



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

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

Refer to: HSA-1/WZ-64

Mr. Dan Robinson
President Sierra Safety Co., LLC
9093 Old State Highway
P.O. Box 547
Newcastle, CA 95658

Dear Mr. Robinson:

Thank you for your letter, sent October 18 requesting Federal Highway Administration (FHWA) acceptance of your company's "Quick Stand" ground mounted temporary sign stand as a crashworthy traffic control device for use in work zones on the National Highway System (NHS). Accompanying your letter was a report from Karco Engineering and a video of the crash tests. On November 30 we received a drawing of the device by fax. You requested that we find your company's temporary sign stand 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

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 for which you are requesting acceptance follows:

The Sierra Safety Quick Stand temporary sign stand is fabricated from steel that conforms to ASTM specification A-500-A /A-513-A. When deployed, it consists of a 1219 mm long by 25 mm square steel tube with a wall thickness of 1.9 mm. "Stops" are welded near the top and bottom of this tube to facilitate using the drive weight. To the lower end of the tube is welded a "dart" fashioned from steel that is 305 mm long. Between the "stops" of the tube is a 3.2 kg drive weight that is 657 mm long and 76 mm in diameter. To the top of the square tube is welded a 1010 mm long by 19 mm square tube extension, also of 1.9 mm wall steel, for mounting a roll-up

sign and warning flags. A flag holder assembly is mounted on the top. After being used to install the sign, the drive weight is held in place with a cotter pin. The overall weight of the sign installation, including sign and flags, is 9.8 kg.

Testing

Full-scale automobile testing was conducted on your company's devices. Two stand-alone examples of the "Quick Stand" 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 complete devices as tested are shown in the Enclosure 1.

The crash test is summarized in the table below:

Test Number	71
Test Article	Sierra Safety "Quick Stand"
Height to Bottom of Sign	565 mm
Height to Top of Sign	2229 mm
Flags or lights	Three flags with Staffs
Test Article Mass (each)	9.8 kg
Vehicle Inertial Mass	787 kg *
Impact Speed, Head-on	97.4 km/hr
Impact Speed, 90 Deg.	97.2 km/hr
Velocity Change, Head-on**	0.05 m/s
Velocity Change, 90 deg.**	N/A
Vehicle crush	None (plus tire blowout)
Occupant Compart. Intrusion	None
Windshield Damage	Localized 63 mm depression, plus general cracking

* The vehicle mass was outside of the lower limit considered acceptable for NCHRP Report 350 820C test vehicle. We consider it acceptable in this instance because the vehicle configuration is identical to many other 820C vehicles used in tests of work zone devices, and because the low mass vehicle is a worse case than the standard car.

**The velocity change recorded for the head-on hit is the difference between the impact speed of the vehicle into the first stand and then into the second. The velocity change for the 90 degree hit was not recorded.

Findings

Damage was limited to scrapes on the bumper and hood, and cracking of the windshield. There were no holes in the windshield as a result of this test, and the cracking was not extensive enough to significantly impair driver visibility. The 63 mm depression in the glass exceeds the 51 mm desirable limit in the draft FHWA Windshield Deformation Guidelines for work zone traffic control devices, but is less than the 75 mm maximum allowable deflection. In addition, these guidelines were drafted for use with channelizing devices and portable sign stands which sit on the pavement and are in direct line of oncoming traffic. The Sierra Safety "Quick Stand" is intended to be installed in soil and cannot be driven into pavement. Therefore, the Quick Stand will always be located outside of the traveled way.

The results of test met the FHWA requirements as noted above. Therefore with the proviso that the Sierra Safety Quick Stand will be located in soil and not placed in the traveled way of a roadway, the device described above and shown in the enclosed drawing for reference is acceptable for use as Test Level 3 devices beyond the shoulder of roads the NHS under the range of conditions tested, when proposed by a state.

Please note the following standard provisions which 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-64 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 Quick Stand 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 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,

Frederick G. Wright, Jr.
Program Manager, Safety

Enclosure

U.S. Patent May 5, 1987

Sheet 1 of 2

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