



U.S. Department
of Transportation
**Federal Highway
Administration**

August 29, 2008

1200 New Jersey Avenue, SE.
Washington, DC 20590

In Reply Refer To: HSSD/B-134D

Barry D. Stephens, P.E.
Sr. Vice President Engineering
Energy Absorption Systems, Inc.
3617 Cincinnati Avenue
Rocklin, CA 95678

Dear Mr. Stephens:

This letter is in response to your request for the Federal Highway Administration (FHWA) acceptance of a roadside safety system for use on the National Highway System (NHS).

Name of system: 12M and 4M Vulcan Barrier™
Manufacturer: Energy Absorption Systems, Inc. (EASI)
Type of system: Portable Steel Thrie Beam Longitudinal Barrier
Test Level: NCHRP Report 350 TL-4
Testing conducted by: LIER (Inrets Road Equipment Test Laboratory, France)
Date of request: June 13, 2008

You requested that we find this system acceptable for use on the NHS under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Requirements

Roadside safety systems should meet the guidelines contained in the NCHRP Report 350. The FHWA Memorandum "ACTION: Identifying Acceptable Highway Safety Features" of July 25, 1997 provides further guidance on crash testing requirements of longitudinal barriers.

Description

The system is a portable steel longitudinal barrier intended for use as a temporary barrier in highway construction zones. The EASI developed the Vulcan Barrier™ to prevent vehicle penetration at Test Level 4 (TL-4) conditions for vehicles up to 8,000 kg with impact speeds up to 80 km/h (50 mph) and impact angles up to 15 degrees. The Vulcan Barrier™ segments are available in two lengths, 4 meter (13 feet, 1 ½ inches) and 12 meter (39 feet, 4 ½ inches). It should be noted that the FHWA initially found this same Vulcan Barrier™ acceptable as a TL-3 barrier in our acceptance letter B-134 dated February 14, 2005, which included a successful crash test of a 2000p vehicle.



The test installation was 70.5 m (231.3 feet) long, consisting of six 12-meter-long Vulcan Barrier™ units pinned together with only the leading and trailing edge segments anchored. The dimensions of the 4 and 12 meter Vulcan Barrier™ units are as follows:

	<u>4m Vulcan Barrier™</u>	<u>12m Vulcan Barrier™</u>
Height:	813 mm (32 in)	813 mm (32 in)
Width:	546 mm (21.5 in)	546 mm (21.5 in)
Length*:	4115 mm (162 in)	11750 mm (463 in)
Weight:	395 kg (871 lbs)	1017 kg (2243 lbs)

* Length measured pin to pin

The Vulcan Barrier™ consists of multiple barrier sections pinned together using a 48 mm (OD) steel connecting pin. When installed in continuous straight segments, a gap-filling steel plate is used which further reduces lateral deflection to optimize impacting vehicle redirection. The stackable steel construction allows for reductions in shipping and storage space requirements. All steel components are hot-dipped galvanized to prevent corrosion and extend product life.

Crash Testing

Full-scale crash testing was conducted on the Vulcan Barrier™. We concur that conducting two full-scale “capacity” EN 1317 (European Norm) tests (in addition to prior tests in the U.S.) was adequate to validate the performance of the system as equivalent to the NCHRP 350 TL-4.

The first test you completed was EN 1317 Test TB11 (900kg/100kph/20 deg) which is comparable to NCHRP 350 Test 4-10 (820P/100kph/20 deg). The test resulted in a maximum permanent deflection of 0.83 m (2.72 ft) and a maximum dynamic deflection of 1.1 m (3.61 ft).

The second test completed was EN 1317 Test TB51(H2) (13000kg/70kph/20 deg) which is comparable to NCHRP 350 Test 4-12 (8000S/80kph/15 deg). This test, using the heavier vehicle, utilized test conditions which require the test unit to withstand approximately 117 percent greater impact severity as compared to the NCHRP 350 Test 4-12. The test resulted in a maximum permanent deflection of 1.97 m (6.46 ft) and a maximum dynamic deflection of 2.4 m (7.87 ft).

The EASI’s use of the LS-DYNA™ simulation software to replicate the heavy vehicle test, as conducted at the LIER testing facility, provides sufficient data to show that the use of 4 meter Vulcan Barrier™ sections, in lieu of the tested 12 meter sections, yields negligible differences in maximum dynamic barrier deflection.

Findings

The test data sheet summarizing the results of the impacts is enclosed for reference. Based upon the successful completion of the aforementioned EN 1317 tests you provided, we agree that your 4 meter and 12 meter Vulcan Barrier™ systems are acceptable for use as TL-4 longitudinal barriers under NCHRP 350 TL-4 conditions. The systems, as described above, may be used on the NHS when such use is acceptable to the contracting authority.

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

- This acceptance is limited to the crashworthiness characteristics of the systems and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the system 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 system being marketed is significantly different from the version that was crash tested, we reserve the right to modify or revoke our 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 is designated as number B-134D and shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed at our office upon request.
- The Vulcan Barriers™ are patented products and considered proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they 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.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate system, 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,



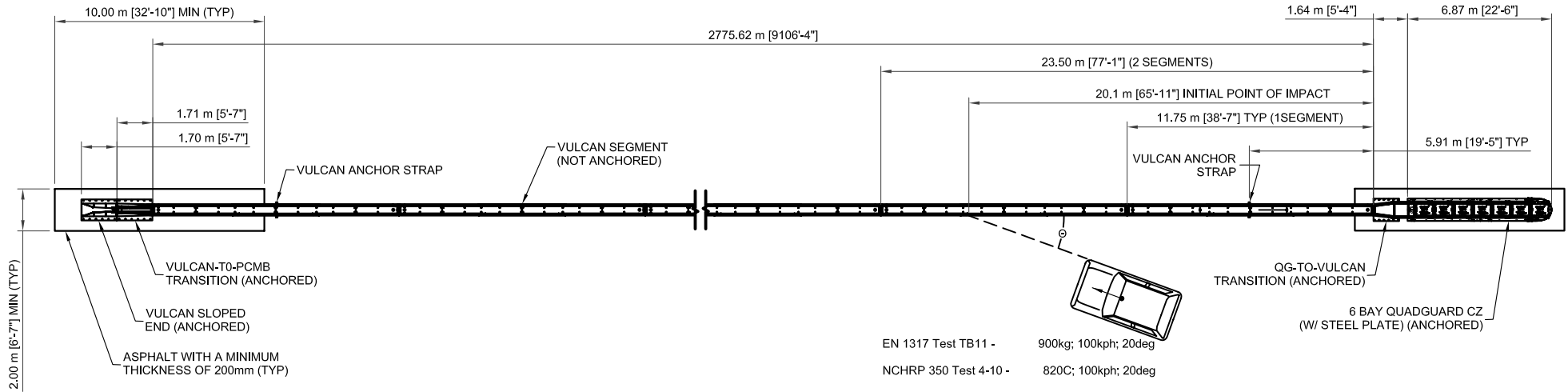
David A. Nicol, P.E.
Director, Office of Safety Design
Office of Safety

Enclosures

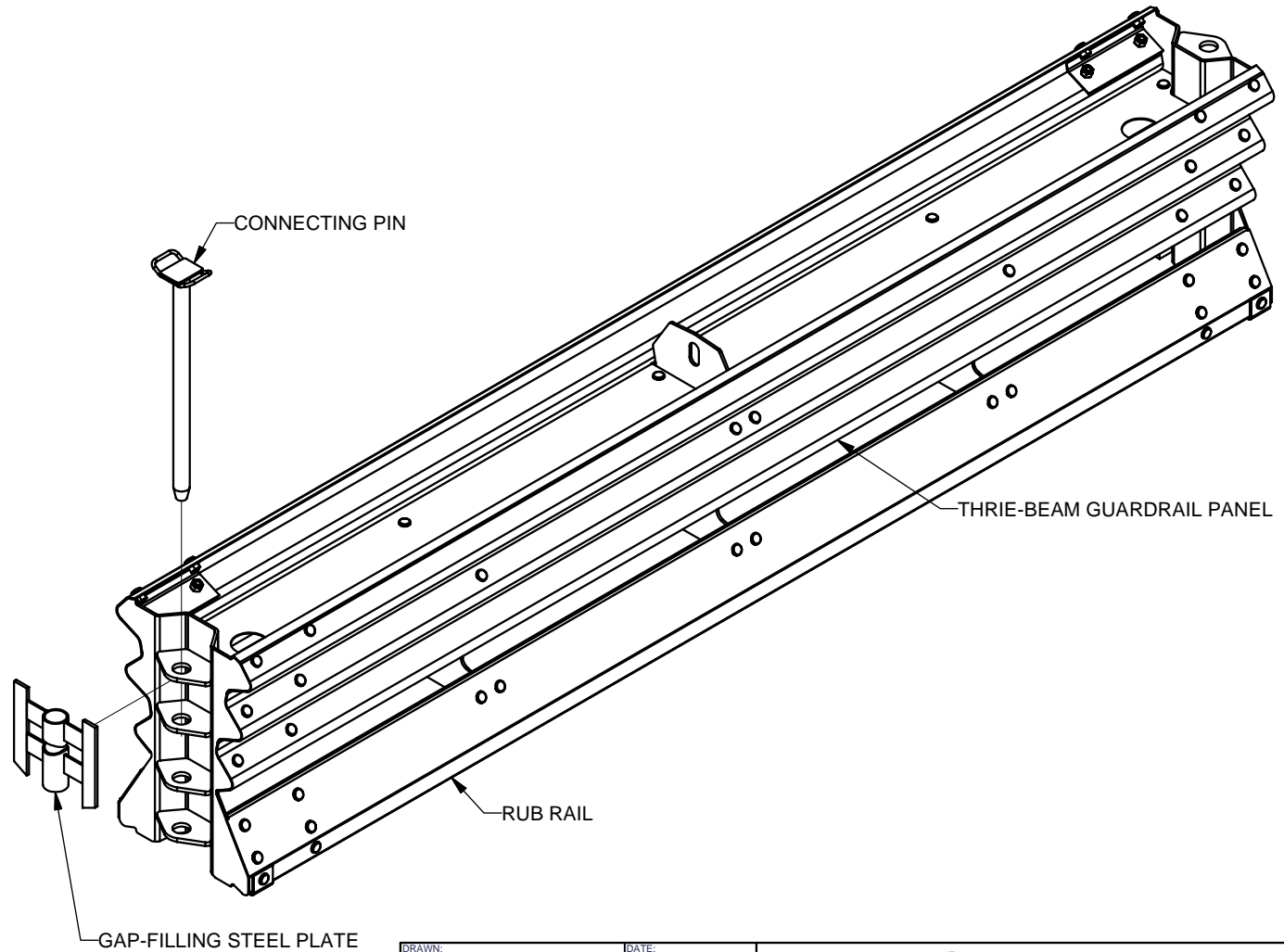
12M VULCAN BARRIER (TL-4) NCHRP REPORT 350 TEST 4-10 TEST MATRIX

LONGITUDINAL BARRIERS

LENGTH OF NEED



EQUIVALENT EN 1317 TEST TB11 CONDUCTED IN SUBSTITUTION FOR REQUIRED NCHRP REPORT 350 TEST 4-10

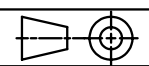


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VULCAN BARRIER, 4M

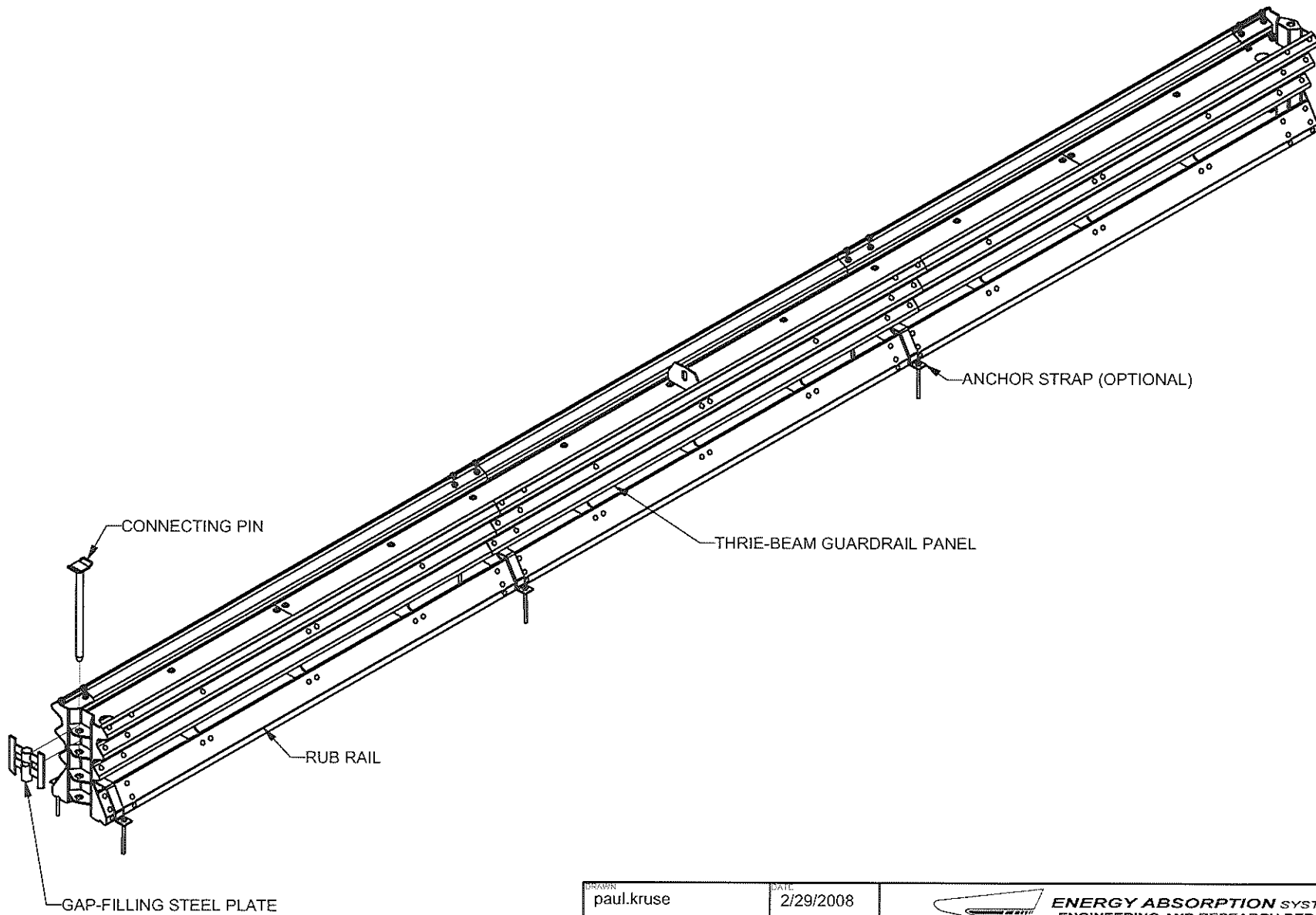
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DRAWING:
4m Vulcan Drawing

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1 of 1

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DRAWN paul.kruse	DATE 2/29/2008
DESIGNED paul.kruse	DATE
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BY:	DATE



ENERGY ABSORPTION SYSTEMS, INC.
ENGINEERING AND RESEARCH DEPARTMENT

VULCAN BARRIER, 12M

UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN INCHES
DIMENSIONS ACCORDING TO ASME Y14.5M-1994 UNLESS OTHERWISE SPECIFIED.



DRAWING
12m Vulcan Drawing

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1 of 1

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