Refer to: HSA-10/WZ-144

Mr. Tom Rockafellow
High-Way Safety Incorporated
13310 5th Street
Chino, California 91710

Dear Mr. Rockafellow:

This is in response to your email message dated January 29, 2003, requesting Federal Highway Administration (FHWA) acceptance of your company's "Flagtree Sign Stands as crashworthy traffic control devices for use in work zones on the National Highway System (NHS). Accompanying your message was a summary letter report of the crash testing conducted by E-Tech Testing Services. 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."

You also requested via an email message of April 30, 2003, that this letter of acceptance include your company's Type I, Type II, and Type III Barricades. These barricades are designed to be similar to the generic barricades detailed in FHWA Acceptance Letter WZ-85 dated November 15, 2001.

**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 were those lightweight devices which could be self-certified by the vendor, Category II devices were other lightweight devices which needed individual crash testing, Category III devices were barriers and other fixed or massive devices also needing crash testing, and Category IV devices were trailer mounted lighted signs, arrow panels, etc. 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.

A brief description of the devices follows:

The Flagtree Sign Stand is a portable sign support system available with either rigid or spring-loaded upright supports. Both types were evaluated.

The Flagtree features a 1219 mm vinyl mesh diamond sign supported by a pair of roving fiberglass braces. The stand has four legs made of 25.4 mm square 16 ga welded steel tube formed from A-569 hot rolled coil sheet steel. Both types share a common feature in that the legs are bolted onto a three piece butterfly bracket which is equipped with a spring loaded detent mechanism that allows the legs to be unlocked and folded up compactly. The sign stand which was tested in the perpendicular orientation features a rigid upright. The butterfly bracket supports a "socket" made from 38.1 mm square 16 ga tube which in turn accepts a telescoping upright with spring loaded detents composed of 23.2 mm by 13 ga and 19.1 mm by 16 ga square tubes. The upright is locked into the socket with a spring detent pin. The sign stand which was tested in the normal position features a spring loaded socket which supports the upright. The vinyl mesh sign is mounted to the upright with a three position multiclamp fastener which slides along the upright. The multiclamp is secured in position on the mast with a 9.5 mm wing nut. A flag holder, made up of three 25.4 diameter steel tubes welded to a 16 ga steel plate, completes the top of the mast. Three 457 mm square vinyl fabric flags with wooden dowels were attached to the top of the support. The rigid upright test article has a total mass of 14.3 kg and the spring loaded mass is 14.7 kg. Four 16 kg sand ballast bags were placed only on the lower support legs for the rigid upright since ballast is not necessary with the spring-loaded upright. Each test article was placed on a flat, clean, and dry asphalt surface.

The height of the stand to the top of the sign was 2340 mm. Including the three flags, the total height of the Flagtree Sign Stand was 2870 mm. The sign mounting height was 610 mm.

**Testing**

In accordance with FHWA policy for testing Category II work zone devices, the test articles were placed 6 m apart and the second was turned 90 deg relative to the first. The test was conducted at a 0 degree angle with the center of the vehicle bumper aligned with the vertical centerline of the test articles.

The tests are summarized in the table below.

| | Flagtree Sign Stand | |
|---|---|---|
| Test Number | 41-6204-001, NCHRP 350 Test 3-71 | |
| Sign Stand Tested | Normal | Perpendicular |
| Orientation | Spring loaded base | Rigid base |
| Weight of Tested Stand | 14.7 kg | 14.3 kg |
| Mounting heights | 610 mm | 610 mm |
| Flags? Lights? | Three flags | Three flags |
| Mass of Test Vehicle | 844 kg | |
| Impact Speed | 99.0 km/hr | 94.5 km.hr |

| | | |
|---|---|---|
| Exit Speed | 94.5 km/hr | 90.0 km/hr |
| Velocity Change | 1.25 m/s | 1.25 m/s |
| Extent of windshield contact | Minor cracking | Contact, little additional cracking |
| Other Damage | Cosmetic | Cosmetic |
| | | |

**Findings**
Damage was limited to minor cracking of the windshield. The results of the testing met the FHWA requirements and, therefore, the Flagtree sign stands described above and detailed in the enclosed drawings are acceptable for use on the NHS under the range of conditions tested, when proposed by a State.

You also requested acceptance of your company's barricades made to conform to the specifications in Acceptance Letter WZ-85. You provided the following detailed specifications for the barricades:

**Specifications for Hi-Way Safety Type I, II and III Barricades**

**Type I and II Barricades:**

Design: "A" Frame barricade consisting of four angle iron legs, two ½ inch plywood panels and hardware.
Legs: 45.25 inch long 14 gauge steel roll form angle 1.25 x 1.25 inch.
Panels: 24 inch wide by 8 inch high, ½ inch thick panel.
Hardware: Panel: ¼ inch 20 x 1 inch carriage bolt with lock washer and nut.
Legs: 3/8 inch x ¾ inch aluminum rivet.

**Type III Barricade**

Design: Freestanding barricade consisting of three plywood panels, two uprights and two detachable bases.
Uprights: Two 62.25 inch tall 1 ½ x 1 ½ inch 10 gauge steel angle.
Panels: Three 60 inch x 7.5 inch x ¾ inch plywood panels.
Bases: Two 60 inch x 2 inch x 2 inch 10 gauge steel roll form angle, each with one 8 inch x 2 inch x 2 inch 3/16 thick square tube welded to center of angle iron creating a posthole for the uprights.

These appear to conform to the FHWA generic barricades except that ACX plywood is specified by FHWA. Therefore, your barricades, detailed above, are acceptable for use on the NHS under the range of conditions the generic barricades were tested, when supplied with ACX plywood panels or equivalent, and when proposed by a State.

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

- Our acceptance is limited to the crashworthiness characteristics of the devices 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 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 FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number WZ-144 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 Flagtree Sign Stands may include patented components and if so are 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 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 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, a copy of which is enclosed.

Sincerely yours,

Michael S. Griffith
Acting Director, Office of Safety Design
Office of Safety

Enclosures

FHWA:HSA-10:NArtimovich:tb:x61331:5/12/03
File: h://directory folder/nartimovich/WZ144-HighWaySafetyFIN
cc: HSA-10 (Reader, HSA-1; Chron File, HSA-10;
N. Artimovich, HSA-10)