U.S. Department of Transportation
Federal Highway Administration

1200 New Jersey Avenue, SE
Washington, D.C. 20590

January 12, 2010

In Reply Refer To:
HSSD/B-201

Mr. 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 device for use on the National Highway System (NHS). You have requested that we find the Vulcan™ Gate, comprised of Unanchored Vulcan, a Vulcan-to-CMB Transition and a completely new Hinge/Connector, acceptable as a Test Level 4 (TL-4), TL-3 and TL-2 device for use on the National Highway System (NHS).

Name of device:	Vulcan™ Gate
Type of device:	Longitudinal Barrier
Testing Level:	NCHRP Report 350 TL-2, TL-3 and TL-4
Testing Conducted by:	E-Tech Testing Services, Inc.
Date of Request:	September 29, 2009
Date of completed package:	December 28, 2009
Task Force 13 Designator:	SWM15

Your current requests are for review and acceptance of:

A. Modification of the current hinge design of Vulcan Barrier, the Vulcan-to-CMB Transition, and the Vulcan component called the Hinge as per FHWA HSSD/B-134C, dated November 21, 2007, with the new Hinge/Connector design.
B. Modified barrier with the new Hinge/Connector design to meet same TL-4 designation as the existing Vulcan Barrier as per HSSD/B-134D, dated August 29, 2008.

Requirements
Roadside safety devices should meet the guidelines contained in the NCHRP Report 350 or the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). The FHWA Memorandum "Identifying Acceptable Highway Safety Features" of July 25, 1997, provides further guidance on crash testing requirements of longitudinal barriers.

Description
For this test, five freestanding Vulcan segments were pinned together and the upstream and downstream ends were pinned to unanchored Hinge/Connectors which were pinned to anchored Vulcan-to-PCMB Transition segments to provide longitudinal tension. The impact point was the first Vulcan segment ahead of the new Hinge/Connector.

Findings
We concur with your request that the Vulcan™ Gate Longitudinal Barrier be granted equivalence to existing successfully crash tested systems meeting TL-2, TL-3, and TL-4 conditions as per NCHRP Report 350 and will be considered acceptable for use on the NHS system when requested by a highway agency. In addition, we concur that the submitted successful crash test results support use of this design with any number of Vulcan segments to configure a Vulcan™ Gate Longitudinal Barrier. For further information on the crash test, the Test Data Summary Sheet is included with this correspondence.

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

- This acceptance is limited to the crashworthiness characteristics of the devices 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 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, 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 NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number B-201, shall not be reproduced except in full. This letter, and 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 Vulcan Gate is a patented product and is considered proprietary. If proprietary devices are specified by a highway agency for use on a 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. FHWA 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 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,

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

Enclosures

FHWA:HSSD:WLongstreet:tb:x60087:1/8/10
File: s://directory folder/wlongstreet/ B201 Vulcan Gate 3-21 NEW HINGE 010610.doc
cc: HSSD (Reader, HSA; Chron File, HSSD; W.Longstreet, HSSD; NArtimovich, HSSD; MMcDonough, HSSD)

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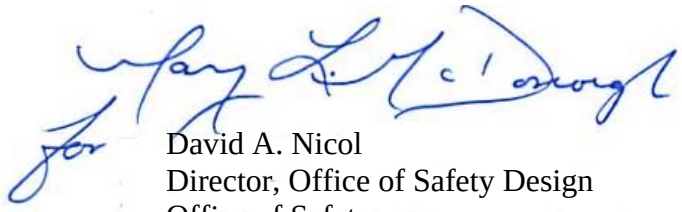
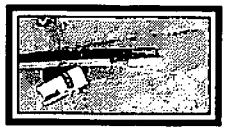
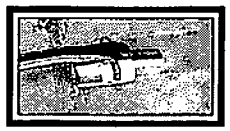


for David A. Nicol
Director, Office of Safety Design
Office of Safety

Enclosures



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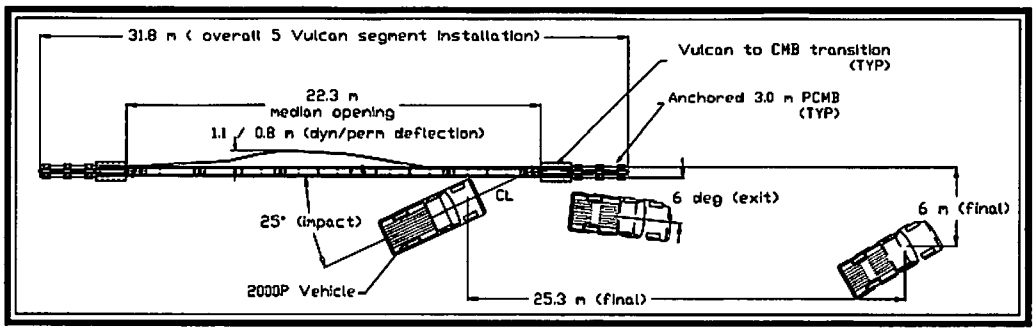

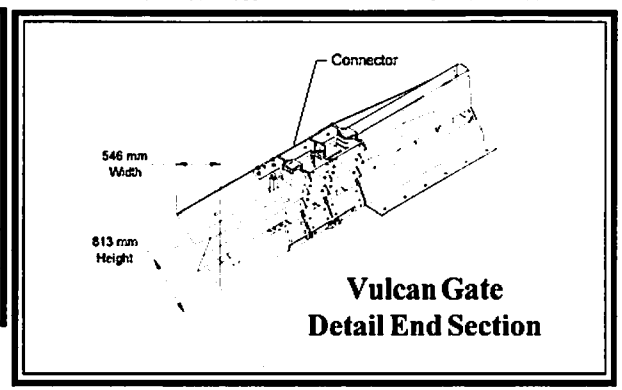

General Information

Test Agency	E-TECH Testing Services, Inc.
Test Designation	NCHRP 350 Test 3-21
Test No.	01-8430-010
Date	8/20/09

Test Article

Type	Vulcan™ Gate
	(5) Vulcan Segments 4115 x 813 x 546 mm (LxH xW),
	463 kg per Segment
Installation Length	31.8 m overall, 22.3 m opening,
	(2) Connectors, (2) Transitions, (2) CMB.
Material and key elements	10 Ga. AASHTO M180 galvanized steel panels
Foundation Type and Anchoring	Transition: 150 mm thick asphalt over 150 mm
	compacted sub-base; (24) 19 mm dia. x 460 mm
	long ASTM A193 B7 threaded rods at nominal
	419 mm embedment using MP-3 Polyester
	anchoring system

Test Vehicle

Type	Production Model
Designation	2000P
Model	1997 Chevrolet C2500
Mass (kg)	
Curb	2090
Test inertial	2035
Dummy	N/A
Gross	2035

Impact Conditions

Speed (km/h)	100.4
Angle (deg)	25
Impact Severity (kJ)	141.2

Exit conditions

Speed (km/h)	54
Angle (deg - veh. c.g.)	6

Occupant Risk Values

Impact Velocity (m/s)	
x-direction	6.6
y-direction	6.9
Ridedown Acceleration (g's)	
x-direction	-15.7
y-direction	-11.1

European Committee for Normalization (CEN) Values

THIV (km/h)	34.6
PHD (g's)	18.5
ASI	1.5

Test Article Deflections (m)

Dynamic	1.1
Permanent	0.8

Vehicle Damage (Primary Impact)

Exterior	
VDS	LFQ-3
CDC	11FLEW3
Interior	
VCDI	AS0000000
Maximum Deformation (mm)	90

Post-Impact Vehicular Behavior (deg - rate gyro)

Maximum Roll Angle	-20.6
Maximum Pitch Angle	-20.1
Maximum Yaw Angle	31.7

Summary of Results - Vulcan Gate Test 01-8430-010

Figure 1. Summary of Results - Vulcan Gate Test 01-8430-010