

# W-Beam Guardrail

*Recent research on standard 27-inch strong steel-post W-beam guardrail shows that it does not meet NCHRP Report 350 Test Level 3 criteria. FHWA recommends 31-inch height for all new installations of guardrail.*

The 2006 publication of AASHTO's *Roadside Design Guide* recommended that newly installed G4(1S) W-beam guardrails have a nominal minimum installation height of at least 27 inches to the top of the rail, allowing for construction variation of plus or minus one inch. However, recent research shown in NCHRP 350 *Recommended Procedures for the Safety Performance Evaluation of Highway Features* indicates the 27-inch guardrail height does not meet Test Level 3 (TL-3) criteria.

## What should be done about it?

First, transportation agencies should ensure that the minimum height of newly-installed G4(1S) W-beam guardrail is at least 27¾ inches (minimum) to the top of the rail, including construction tolerance. A nominal installation height of 29 inches, plus or minus one inch, may be specified and is acceptable for use on the National Highway System (NHS).

## What else should be done about it?

The newly-released AASHTO Manual for Assessing Safety Hardware (MASH) has shown performance problems with the 27¾ inch high W-beam guardrail. Based on this research it is recommended that agencies consider adopting a standard 31-inch high (nominal) guardrail design for new installations in place of the G4 (1S) system. The new recommendation comes as a result of tests showing improved crash-test performance at 31-inches regarding the capacity of the guardrail to contain and redirect vehicles with higher center-of-gravity such as pickup trucks and SUVs. Experience shows implementing the 31-inch designs over the 27¾ inch guardrail can be done at little to no additional cost.

## What is W-beam Guardrail?

"W-beam" is the common name for the most widely used highway barrier, (AASHTO designation G4(1S) or SGR-04 in the *Standardized Highway Barrier Hardware Guide*). Its name comes from the shape of the beam used as the rail element of the guardrail, which is supported at 27¾ inches by strong posts (wood or steel) and a "block out" to provide space between the post and beam. The newer 31-inch w-beam guardrail systems include the generic Midwest Guardrail System (MGS) as well as 3 proprietary guardrails. The terms guardrail and guiderail are synonymous, and are used in different regions around the country.



Source: FHWA

## Key Points

1. 27-inch W-beam guardrail is no longer acceptable on NHS routes.
2. 27¾ inch W-beam guardrail is the absolute minimum acceptable height meeting NCHRP Report 350 (no tolerance).
3. Various 31-inch guardrail designs have passed MASH testing and are recommended.

## **What about existing guardrail that is less than the required 27 ¾ inch height?**

A future memorandum, coordinated by FHWA with the AASHTO Technical Committee on Roadside Safety, will provide guidance on addressing recommended adjustments to existing guardrail when the height is reduced by a pavement overlay.

## **Repair Guidance**

It is important that each agency develop guidance for when to make guardrail repairs. FHWA's W-Beam Guardrail Repair publication, FHWA-SA-08-002, is available here:

[http://safety.fhwa.dot.gov/local\\_rural/training/fhwasa08002/fhwasa08002.pdf](http://safety.fhwa.dot.gov/local_rural/training/fhwasa08002/fhwasa08002.pdf)

## **Concerns about Weathering Steel**

The use of weathering steel (sometimes called Cor-Ten, A-588, or rusting steel) in guardrails should be limited. Because roadside barriers are usually close enough to the path of travel that they might be sprayed with water from passing vehicles, chemicals found in the water spray can affect and degrade the structural integrity of weathering steel barriers. If weathering steel is desired for aesthetic purposes, agencies should adopt a frequent inspection and replacement schedule. It may continue to be used on the backside of steel backed timber rail.

## **Guardrail Panel Installation**

ALL W-beam guardrail panels shall be lapped in the direction of traffic. With two-way traffic, the laps on the right side of traffic are to be in the direction of traffic or toward the downstream end.

## **6x8 timber versus W6x shapes**

The 6x8 timber and the W6x8 or W6x8.5 may be used interchangeably. NCHRP Report 350 testing has shown that these posts may be substituted when not in a barrier terminal. MASH testing shows there may be a difference in performance between steel and wood post systems particularly when the rail is under 27 ¾ inches high.

## **For More Information**

Roadside Hardware Policy and Guidance:

[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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