

RECEIVED MAR 27 2006



U.S. Department
of Transportation

**Federal Highway
Administration**

March 24, 2006

400 Seventh St., S.W.
Washington, D.C. 20590

In Reply Refer To:
HSA-10/WZ-224

Mr. Jan Miller
Mr. Felipe Almanza
Traffix Devices
200 Calle Pintoresco
San Clemente, California 92672

Dear Messrs. Miller and Almanza:

Thank you for your letter of November 11, 2005, requesting the Federal Highway Administration's (FHWA) acceptance of your company's linked Water Wall units as a crashworthy test level 2 (TL-2) Longitudinal Channelizing Barricade (LCB) and individual units as crashworthy TL-3 barricades for use in work zones on the National Highway System (NHS). Accompanying your letter were reports of crash testing conducted by Karco Engineering and video of the tests. You requested that we find these devices acceptable for use on the NHS under the provisions of 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 work zone traffic control devices is contained in two memoranda. The first, dated July 25, 1997, titled "INFORMATION: Identifying Acceptable Highway Safety Features," established four categories of work zone devices: Category I devices are those lightweight devices which are to be self-certified by the vendor, Category II devices are other lightweight devices which need individual crash testing but with reduced instrumentation, Category III devices are barriers and other fixed or heavy devices also needing crash testing with normal instrumentation, and Category IV devices are trailer mounted lighted signs, arrow panels, etc. for which crash testing requirements have not yet been established. The second guidance memorandum was issued on August 28, 1998, and is titled "INFORMATION: Crash Tested Work Zone Traffic Control Devices." This later memorandum lists devices that are acceptable under Categories I, II, and III. Our new acceptance process was outlined in our memorandum "FHWA Hardware Acceptance Procedures – Category 2 Work Zone Devices" dated November 11, 2005.



A brief description of the devices follows:

Each Water Wall unit is 1803 mm long x 812 mm wide x 812 mm tall (71" x 18" x 32") and is rotational molded of linear medium density polyethylene plastic. The walls are nominally 6.3- mm (0.25- inch) thick, and are concave on each side, the top being as wide as the bottom. Each end of the Water Wall units has four lugs (for connecting to adjacent units when deployed as a LCB). The lugs have a radius of 152.4 mm (6.0 inches) and are 63.5- mm (2.0- inches) thick. Each unit weighs 80 pounds empty.

Testing

The TraFFix Devices Water Walls were tested in two distinct configurations. First, the individual units were tested, empty, as stand-alone barricades. Next, multiple units were linked together to form a LCB and water was added for ballast before the test impact with the 820C small car.

Stand Alone Barricade Testing

Full-scale automobile testing was conducted on TraFFix Water Wall Barricades. Two stand-alone examples of the device were tested in tandem, one head-on and the next placed six meters downstream turned at 90 degrees, as called for in our guidance memoranda.

The tests are summarized in the table below.

	NCHRP Report 350 Test 3-71	
Test Number	TR-P24165-02-NC	
Orientation of unit	Head-on	Perpendicular
Weight of Tested Unit	36.3 kg (80 pounds)	
Flags Lights	None	None
Mass of Test Vehicle	(Gross static weight) 833 kg (1837 pounds)	
Impact Speed*	101.01 km/hr (62.8 mph)	
Exit Speed*	94.31 km/hr (58.6 mph)	
Velocity Change*	1.86 meters per second	
Extent of contact	Struck by front bumper	Struck by unit 1
Windshield Damage	None - No contact	None – No contact

*The speed of the test vehicle was not recorded after impact with the first unit. The speed change after contacting *both* units was well within the 5.0 m/s maximum permitted for impacts with *single* portable work zone traffic control devices.

Longitudinal Channelizing Barricade Testing

The FHWA's guidance for crash testing of LCBs is that a length-of-need test be run using an 820C vehicle at 20 degrees. This is either Test 2-10 at 70 kmh for TL-2, or Test 3-10 at 100 kmh for TL-3. Vehicle penetration of the LCB is acceptable, but the other evaluation criteria appropriate for a longitudinal barrier, including vehicle trajectory and occupant risk factors, must be met. The Water Wall was already tested at TL-1 as a redirective batter, and was the subject of our letter B-130 (dated November 30, 2004.) You selected TL-2 for testing the Water Wall as a LCB.

A total of 26 Water Wall units were used for this LCB test for an approximate total length of 47 meters (154 feet). A 38.1-mm (1.5-inch) diameter steel pin was inserted through the 38.1-mm (1.5-inch) diameter circular holes in the overlapping lugs between units to link them to each other. The LCB was positioned at an angle of 20 degrees with respect to the trajectory of the test vehicle. For this test the units were filled to their maximum capacity of approximately 127 gallons of water, making each weigh approximately 500 kg (1,100 pounds). Full-scale automobile testing was conducted on Traffix Water Wall Barricades.

The tests are summarized in the table below.

	NCHRP Report 350 Test 2-10
Test Number	TR-P25124-01-NC
Length of Tested LCB	47 m (154 feet)
Weight of Tested Units	26 at 500 kg (1100 pounds) each
Flags? Lights?	None
Mass of Test Vehicle	827 kg (1823 pounds)
Impact Speed	71.4 km/hr (44.3 mph)
Impact Angle	20 degrees
Occup. Impact Velocity	6.4 m/s (21 fps) X-direction, 0 Y-direction
Vehicle Trajectory	Vehicle did not penetrate the line of LCBs. Final position was with right front wheel resting atop the LCB
Maximum roll angle	Approximately 40 degrees (data channel failed)
Extent of contact	Vehicle remained in contact with the LCB after initial impact.
Windshield Damage	No contact
Max LCB Deflection	1.36 m (5.36 ft) Lateral deflection
LCB Damage	Units 13 through 17 damaged Pin connecting units 13 and 14 bent but remained connected
Occupant compartment Deformation	None

Findings: Stand Alone Barricades:

Vehicle damage was minor, and the trajectory of the empty units was ahead of the test vehicle showing no potential for impact with the windshield. The results of the testing met the FHWA requirements for Type I/Type II barricade units and, therefore, the empty Water Wall barricades described above and detailed in the enclosed drawings are acceptable as TL-3 devices for use on the NHS under the range of conditions tested, when proposed by a State.

Findings: Longitudinal Channelizing Barricade

Vehicle damage was minor and limited to exterior bumper and sheet metal crush. There was no occupant compartment deformation. The trajectory of the test vehicle showed moderate roll as the vehicle climbed the face of the LCB, coming to rest with the right front tire on top of the barricade and the rear tire off the ground. This is considered "moderate roll" and is acceptable under Report 350.

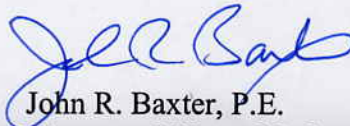
The results of the testing met the FHWA requirements for Type I/Type II barricade units and, therefore, the empty Water Wall barricades described above and detailed in the enclosed drawings are acceptable as TL-3 devices for use on the NHS under the range of conditions tested, when proposed by a State.

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 and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices (MUTCD). In order for the stand-alone units to be used as barricades they must be affixed with retroreflective sheeting per MUTCD Part VI. In order for the LCB to comply it must be affixed with delineators (buttons or small panels of retro-reflective sheeting) spaced on each unit.
- 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 WZ-224, 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 TrafFix Devices Water Wall unit is a patented device and is considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are *selected by the contractor* for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are *specified by a highway agency* for use on Federal-aid 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 existing highway facilities or that no equally suitable alternative exists; (c) or 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, 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 "John R. Baxter".

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

Enclosures

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.