Pooled Fund Post

The Newsletter of the Roadside Safety Pooled Fund Program

http://www.roadsidepooledfund.org

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Pre-stressed Concrete Beam Type TL-2 Guardrail System at 31-inch Rail Height

TTI Researcher: William F. Williams (w-williams@tti.tamu.edu, (979) 862-2297)

Tech Representative: Donna J. Hardy, West Virginia Department of Transportation

The purpose of this study was to increase the height of the West Virginia DOT Pre-stressed Concrete Beam TL-2 Guardrail system to 31 inches above the pavement surface. A model of the final modified design is shown in Figure 1. The researchers reviewed the existing details of the current 28-inch height bridge rail design (Figure 2) and increased the height to 31 inches (Figure 3). Engineering strength analyses were performed on the post to determine if the new post size and anchoring details meet the strength requirements of MASH TL-2 impact conditions.

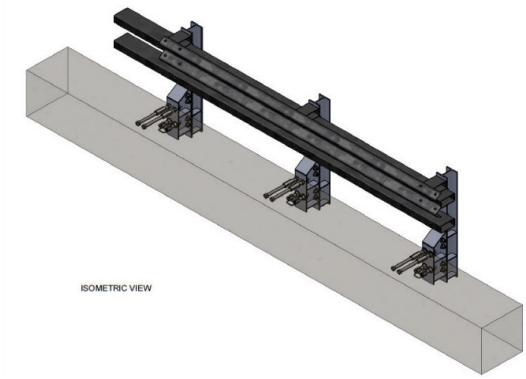


Figure 1: Modified Guardrail Design

The modified design met the strength requirements of MASH TL-2. The post and steel block out were modified such that the two components could be bolted together. Up to 4 inches of adjustment could be accommodated in this connection.

After increasing the rail height to 31 inches, there was a 18⅞ inches opening between the main rail and the deck. A lower rail (HSS8×4×3 /16) was added to provide protection against tire snagging in the space between the main rail and the deck. Also, stiffeners were added in the W8×24 block out and post for strength.

Based on the analyses results, the details presented herein are recommended for implementation on bridges for MASH TL-2 applications.

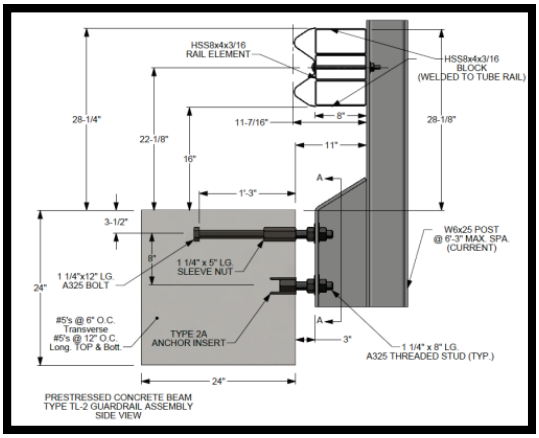


Figure 2: Original WVDOT Guardrail at 28 3/8 " Height

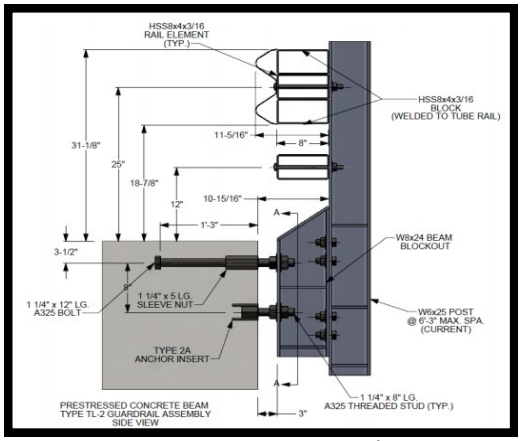


Figure 3: Modified Guardrail at 31 1/8" Height

For complete results, visit: https://www.roadsidepooledfund.org/files/2014/11/TMNo-600771-PrestressedConcreteBeamTL-2Guardrail.pdf

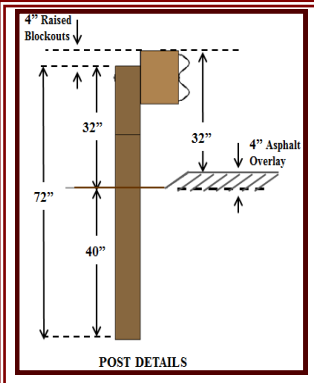
Evaluation of the Crashworthiness Alternative of Raising Wood Blockouts on Wood Post

TTI Researcher: Chiara Silvestri Dobrovolny (c-silvestri@tti.tamu.edu, (979) 845-8971)
Tech Representative: Christopher Lindsey, Texas Department of Transportation

The objective of this research was to analyze wood post W-beam rail performance when wood blockouts are raised on posts of a rail system that is below the recommended rail height. This was done to help DOTs decide whether or not raised blockouts can be used as a cost-effective means to increase rail height without compromising performance. Pendulum tests were performed on 8-inch wood blockouts raised on wood posts embedded in soil. Recorded data from the pendulum testing was also used to help validate the FE models of full-scale impact events. Based on the guardrail configuration, three cases were identified for further evaluation through finite element analyses:

1. 31-in MGS system with 4 inches pavement overlay in front of post and blockouts raised 4 inches on posts (MASH);
2. 27.75-in rail system with 4 increased post embedment due to possible rail deficiency or posts settlement, and blockouts raised 4 inches on posts (NCHRP Report 350);
3. 27.75-in rail system with 4 inches pavement overlay in front of post and blockouts raised 4 inches on posts (NCHRP Report 350)

All cases indicated that the practice of raising wood blockouts on wood posts to maintain minimum rail height requirements appear to be crashworthy and likely to pass required roadside safety evaluation criteria.

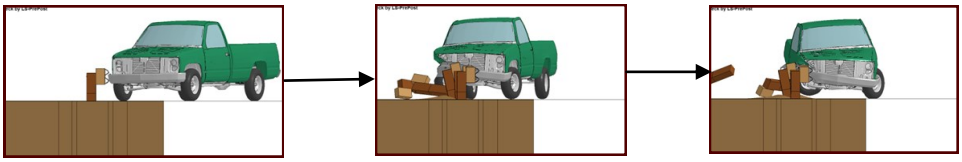


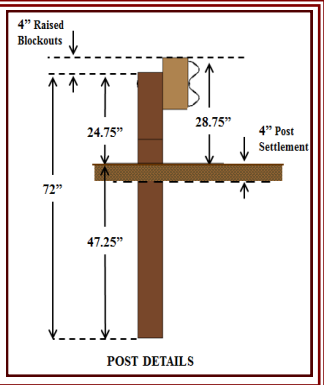
1) MGS SYSTEM WITH 4'' PAVEMENT OVERLAY AND 4''RAISED BLOCKOUTS

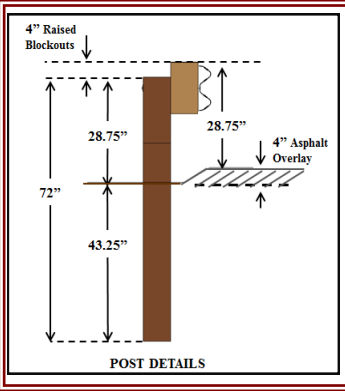
A predictive impact simulation was performed with a 2270P vehicle at 62 mph and 25 degrees orientation against the MGS system. The vehicle was contained and redirected, and maintained its stability throughout the impact event. Occupant risks values were all below the limits required by *MASH* criteria, and no phenomenon of snagging or pocketing seemed to occur. The rail did not show regions of high plastic strain that might suggest failure of the steel w-beam.

2) 27.75'' RAIL SYSTEM WITH HEIGHT DEFICIENCY AND 4'' RAISED BLOCKOUTS

A predictive impact simulation was performed with a 2000P vehicle at 62 mph and 25 degrees orientation against the rail system. The vehicle was contained and redirected, and maintained its stability throughout the impact event. Occupant risks values were all below the limits required by *NCHRP Report 350* criteria. The rail did not show regions of high plastic strain that might suggest failure of the steel w-beam.

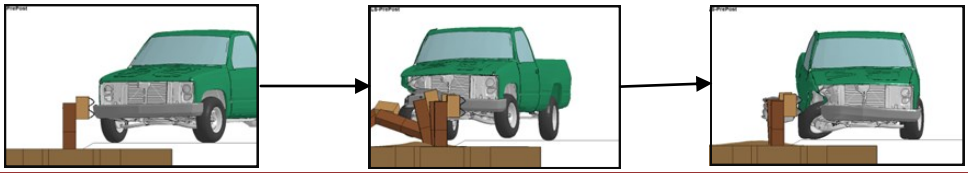






2) 27.75'' RAIL HEIGHT WITH 4'' PAVEMENT OVERLAY AND 4'' RAISED BLOCKOUTS

A predictive impact simulation was performed with a 2000P vehicle at 62 mph and 25 degrees orientation against the rail system. The vehicle was contained and redirected, and maintained its stability throughout the impact event. Occupant risks values were all below the limits required by *NCHRP Report 350* criteria. The rail did not show regions of high plastic strain that might suggest failure of the steel w-beam.



For complete results, visit: https://www.roadsidepooledfund.org/files/2013/09/RNo12-602371-00001-TX-59.pdf

Signs on Concrete Median Barriers

TTI Researcher: Akram Y. Abu-Odeh (abu-odeh@tamu.edu, (979) 862-3379)
Research Project Manager: Wade Odell, Texas Department of Transportation

The purpose of this research was to design crashworthy sign mounting that can be placed within the Zone Of Intrusion (ZOI). In this study, researchers completed a literature review, static loading tests to validate a sign post model, *MASH* impact simulations and full-scale crash tests. The *MASH* impact simulations and full-scale crash tests were completed successfully for four sign mounting designs. These designs are:

1. Schedule 80 post mounted rigidly on a spreader tube
2. Hinge and sacrificial pin
3. Sliding base in a chute
4. Slotted 10 BWG post

Detailed finite element simulations of the four selected designs were performed using 6 ft × 4 ft sign size (Figure x). Three designs, the spread tube, the rotating post with sacrificial pin and the sliding chute mounting, were simulated using a 2.5-inch nominal size Schedule 80 post. The fourth design, the slotted post, was simulated using a 2.5-inch nominal size 10 BWG post. The results of all simulations indicated that these four designs would pass *MASH* 3-11 test conditions within the accepted evaluation criteria.

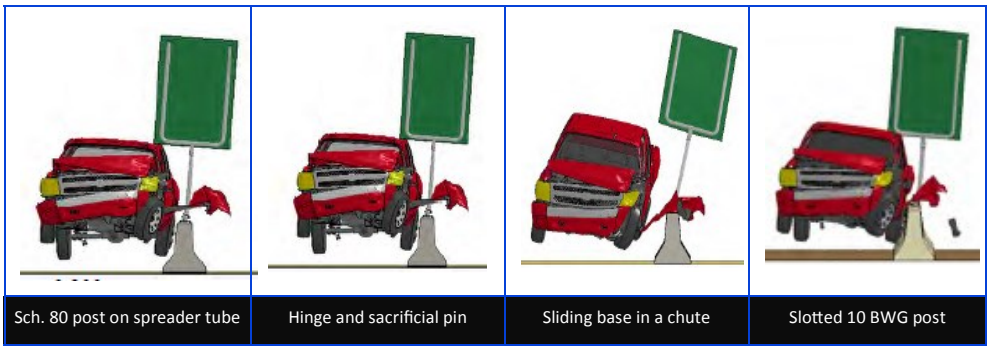


Figure 1: Final Configurations of FE Simulations for Sign-Mounting Designs

For the full-scale crash tests of all four tests, the test article consisted of three key assemblies: the barrier assembly, the sign panel assembly, and the sign mounting assembly. All tests shared the same concrete median barrier and sign panel assemblies. Each test has a different sign mounting assembly design. None of the above sign support systems interfered with the ability of the concrete median barrier to contain and redirect the 2270P vehicles. Each of the systems performed successfully according to the *MASH* criteria for longitudinal barriers (Figure 2 & 3).

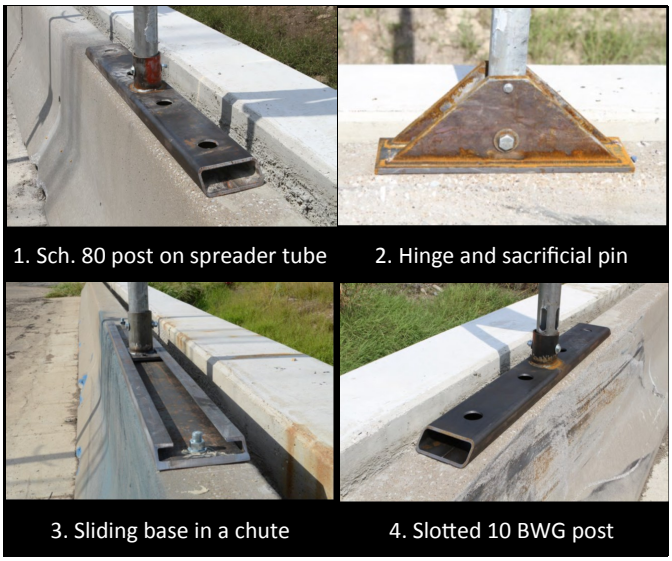


Figure 2: Sign Mounting Designs

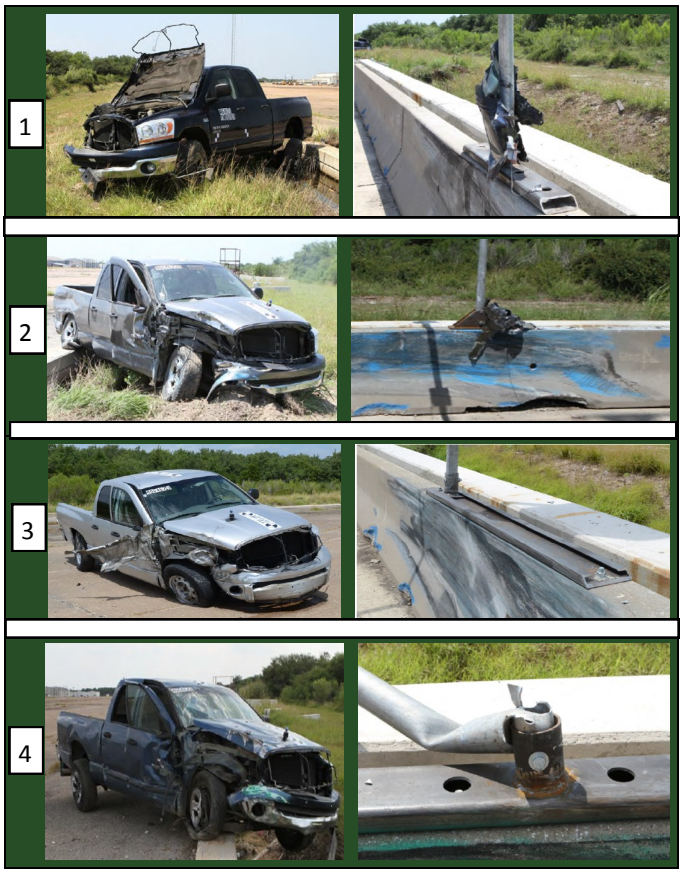


Figure 3: Final Configurations of Vehicle and Barrier

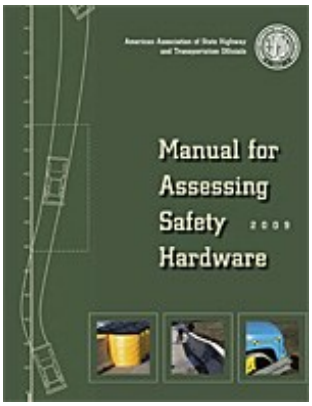
For complete results, visit: http://tti.tamu.edu/documents/0-6646-1.pdf

Participating Partners

ALASKA DOT and Public Facilities
CALIFORNIA DOT
FLORIDA DOT
ILLINOIS DOT
LOUISIANA DOT and Development
MINNESOTA DOT
PENNSYLVANIA DOT
TENNESSEE DOT
TEXAS DOT
WASHINGTON STATE DOT
WEST VIRGINIA DOT
FEDERAL HIGHWAY ADMINISTRATION
TEXAS A&M TRANSPORTATION INSTITUTE

Did you Know...

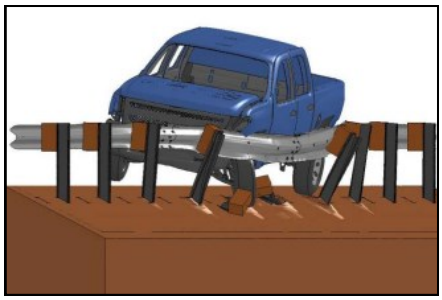
- *The AASHTO Technical Committee on Roadside Safety is proposing a new MASH implementation plan that has compliance dates for installing MASH hardware that differ by hardware category. Now more than ever it is critical for the States to continue to pool resources to address common issues and share and gather information as they move forward with MASH implementation.*



TTI Proving Grounds Research Facility

Crash Testing

Bogie Test Vehicle



Finite Element Analysis Simulation

The Proving Grounds Research Facility, a 2,000 acre complex, enables researchers to conduct experiments and testing with the ultimate goal of improving transportation safety. This site has large expanses of concrete runways and parking aprons well suited for experimental research and testing in the areas of vehicle performance and handling, vehicle-roadway interaction, durability and efficacy of highway pavements, evaluation of roadside safety hardware, and connected and automated vehicles.

ISO 17025 TTI Proving Ground is an International Standards Organization (ISO) 17025 accredited laboratory with American Association for Laboratory Accreditation (A2LA) Mechanical Testing Certificate 2821.01.

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