



April 23, 2007

In Reply Refer To: HSSD/B-157

Mr. Stephen L. Brown, President  
Trinity Highway Products, LLC  
P.O. Box 568887  
Dallas, Texas 75356-8887

Dear Mr. Brown:

Thank you for your company's letter of March 20, 2007, requesting the Federal Highway Administration (FHWA) acceptance of modifications to the CASS-TL-4 cable barrier system and the CASS Cable Terminal. Accompanying your letter were drawings of the modified barrier and terminal. You requested that we find these devices acceptable for use on the National Highway System (NHS) under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

### **Introduction**

The FHWA guidance on crash testing of roadside safety hardware is contained in a memorandum dated July 25, 1997, titled "INFORMATION: Identifying Acceptable Highway Safety Features."

In the FHWA acceptance letter B-141 dated November 17, 2005, the FHWA accepted the 3-cable CASS-TL-4 Cable Safety System to test level 4 (TL-4) criteria. Your current request is to modify that barrier and terminal design to incorporate a fourth cable at a height of 640 mm (25-3/16 inch), midway between the bottom and middle cables of the original TL-4 CASS.

You also requested a modification to the NCHRP Report 350 TL-3 compliant terminal to accommodate the fourth cable. The modification includes increasing the length of the CASS Cable Terminal through the addition of a fourth Cable Release Post as shown in the enclosed drawing. The fourth cable remains at the 640 mm height on the traffic side of the terminal from post #9 through post #4, at which point it begins to descend towards its terminus at Cable Release Post #1X.

You requested that the CASS-TL-4 Cable Safety System be acceptable with post spacings from 2.0m (6.5 feet) to 9.9m (32.5 feet) and with the same range of post embedment types (direct driven, set in driven tube, set in tube sleeve in concrete foundation.)

## Testing

Full-scale automobile testing documented under earlier acceptance letters was conducted on 100m (334-foot) long installations of the CASS-TL-3 Cable Safety System with cables spaced at 2m (6.5 feet), 6m (20 feet) and 9.9m (32.5 feet). The cables were not pre-stretched, but were tensioned to 5,600 pounds force for the test. The dynamic deflection for the 100m (330-foot) long test installations were 1.6m (5.3 feet) for the 2m post spacing, 2.3m (7.7 feet) for the 6m post spacing and 3.4m (11.2 feet) for the 9.9m post spacing.

Although the barrier performed well under ideal test impact conditions with the pickup truck, the likelihood of passenger car underrides of **any cable system** may increase as the post spacing increases, particularly when the barrier is installed on non-level or slightly irregular terrain and the cables are not restrained from lifting at each post. Consequently, some transportation agencies have limited post spacing to approximately 6m (20 feet) for cable barriers. The dynamic deflection of the barrier is likely to increase when it is installed along the convex sides of horizontal curves, and when distances between anchorages exceed the 100m (330-foot) test length.

In spite of the above caveat, the modification to the CASS TL-4 design described above using 4 cables may be used as either a roadside or median barrier on the NHS when such use is acceptable to the contracting agency. Although the cables used in the test were not pre-stretched, this acceptance is also valid if and when pre-stretched cables are used, assuming that the recommended post-tensioning is applied to the cables. The modified CASS-TL-4 end terminal is likewise found to be acceptable.

## Findings

Because the addition of the fourth cable and associated terminal hardware is not considered to be detrimental to the performance of the crash tested system, and is indeed likely to increase the capacity and improve the performance, the CASS-TL-4 devices described in the requests above and detailed in the enclosed drawings are acceptable for use on the NHS under the range of conditions tested, when proposed by a State.

Please note the following standard provisions that apply to the FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that it will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.

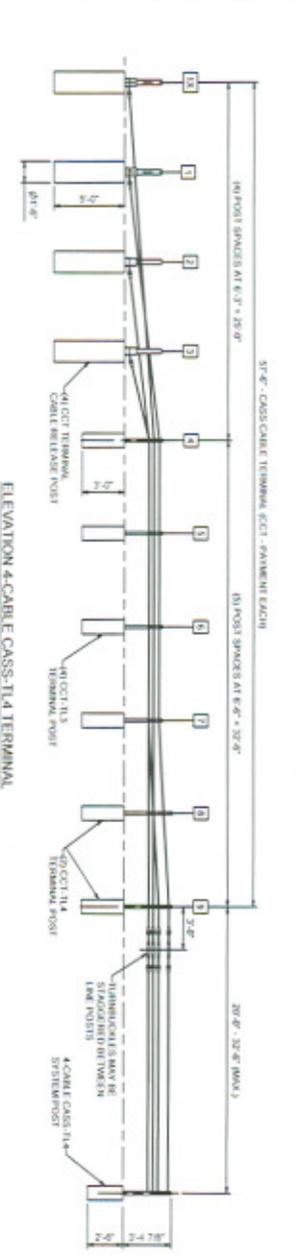
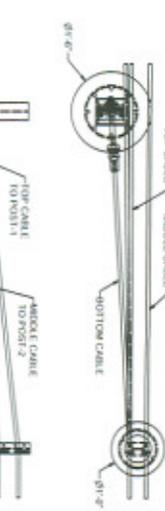
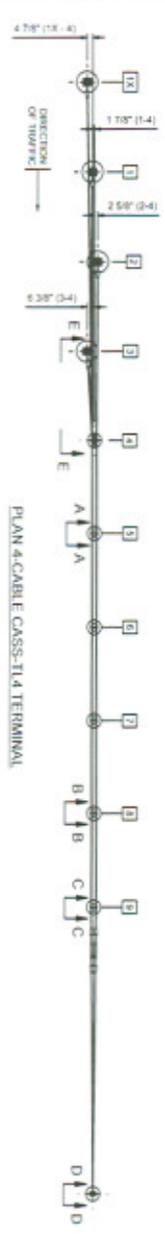
- To prevent misunderstanding by others, this letter of acceptance, designated as number B-157 shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- The CASS barrier and terminal are patented devices and considered "proprietary." The use of proprietary devices *specified by a highway agency* for use on Federal-aid projects must meet one of the following criteria: (a) it must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that it is essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) it must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

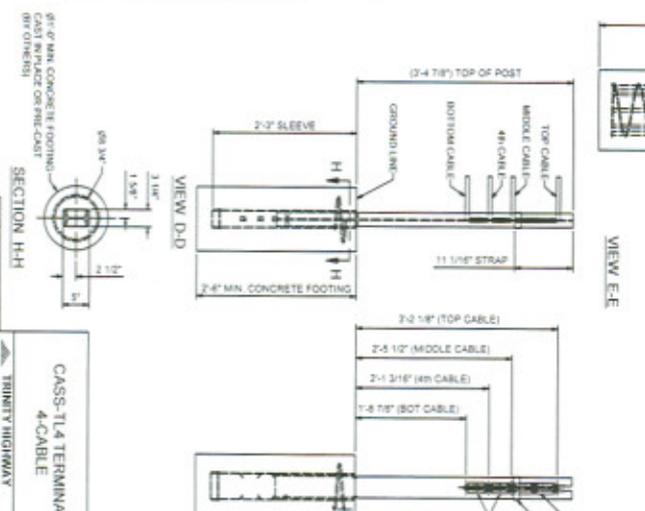
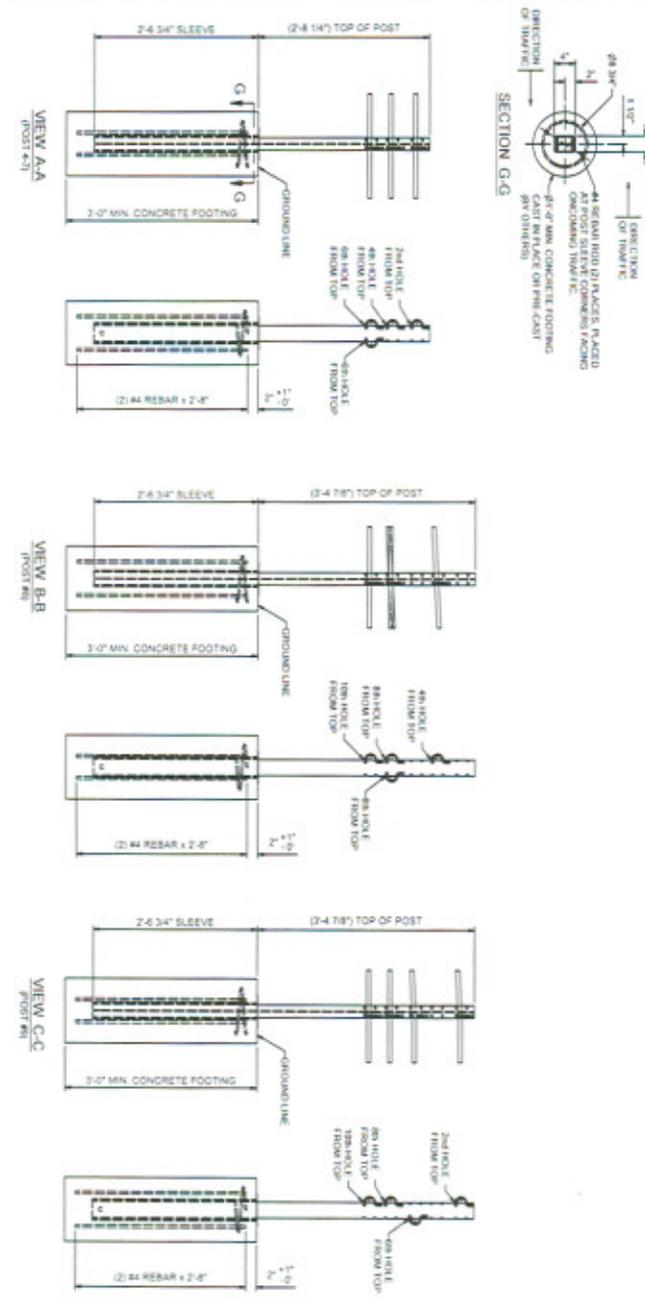
A handwritten signature in blue ink, appearing to read "George Ernie Jr.", is written over a light blue circular stamp.

for: John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

Enclosures

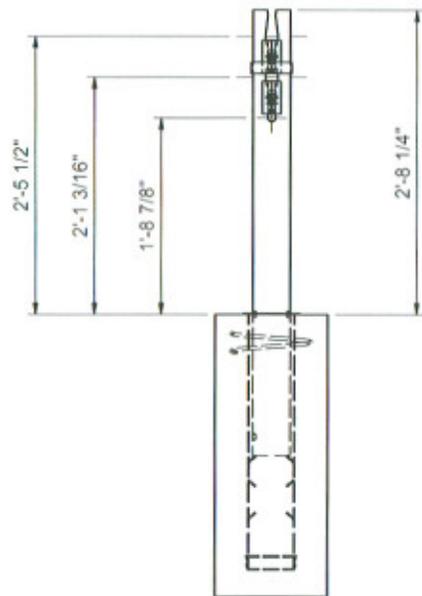


ELEVATION 4-CABLE CASS-T1A TERMINAL

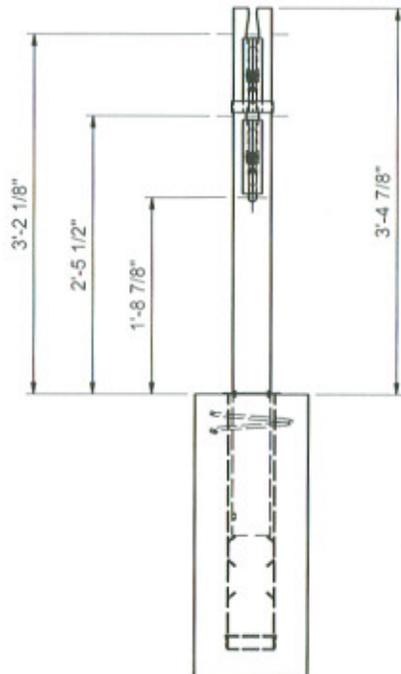


CASS-T1A TERMINAL	
4-CABLE	
DATE SPEC	REV
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08/15/11	5
08/15/11	6
08/15/11	7
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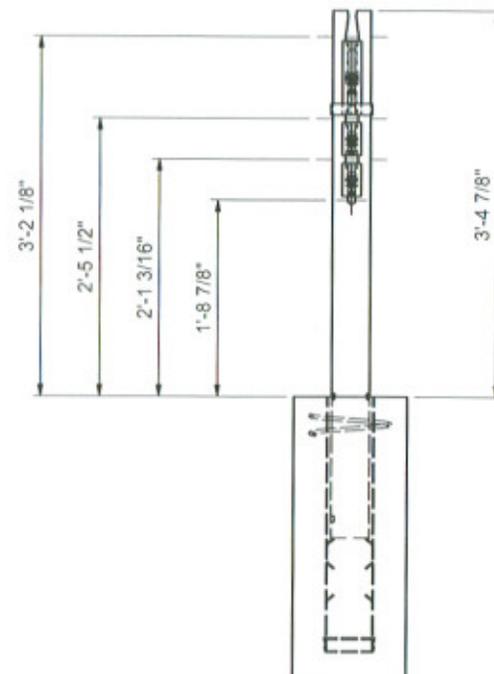
TRINITY HIGHWAY PRODUCTS, LLC  
CCT-4



**CASS-TL3 - 3-Cable**  
(FHWA letter HSA-10/B-141)



**CASS-TL4 - 3-Cable**  
(FHWA letter HSA-10/B-141)



**CASS-TL4 - 4-Cable**  
(PROPOSED)

**NOTE:**  
CONCRETE FOOTING OPTION SHOWN  
DRIVEN POST OR DRIVEN SLEEVE  
INSTALLATIONS OPTIONAL

<b>4-CABLE CASS-TL4 PROPOSAL</b>		GALV SPEC:		
		SHIPPING WT:		
		DRW	E.A.S.	2/2/2007
		CHK	G.N.	2/2/2007
SHT: 1 OF 1		SIZE: B		
DWG NO.		Heights	REV	
TRINITY HIGHWAY PRODUCTS, LLC			0	

PROJ. \_\_\_\_\_

Sec. 635.411 Material or product selection.

(a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

- (1) Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable unpatented items; or
- (2) The State highway agency certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or
- (3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

(b) When there is available for purchase more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State highway agency wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

(c) A State highway agency may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

(d) Appendix A sets forth the FHWA requirements regarding (1) the specification of alternative types of culvert pipes, and (2) the number and types of such alternatives which must be set forth in the specifications for various types of drainage installations.

(e) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.