Refer to: HSA-10/WZ-115

Mr. Henry Ross
United Rentals Highway Technologies
P.O. Box 7050
Villla Park, Illinois 60181-7050

Dear Mr. Ross:

Thank you for your letters of January 29 and March 15, 2002, requesting Federal Highway Administration (FHWA) acceptance of your company's portable sign trailer as a crashworthy traffic control device for use in work zones on the National Highway System (NHS). Accompanying your letter was a letter report of crash testing conducted by E-Tech testing services and a 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." On April 5, 2002, in response to our request, you provided additional information via the Internet.

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.

The trailer consists of 2 x 2 inch square steel (ASTM A-500, Grade B) tubing with a wall thickness of 1/8 inch. Two 14 inch diameter wheels are affixed to the axle, which is 45 inches long. The tongue is 6 feet long. The 2 inch diameter steel pipe mast is six feet in length and carries a framework that supports signs up to 51 inches wide. The mast is slides into a 2-½ inch diameter pipe, which is affixed to a hinged connection that, along with the overall trailer design, is illustrated in the enclosed drawings for reference. The overall weight of the trailer and sign is 220 pounds (99.8 kg).

Testing

Full-scale automobile testing was conducted on your company's devices. Two stand-alone examples of the device were tested in separate impacts. One was struck head-on and the other was impacted at 90 degrees. The complete device as tested is shown in Enclosure 1. The crash test is summarized in the table below:

Test Number	05-7210-016	05-7210-017
Test Article	United Rental Portable Sign Trailer	
Orientation	Head-on	Perpendicular
Height to Bottom of Sign	1276 mm (50 in)	1276 mm (50 in)
Height to Top of Sign	2800 mm (110 in)	2800 mm (110 in)
Flags or lights	None	None
Test Article Mass (each)	99.8 kg	99.8 kg
Vehicle Inertial Mass	819 kg	816 kg
Impact Speed	101.8 km/hr	99.7 km/hr
Velocity Change	3.9 m/s	3.9 m/s
Occupant Impact Speed	3.9 m/s	3.9 m/s
Vehicle crush	None	Roof crush
Occupant Compart. Intrusion	None	Sign edge entered vehicle
Windshield Damage	No Contact	Penetration

Findings

This trailer is somewhat similar to one crash-tested at the Federal Outdoor Impact Laboratory for the State of Montana. The Montana trailer was judged acceptable for use in FHWA Acceptance Letter WZ-19 dated July 26, 1999. The Montana trailer was also tested via two impacts, at zero and 90 degrees respectively. There was a significant difference in the testing procedure, however, in that the sign panel was oriented perpendicular to the direction of vehicle travel in both impacts of the Montana trailer, causing the face of the sign to impact the vehicle in both tests. In testing the UR trailer, the entire rig, sign and all, was turned through an angle of 90 degrees. This resulted in the edge of the sign facing the test vehicle in the second test.

Apparently the testing of the Montana trailer was conducted in this manner because it was known that the leading edge of an end-on sign would be very likely to cause severe damage. It was also recognized that these sign trailers are removed at the end of the workday. Therefore, the situation where the sign is turned 90 degrees in order to obscure the message from drivers does not occur.

The URL trailers were tested with the sign blank oriented perpendicular to the trailer tongue in both tests. In the second test the thin edge of the sign penetrated the windshield and caused extensive roof damage. If the second test had been run with the sign perpendicular to the windshield it is expected that the results would be comparable to those of the Montana trailer. The results of the testing met the FHWA requirements except as noted and, therefore, the devices described above and shown in the enclosed drawings for reference are acceptable for use on the NHS under the range of conditions tested, when proposed by a State. The failing results of the second test are an indication that the trailer should never be left with the sign oriented parallel to traffic. The design of the United Rentals trailer incorporates a hinge base feature that makes it relatively easy to obscure the message of the sign when it is no longer appropriate.

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, 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 FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number WZ-115 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 United Rentals trailer 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

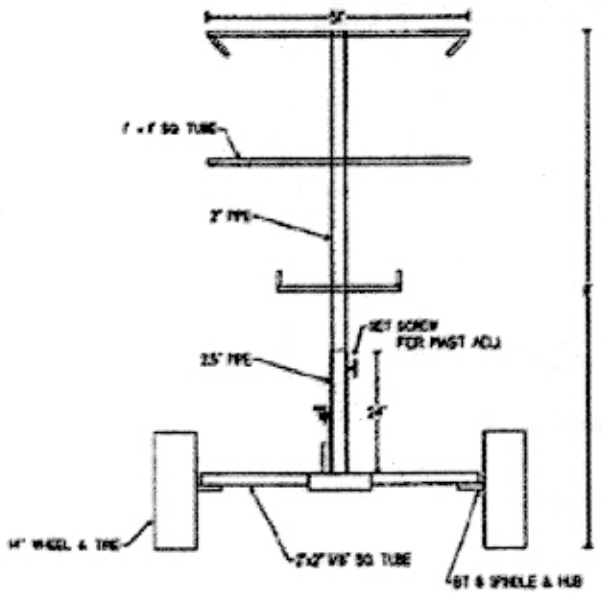
through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction 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,

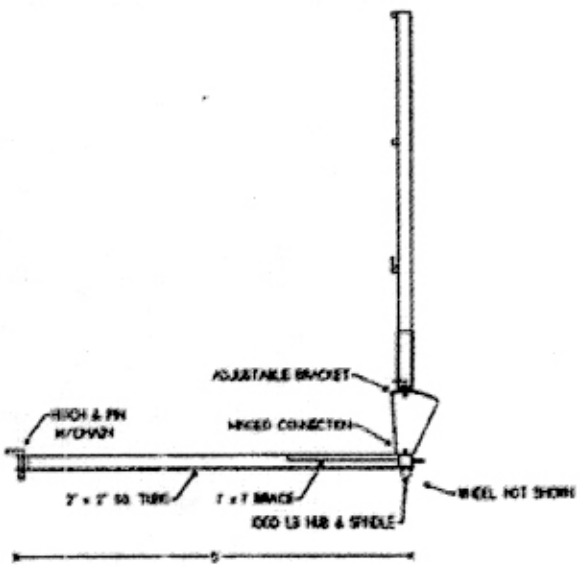
Carol H. Jacoby, P.E.
Director, Office of Safety Design

Enclosure

PORTABLE SIGN TRAILER



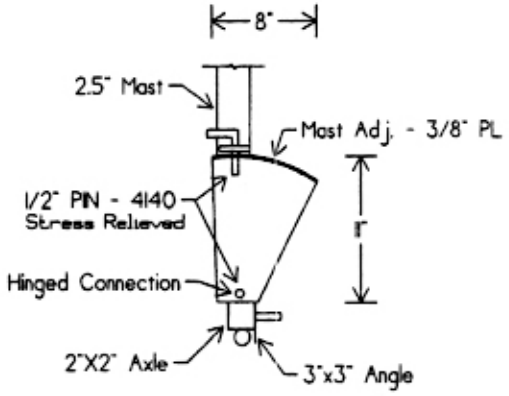
BACK VIEW



SIDE VIEW

PORTABLE SIGN TRAILER

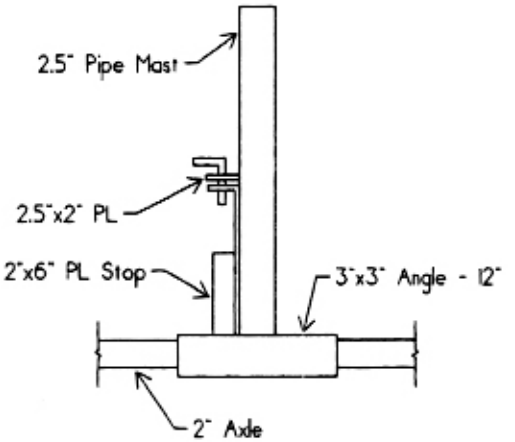
Hinged Mast Connection



BACK VIEW

PORTABLE SIGN TRAILER

Hinged Mast Connection



SIDE VIEW

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.

ENCLOSURE 2