



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

July 16, 2007

1200 New Jersey Avenue, SE.
Washington, DC 20590

In Reply Refer To: HSSD/CC-35H

Mr. Barry D. Stephens
Sr. Vice President Engineering
Energy Absorption Systems, Inc.
3617 Cincinnati Avenue
Rocklin, CA 95765

Dear Mr. Stephens:

Thank you for your letter of April 2, 2007, requesting the Federal Highway Administration (FHWA) acceptance of a modification to your company's QuadGuard® system impact attenuator. This modification to the internal energy absorbing element is necessary to accommodate the changes in materials used by vendors of the crushable cartridges. You requested that we find these modifications to Type I cartridges 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."

Type I cartridges are used in the front portion of QuadGuard systems. You conducted instrumented pendulum tests of individual existing Type I cartridges to establish accurate force vs deflection curves. Similar tests of the modified Type I cartridges showed the crush profile to be nearly identical to that of the existing cartridge. To confirm that the new cartridges had impact performance similar to the older cartridges you conducted a NCHRP 350, Test 3-30 (820C, 100 kph, 0 degree angle of impact, with four-foot offset.) This test was chosen because the front mounted Type I cartridges most affect the impact performance of the 820C vehicle and thus would be the worst case scenario. The results from the full scale crash test were also acceptable.



Testing

Summary of NCHRP Report 350 Test 3-30

820C Test Vehicle:	1993 Ford Festiva
Vehicle Mass:	812 kg
Impact Speed:	98.3 km/hr
Occupant Impact:	11.5 m/s
Ridedown:	14.8 g's

Findings

The results of the testing show that the QuadGuard® system performance using the modified Type I cartridges was similar to the original system, and met the FHWA requirements.

Therefore, the modified Type I cartridges described above are acceptable for use in QuadGuard® systems on the NHS when proposed by a State or other highway agency.

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 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, 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 they 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 CC-35H 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 QuadGuard® is a patented device and is 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.
- 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, reading "George E. Rice, Jr." with a stylized flourish at the end.

George E. Rice, Jr.
Acting Director, Office of Safety Design
Office of Safety

Enclosure



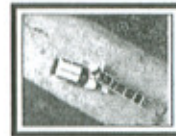
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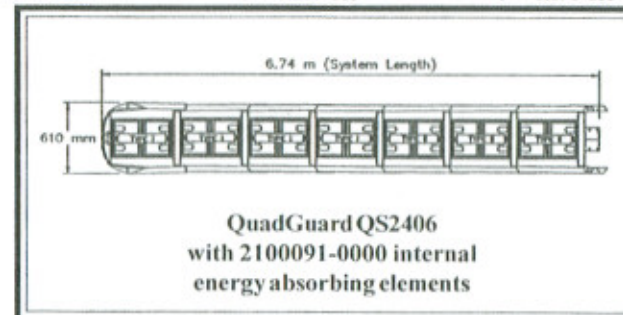
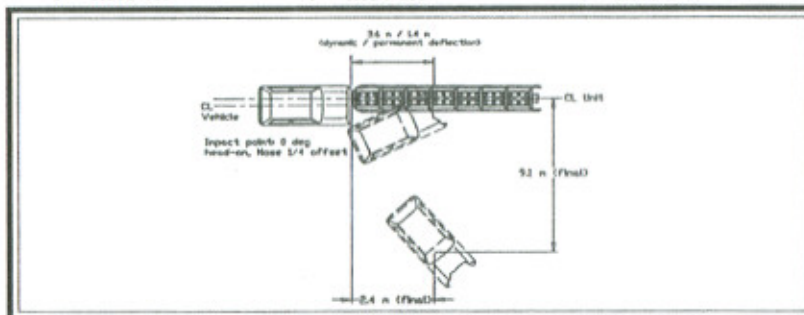
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General Information

Test Agency E-TECH Testing Services, Inc.
 Test Designation NCHRP 350 Test 3-30
 Test No. 01-7620-026
 Date 2/21/07

Test Article

Type Energy Absorption Systems, Inc.
 QuadGuard System QS2406
 with 2100091-0000 internal
 energy absorbing elements
 within the Type I cartridges.

Installation Length, (mm)..... 6 bay 6740 mm long 610 mm wide

Material and key elements..... 6 bay system, 7 energy
 absorbing cartridges (3) Type II
 and (4) Type I with 2100091-0000
 internal energy absorbing
 elements
 P.C. Concrete, clean

Foundation Type and Anchoring..... Unreinforced 27.6 MPa concrete,
 clean and dry, with (52) 19 mm x
 178 mm ASTM A193 Grade B-7
 threaded studs and
 MP-3 Anchoring System

Test Vehicle

Type Production Model
 Designation 820C
 Model 1993 Ford Festiva
 Mass (kg)
 Curb 757
 Test inertial 812
 Dummy 75
 Gross Static 887

Impact Conditions

Speed (km/h)..... 98.3
 Angle (deg)..... 0
 Impact Severity (kJ)..... 302.8

Exit conditions

Speed (km/h)..... N/A
 Angle (deg)..... N/A

Occupant Risk Values

Impact Velocity (m/s)
 x-direction 11.5
 y-direction 1.5
 Ridedown Acceleration (g's)
 x-direction -14.8
 y-direction 5.3

European Committee for Normalization (CEN) Values

THV (km/h) 41.8
 PHD (g's) 14.8
 ASI 1.2

Test Article Deflections (m)

Dynamic 3.6
 Permanent 1.4

Vehicle Damage

Exterior
 VDS FL-3
 CDC 12FLEW3

Interior
 ODCI AS0000000
 Maximum Deformation (mm) 15

Post-Impact Vehicular Behavior (deg - rate gyro)

Maximum Roll Angle -38.8
 Maximum Pitch Angle -39.6
 Maximum Yaw Angle -248.5



E-TECH Testing Services, Inc.

QuadGuard System (QS2406) Crash Test Results -

Summary of Results - QuadGuard QS2406 Test 01-7620-026

The results of this report relate only to the QuadGuard QS2406 configuration tested. This report may not be reproduced except in full, without the prior written approval of E-TECH Testing Services, Inc. Prepared by: John F. LaTurner, P.E. - Manager. Report 306 - Issued 3/5/07