



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

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

December 15, 2005

In Reply Refer To: HSA-10/WZ-219

Dr. Ron Faller
Midwest Roadside Safety Facility
527 Nebraska Hall
P.O. Box 880529
Lincoln, Nebraska 68588-0529

Dear Mr. Faller:

Thank you for your letter of July 22, 2005, requesting the Federal Highway Administration (FHWA) acceptance of Missouri's 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 were reports of crash testing you conducted 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.

A brief description of the devices follows:

The Missouri ground mounted portable sign support is a single tube of 1.25 in square galvanized Telespar steel tubing with 0.125 in wall thickness and a length of 30 in. The tube is mounted to an anchor that consists of a 0.75 in diameter by 12 in long steel rod with a



6 in wide x 5.25 in high x 0.125 in thick triangle soil plate. A 3 in diameter washer with a 0.156-inch thickness was welded to the steel rod at the top of the attached soil plate. The anchor is ASTM Grade A-513 steel. The vertical tube is welded to the top of the anchor's washer.

The vertical fiberglass rib of the roll-up sign is secured to the support using a panel-to-post clamp. The clamp is 1.625 in wide x 5 in long U-shaped with 1 in long legs and a thickness of 0.125 in. It is fabricated from ASTM A-36 steel. A 0.25 in diameter by 2.25 in long ASTM A-307 Grade 2 bolt with nut is inserted through a hole in the center of the U-shaped clamp and tack welded around the bolt head.

The sign panel is 48 x 48 reflective vinyl on a crossbrace. The vertical member is 0.25 in thick x 1.25 in wide by 66 in long with a 0.3125 in diameter hole drilled 8.25 in from the bottom. The horizontal brace is 0.1875 thick x 1.25 in wide by 66 in long.

Height to bottom of sign: 18 inches
 Height to top of sign: 86 inches
 Weight of sign post: 6.0 pounds
 Weight of clamp and bolt: 0.5 pounds
 Weight of panel and crossbraces: 6.3 pounds
 Total weight of system: 12.8 pounds.

Testing

Full-scale automobile testing of an earlier design resulted in an unacceptable amount of windshield damage on the test vehicle. It was determined that early release of the sign from the support tube contributed to the damage. The bolt used to apply pressure on the base of the vertical crossbrace was replaced with a through bolt. This improved the performance to the point where no significant components of the stand came near the bogie's simulated windshield.

Bogie vehicle testing was conducted on the Missouri ground mounted sign supports. Stand-alone examples of the device were tested in separate runs, one head-on and one turned at 90 degrees.

The tests are summarized in the table below.

	NCHRP Report 350 Test 3-71		
Test Number	MOSBOG-10	MOSBOG-11	MOSBOG-12
Sign Stand Tested	Head-on	90 degrees	Head-on
Mass of Test Vehicle	2,467 pounds		
Impact Speed, km/hr (mph)	99.3 (61.7)	104.4 (64.9)	100.7 (62.6)
Velocity Change m/sec (fps)	0.97 (3.22 fps)	1.5 (4.99)	1.17 (3.81)
Extent of contact	Only vinyl*	Only vinyl*	No contact
Windshield Damage	None	None	None
Other notes			

* Only the retroreflective vinyl sign contacted the "windshield" vicinity of the bogie.

This crash-testing program used a hard-nosed bogie vehicle of a mass larger than the standard 820C test vehicle. There are significant constraints involved in using such a non-standard testing device, some of which are:

1. The potential vehicle velocity change must be considered insignificant.
2. The crush characteristics of an automobile bumper must not be expected to have a significant affect on the trajectory of the test article.
3. The profile of the bogie vehicle must be configured to replicate the outline of a production vehicle. The Midwest Roadside Safety Facility bogie was configured to replicate the outline of a Geo Metro, a vehicle commonly used in testing of work zone devices.
4. No part of the test article may intrude into the windshield area of the vehicle after impact.

Findings

Contact between the test article and the vehicle was limited to the bumper and hood areas of the bogie. In some cases the vinyl sign separated from the crossbraces and slid up and across the windshield but would not have caused any damage at all.

The results of the testing met the FHWA requirements and, therefore, the Missouri Ground Mounted Temporary Sign Stand 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.

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.
- 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-219 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.

- 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.

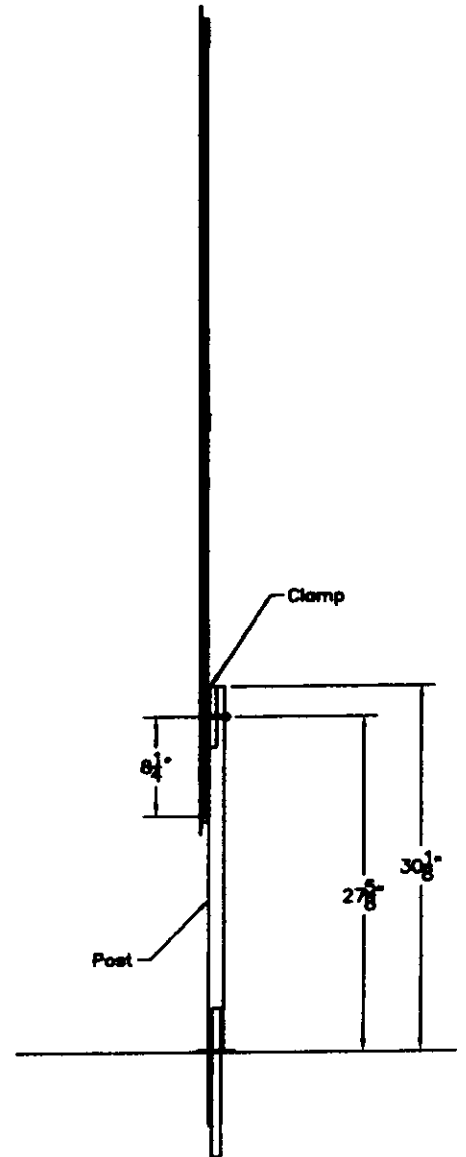
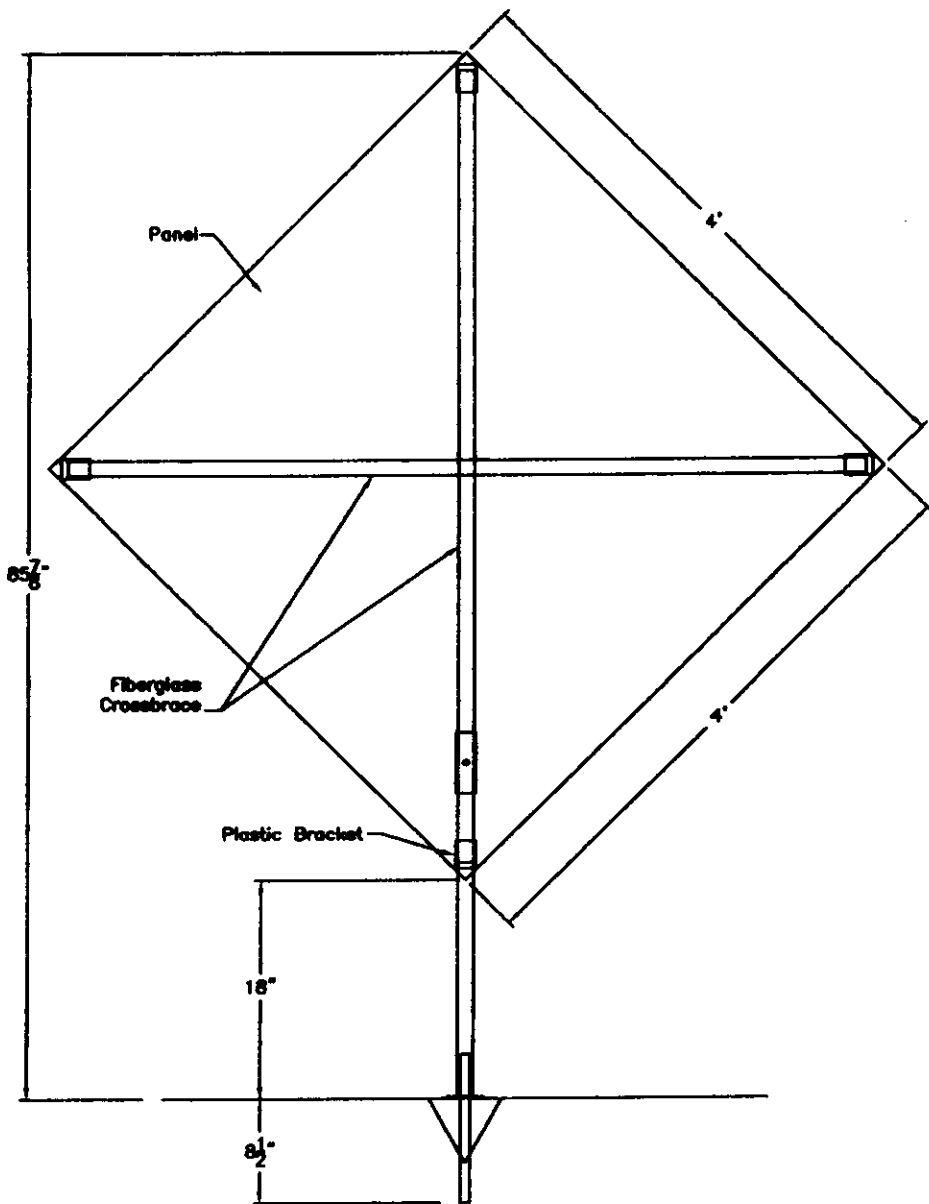
Sincerely yours,

/original signed by/

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

Enclosures

FHWA:HSA-10:NArtimovich:tb:x61331:12/13/05
File: h://directory folder/artimovich/WZ219MissouriFIN.doc
cc: HSA-10 (Reader, HSA-1; Chron File, HSA-10;
N.Artimovich, HSA-10)



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Missouri Temporary Ground -
Mounted Sign Stand

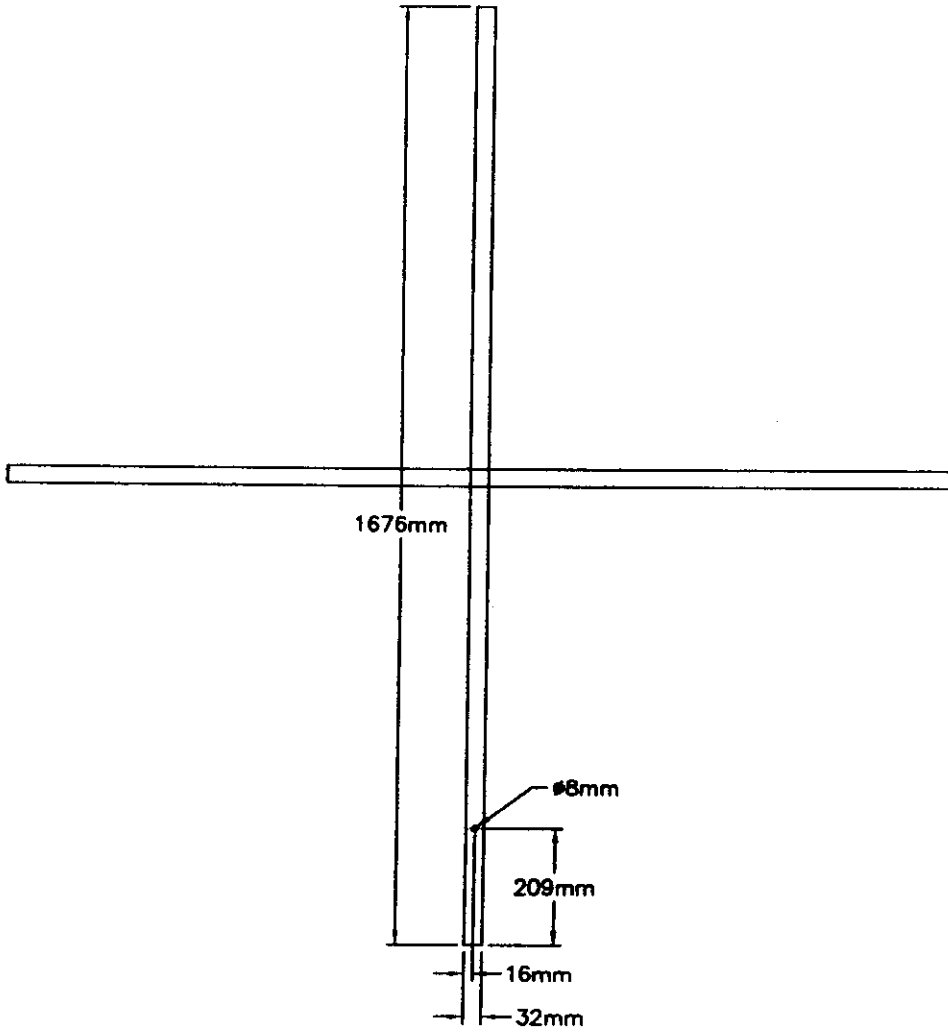
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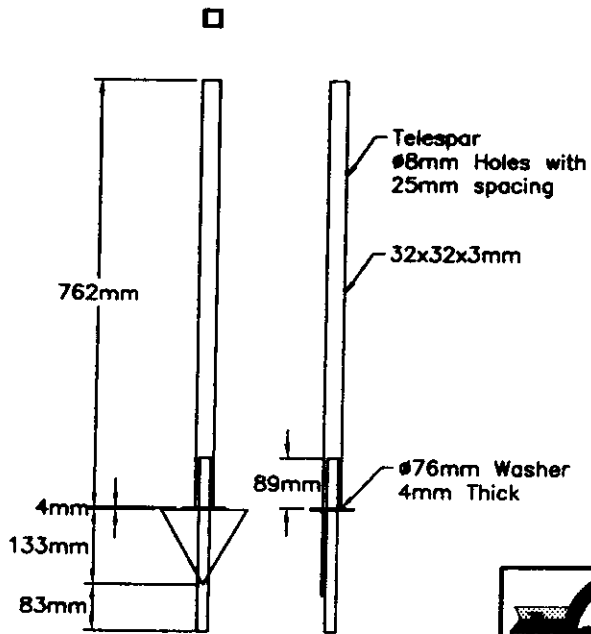
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Sheet:
1 of 2
Date:
12/15/2004
By:
GEP
Rev:
KAP/RKF

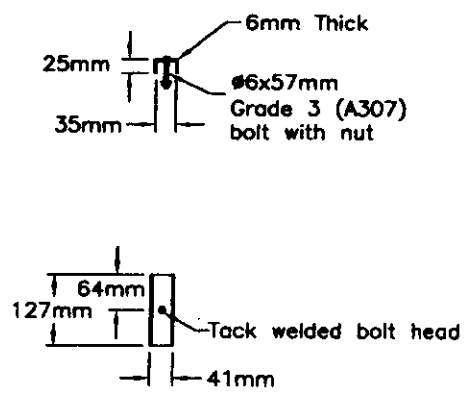
Crossbrace



Post



Clamp



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Missouri Temporary Ground -
Mounted Sign Stand

Part Details

Drawing Name
MOSbogl1.dwg

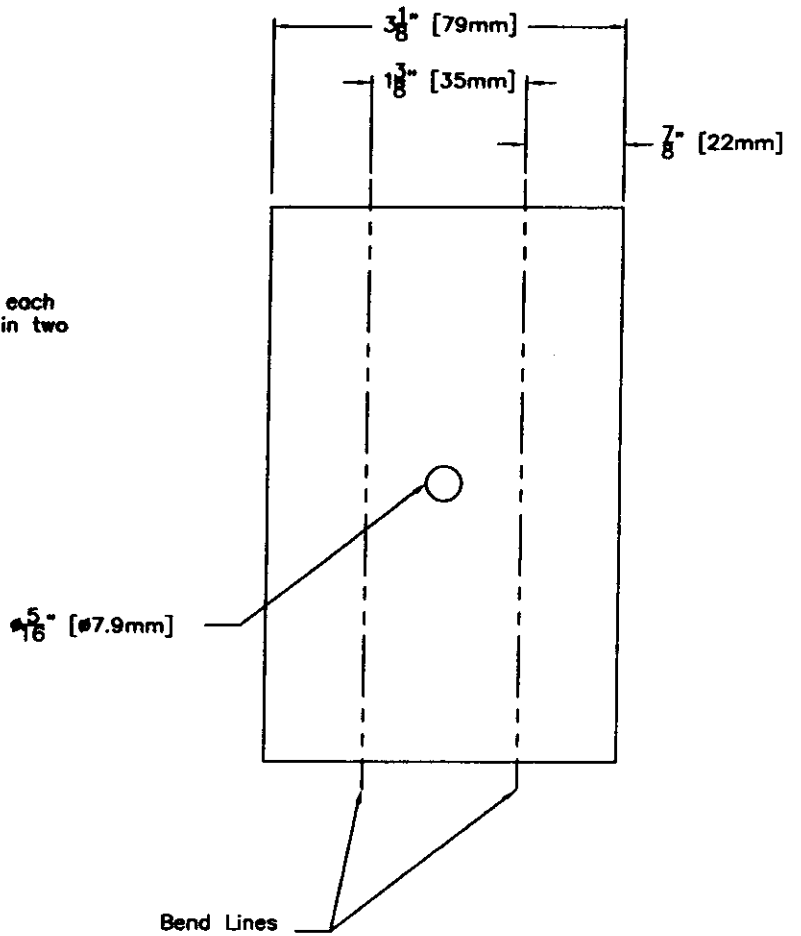
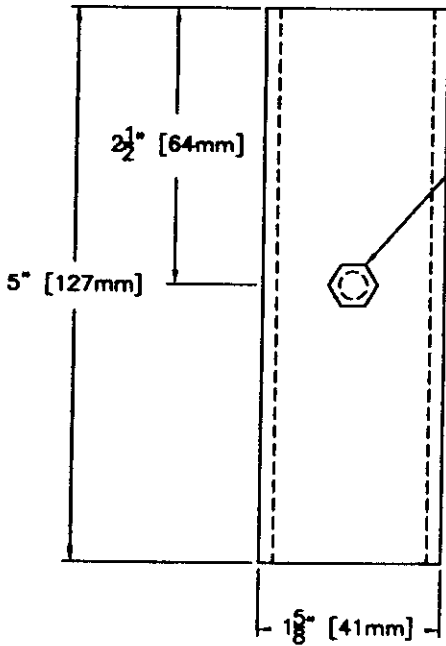
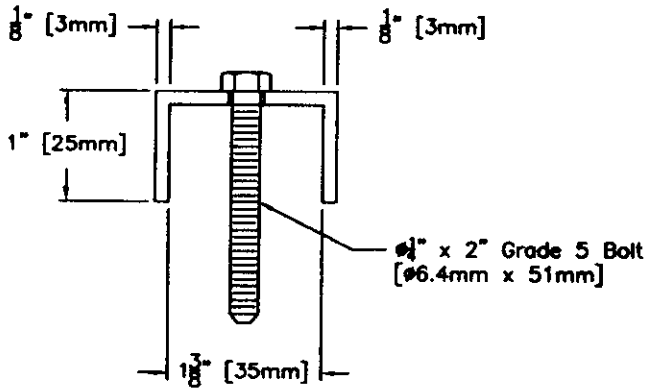
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Sheet
2 of 2

Date
12/15/2004

By
GEP

Rev
KAP/RKF



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**Missouri Temporary Ground -
 Mounted Sign Stand**

One bolt clamp

Sheet

1 of 1

Date:

12/13/2004

By:

GEP

Rev:

KAR/DP

Drawing Name:

missouritemp.dwg

Scale:

None