U.S. Department of Transportation
Federal Highway Administration

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

August 18, 2011

In Reply Refer To:
HSST/ B-69D

Mr. Gerrit A. Dyke, P.E.
Vice President of Engineering and R & D
Barrier Systems, Inc.
3333 Vaca Valley Parkway, Suite 800
Vacaville, CA 95688

Dear Mr. Dyke:

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: Quickchange Concrete Reactive Tension Barrier System (QMB-CRTS)
Type of system: Moveable Concrete Longitudinal Barrier
Test Level: NCHRP Report 350 Test Level 4 (TL-4)
Testing conducted by: Safe Technologies, Inc. and MIRA, LTD
Date of request: December 28, 2010
Date request acknowledged: January 7, 2011
Task Force 13 designator: SGM22b

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" at TL-4.

Requirements
Roadside safety devices should meet the guidelines contained in NCHRP Report 350 if tested prior to December 31, 2010. Devices tested after that date must follow the guidelines contained in the American Association of State Highway and Transportation Official's (AASHTO) Manual for Assessing Safety Hardware (MASH). The FHWA memorandum "ACTION: Identifying Acceptable Highway Safety Features" of July 24, 1997, provides further guidance on crash testing requirements of roadside features, including crash cushions.

Decision
The following system design was found acceptable, with details provided below:

- Quickchange Concrete Reactive Tension Barrier System (QMB-CRTS)

Description
The system is a portable and moveable reinforced concrete longitudinal barrier intended for use as a temporary barrier in highway construction zones or as a semi-permanent installation for use in reversible-lane operations. It was originally tested and accepted as an NCHRP Report 350 TL-3 barrier and fully described in FHWA Acceptance Letters B69 and B-69A. Only the internal reinforcement was changed to achieve the higher performance level. Barrier segment shape and connection details were unchanged from the TL-3 design.

Crash Testing
Crash testing was performed at Safe Technologies, Inc. in California and at the MIRA. LTD facility in the United Kingdom. Although all of the tests described below were based on the European EN 1317 standards, tests with the NCHRP Report 350 820C and 2000P test vehicles were successfully conducted in conjunction with the FHWA's original TL-3 acceptance letters for the original QMB-RTS designs. Tests 3-10 and 3-11 are identical to tests 4-10 and 4-11. The results of these earlier tests were included with acceptance letter B-69.

The first test reported here was EN 1317 Test TB11 which is comparable to NCHRP Report 350 Tests 3-10 and 4-10. The test installation consisted of 41 meters (134 feet) of anchored Steel Reactive Tension QMB units for additional mass, followed by 42 meters (138 feet) of 1-meter (39-inch) long CRTS units. Dynamic deflection was 540 millimeters (21.3 inches). Enclosure 2 is the test summary sheet prepared by Safe Technologies, Inc.

The second test completed by Safe Technologies, Inc. was EN 1317 Test TB32. This test installation consisted of 24 meters (79 feet) of unanchored Steel Reactive Tension QMB units for additional mass, followed by 48 meters (157 feet) of 1-meter (39 inch) long CRTS units in the impact area. Another 23 meters (75.5 feet) of Steel Reactive Tension units were connected to the downstream end of the CRTS units. Dynamic deflection was 700 millimeters (27.6 inches). Enclosure 3 is the test summary sheet. The Impact Severity (IS) for this test was recorded as 87.7 kJ, significantly less than the Report 350 recommended value of 138.1 kJ. However, as noted above, test 3-11 was successfully run on the original CRST design and was the basis for FHWA acceptance letter B-69. For that test, the reported dynamic deflection was 610 millimeters (24.0 inches). Since test 3-11 is identical to test 4-11 and the only design change to the CRST was the addition of internal reinforcing, the earlier 3-11 test will suffice to demonstrate the crashworthiness of the CRST with the 2000P test vehicle.

EN 1317 test TB51 was conducted by MIRA, LTD. The test vehicle was a13000-kg (28,660-pound) bus impacting the CRST barrier at a nominal speed of 70 km/hr (43.5 mph) and an impact angle of 20 degrees. The test installation consisted of 99 meters (325 feet) of free-standing CRST units, anchored at both ends. The dynamic deflection was 1.7 meters (5.6 feet). Enclosure 4 is the test summary sheet. Because the impact severity of this test far exceeded the Report 350 target value and the center of mass of the bus was higher than the Report 350 8000S single-unit truck, the FHWA will accept this test as a substitute for Report 350 test 4-12.

Findings
Based upon the successful completion of the EN 1317 tests you provided, we agree that your QMB-CRTS, with additional internal reinforcement, is acceptable for use as a TL-4 longitudinal

barrier under NCHRP Report 350 test and evaluation conditions. The design, as described above, may be used on the NHS when such use is acceptable to the contracting authority.

In supplemental correspondence, you stated that all of your CRST barrier segments have been manufactured with the additional reinforcing since successful completion of Test TB32 and that barriers made subsequent to this acceptance letter will be marked to identify their TL-4 capacity. For barriers already in circulation, you can verify TL-3 or TL-4 capacity by determining their date of manufacture if requested to do so by a using agency.

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

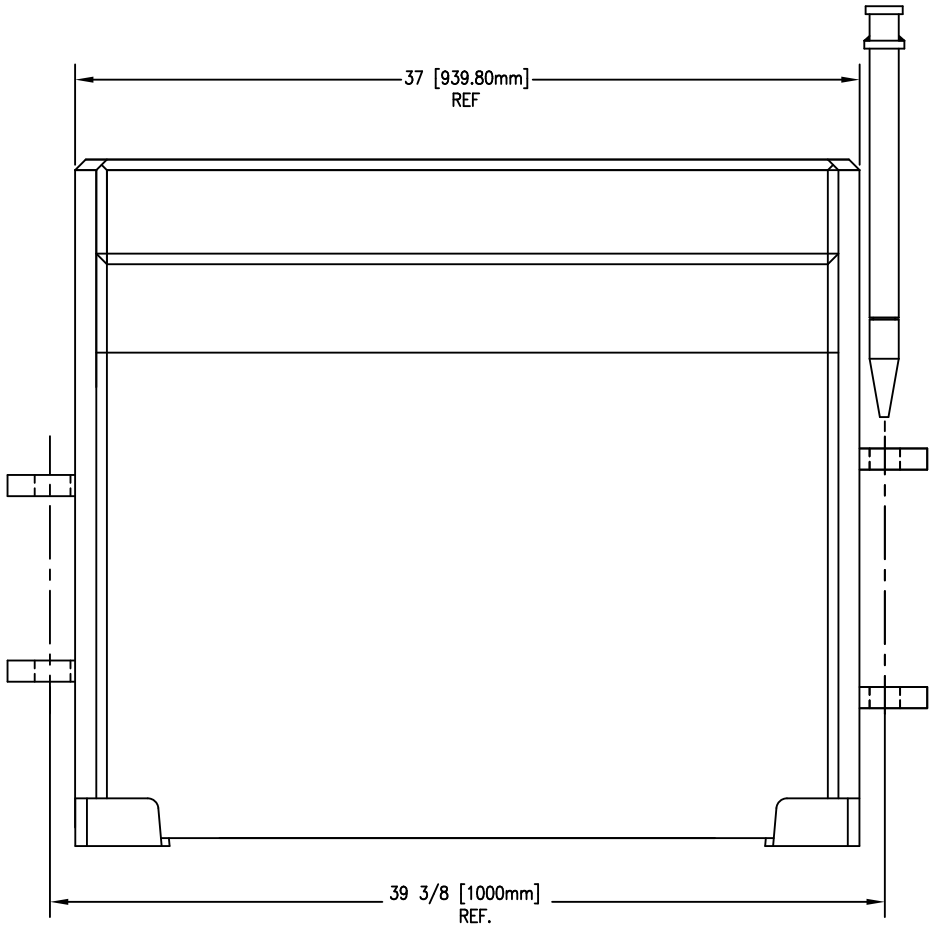
- This letter includes an AASHTO/ARTBA/AGC Task Force 13 designation that should be used when drafting new or revised Task Force 13 drawings.
- This acceptance is limited to the crashworthiness characteristics of the systems and does not cover their structural features, or conformity with the Manual 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 NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance is designated as number B-69d 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 QMB-RTS TL-4 barrier is a patented product and considered proprietary. If proprietary devices are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, (a) they 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.

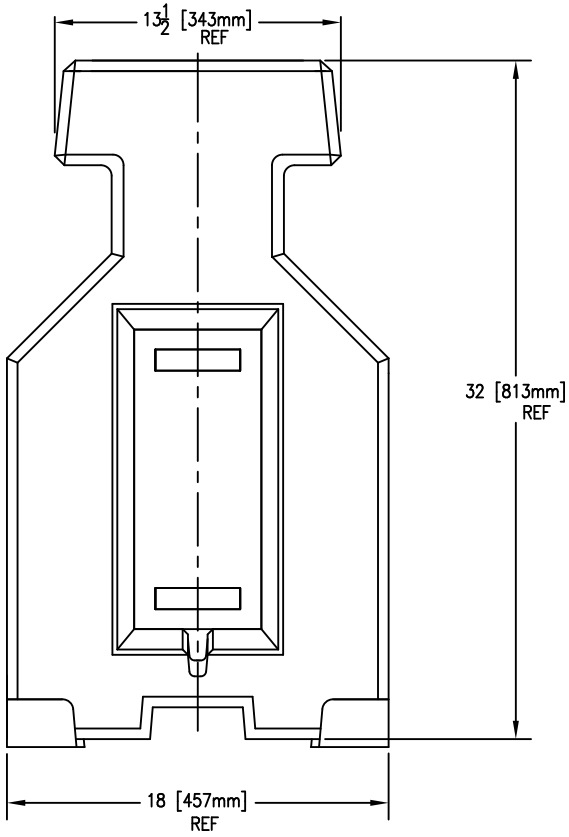
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate system, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures





APPROVALS

DRAWN BY:	GAD
DRAWN DATE:	12/29/2010
APPR'D BY:	GAD
APPR'D DATE:	12/29/2010

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ±1/16 DECIMAL .XX = ±.03 .XXX = ±.010 ANGLES ±1/2°

INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5–1994

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

REV	ECN#	DATE
–	1758	10/12/2011

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY
3333 Vaca Valley Parkway Ste 800
Vacaville, CA 95688
Tel: 888-800-3691
www.barriersystemsinc.com

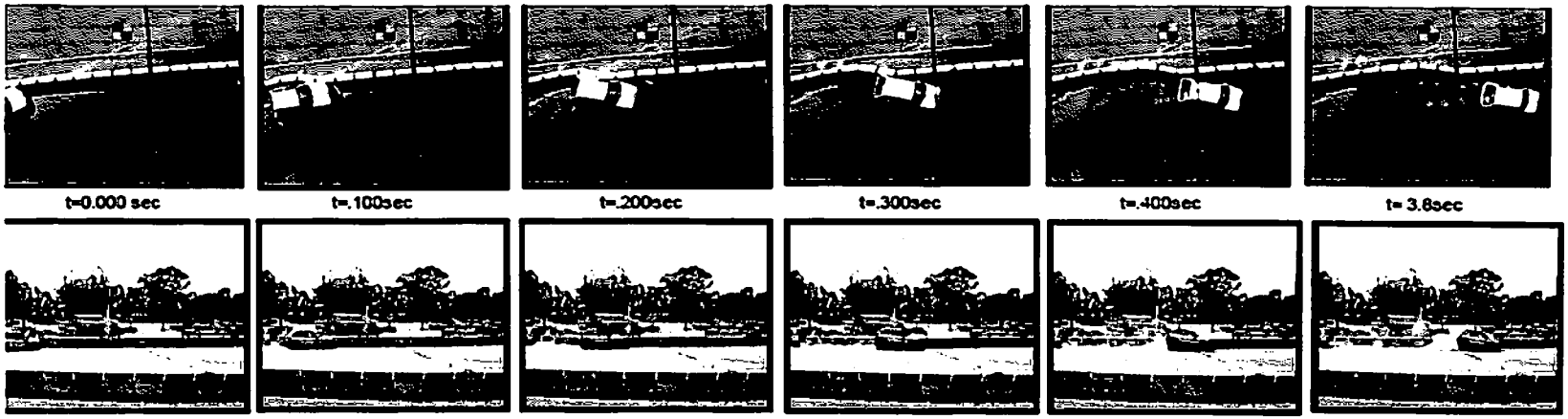
TITLE
CONCRETE BARRIER 18" RTS, TL4

SIZE	DWG NO.	REV.
B	C050236-US	A

SCALE 1:6 SHEET 1 OF 1

Doc. B100108

Enclosure 2



General Information

Test Agency	SAFETECHNOLOGIES, INC.
Test Designation	EN 1317-2, Test TB 11
Test No	RTS02
Date	4/19/2000

Test Article

Type	Barrier Systems, Inc. 18" CRTS/QMB Longitudinal Barrier
Installation Length	83 meters overall (42-CRTS)
Size and/or dimension and material of key elements	CRTS Section length 1000mm, height 813mm, width 457mm, mass 680kg

Test Vehicle

Type	Production Model
Designation	900 kg
Model	1990, Ford Festiva
Mass (kg)	
Curb	795
Test Inertial	791
Dummy(s)	75
Gross Static	912

Impact Conditions

Speed (km/h)	104.7
Angle (deg)	20
Impact Severity (kJ)	41.4

Exit Conditions

Speed (km/h)	70
Angle (deg)	14

Occupant risk Values

Impact Velocity (m/s)	
x-direction	4.5
y-direction	-7.8
Ridedown Acceleration (g's)	
x-direction	-8.3
y-direction	18.2
THIV (km/h)	31
PHD (g's)	19
ASI	1.4

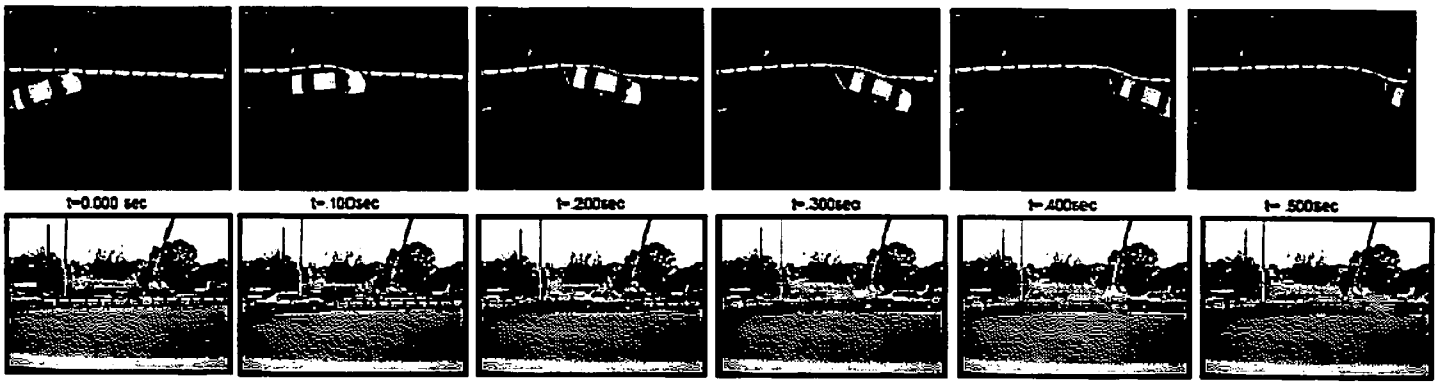
Test Article Deflection (mm)

Dynamic	540
Permanent	540
Working Width	W3

Vehicle Damage

Exterior	
VDS	LFQ-3
CDC	11FLEE3
Interior	
OCDI	AS0000000

Enclosure 3



General Information

Test Agency	SAFE TECHNOLOGIES, INC.
Test Designation	EN 1317-2, Test TB 32
Test No	CO2N2
Date	12/6/2000

Test Article

Type	Barrier Systems, Inc. 18" CRTS-QMS Longitudinal Barrier
Installation Length	95 meters overall (4B-CRTS)
Size and/or dimension and material of key elements	CRTS Section length 1000mm, height 813mm, width 457mm, mass 660kg

Test Vehicle

Type	Production Model
Designation	1500 kg
Model	1998, BMW 528e

Mass (kg)

Curb	1393
Test Inertial	1452
Dummy(s)	n/a
Gross Static	1452

Impact Conditions

Speed (km/h)	115.7
Angle (deg)	20
Impact Severity (kJ)	87.7

Exit Conditions

Speed (km/h)	81.7
Angle (deg)	21

Occupant risk Values

Impact Velocity (m/s)

x-direction	4.8
y-direction	-6.7

Ridedown Acceleration (g's)

x-direction	-7.5
y-direction	19.2
THIV (km/h)	.27
PHD (g's)	700 .20
ASI	700 1.2
Test Article Deflection (mm)	W4
Dynamic	
Permanent	
Working Width	

Vehicle Damage

Exterior

VDS	LFQ-4
CDC	11FLEE4

Interior

OCDI	AS0010000

Enclosure 4

General Information				Impact Conditions		Test Article Deflections	(Deflection of Traffic face)
Test Agency		MIRA Ltd		Speed (km/h)	71.4 km/h (2% above target speed)	Working Width (m)	1.9m
Test No		D0104		Angle (deg)	19.9deg (0.5% below target weight)	Dynamic (m)	1.7m
Date		25th July 2005		Exit Conditions		Permanent (m)	1.4m
Test Article				Speed (km/h)	58 km/h	Vehicle Penetration (m)	1.7m
Type		H2 Concrete Safety Barrier		Angle (deg)	3.5°	Vehicle Damage – Exterior	
Installation Length (m)		99m Inc End Anchors (Nom)		Occupant Risk Values		VDS	N/a
Size and/or dimension and material of key elements		32"H x 18"W x 30"L Sections		THIV (km/h)	11 km/h	CDC	N/a
Soil Type and Condition		Concrete plinth		PHD (g)	7g	Vehicle Damage – Interior	
Test Vehicle				ASI	0.4	OCDI	Not Applicable to this type of vehicle
Type		Coach				Post Impact Vehicular Behaviour	
Designation		Bedford				Max Roll Angle (deg)	-11.6 (CFC60 filter)
Model		N/a				Max Pitch Angle (deg)	4.6 (CFC60 filter)
Mass	Kerb (kg)	8690				Max Yaw Angle (deg)	-20.0 (CFC60 filter)
	Test Inertial (kg)	12995	Target Test Inertial: 13000				
	Total Ballast (kg)	4305					
	Gross Static (kg)	12995					