NCHRP 350	MASH
Small car test vehicle	820C vehicle (1,800 lbs.)	1100C vehicle (2,420 lbs.)
Small car impact angle	20 degrees	25 degrees
Light truck test vehicle	2000P vehicle (4,400 lbs.)	2270P vehicle (5,000 lbs.)
Gating terminals and crash cushion impact angle	15 degrees	5 degrees
Variable message signs and arrow board trailers	No mention	Added to TMA crash test matrix
Support structure and work zone traffic control device testing	Only small car tested	Small car and light truck tested
Windshield damage criteria	Subjective/Qualitative	Objective/Quantitative
Vehicle rebound in crash cushion tests	None	Required

## For More Information

Purchase MASH report from the AASHTO Bookstore: <https://bookstore.transportation.org>

FHWA Presentation on MASH (October 2009): <http://fhwa.na3.acrobat.com/mashfinal>

FHWA website on roadside hardware: [http://safety.fhwa.dot.gov/roadway\\_dept/policy\\_guide/road\\_hardware](http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware)

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