



U.S. Department
of Transportation

Federal Highway
Administration

Memorandum

Subject:

W-Beam Guard Rail End Terminals

Date:

JUN 28 1990

From:

Director, Office of Highway Safety
Director, Office of Engineering
Washington, D.C. 20590

Reply to
Attn. of:

HHS-12

To:

Regional Federal Highway Administrators
Federal Lands Highway Program Administrator

Changes in the vehicle fleet (increasing number of smaller and lighter weight vehicles) using our highway system and the continuing introduction of new commercial high performance guardrail terminals have prompted several of our field offices to question the effectiveness and appropriate use of the turned-down W-beam guardrail terminal.

The questions have focused on where the terminal can or cannot be safely used and what are better alternatives. Although its use on new construction is declining, it continues to be used, especially at the local government level. Therefore, in response to field office requests, the following information and guidance applicable to Direct Federal and Federal-aid projects are provided.

Because of the length of time the turned down terminal has been in existence and the various efforts over this span of time to improve the design and performance of the terminal, there currently exists a wide variance in the design details of this generic type of terminal. These include:

- Methods of anchorage
- Degree of flare or no flare
- Whether the W-beam end section is rotated or not
- Use of weak or strong posts, and their spacing
- Whether the W-beam is firmly attached to the posts or a quick release mechanism is used
- Length of the turned-down beam
- Grading of the site

As discussed in the AASHTO Roadside Design Guide, there are problems and limitations with the turned down W-beam guardrail terminals. The poorer designs will cause almost any size passenger car or pick-up truck to vault or roll over. Even the more improved design elements (flared or use of quick release mechanisms) have caused vaulting/rollover of mid-size vehicles during crash tests at high speed and end on impact conditions. Also, based on extensive operational experience and anecdotal accident information, there are significant safety problems with the turned-down end terminal when used under certain conditions. One of the problems most often noted occurs on high speed facilities where vehicles are vaulted by the guardrail terminals directly into a roadside fixed obstacle the guardrail installation was intended to shield.

There are a number of W-beam guardrail terminals currently available that provide a greater degree of safety than the turned-down terminal. Although most of these terminals are more costly than the turned-down terminal, they can be justified for use on high speed and high volume facilities. The major thrust of current highway programs is 3R/4R type projects, which include safety enhancements such as guardrail modernization, improvements or installation to shield against roadside hazards. Because it will often be many years before these sections of highways are again scheduled for improvement, the FHWA believes it is important to incorporate the latest, improved safety technology into these types of projects.

Therefore, in order to provide the traveling public with the best safety features possible based on available information, the following guidance is provided relative to the use of turned-down W-beam guardrail terminal installations on Direct Federal and Federal-aid projects (upstream end only where there is a low probability of impacts from opposite direction traffic):

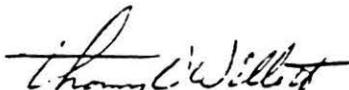
- Turned-down terminals should not be used on new installations of guardrails for freeway, expressway, or other high speed, high volume facilities.
- Safety improvement projects, hazard elimination projects, or 3R/4R projects on high speed, high volume facilities should require replacement of turned-down end terminals with approved terminals.
- Use of turned-down terminals on projects involving high speed, but moderate traffic carrying facilities should be considered on a case-by-case basis or an approved State developed policy.

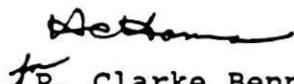
- Development of adequate recovery area behind the terminal and sufficient distance from protected piers, abutments or other fixed hazards is necessary to prevent tragic "vault into object" accidents from occurring.
- Use of turned-down terminals on low speed or any low traffic volume facility may be allowed based on reasonable risk management considerations.

Regardless of which guardrail terminal design is used, whether it is the Breakaway Cable Terminal (BCT), the eccentric loader, or one of the newer commercial products, it is extremely important that it be properly installed and that proper grading be provided in order for the device to function as intended. Unfortunately, we continue to note new installations where the terminals have been installed incorrectly or placed in locations where the effectiveness of the device is severely compromised.

We strongly urge that standard designs or standard construction plan sheets be reviewed to assure that grading details and limits are included and that design details are correct and up-to-date for all guardrail terminals used in your State. Also, during your construction inspections, special attention should be given to these devices to assure they are being installed in accordance with the plans.

The Offices of Engineering and Highway Safety, with the cooperation of the Office of Safety and Traffic Operations Research and Development, are continuing to work together to provide the latest information on the design, installation, and maintenance of approved safety-related hardware.


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R. Clarke Bennett

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cc: HSA-1, HHS-1, HHS-12 (JLasek)
HNG-1, HSR-1
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