July 15, 2004

Refer to: HSA-10/WZ-187

Mr. Dennis C. Hipskind
President
Three Rivers Barricade and Equipment Company
3330 Taylor Street
Fort Wayne, Indiana 46802

Dear Mr. Hipskind:

Thank you for your letter of April 7, 2004, requesting Federal Highway Administration (FHWA) acceptance of your company's "KMAC" Portable Sign Stands as crashworthy traffic control devices for use in work zones on the National Highway System (NHS). Accompanying your letter were reports of crash testing conducted by E-TECH Testing Services 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 main upright supports for the signs are made of nominal 102mm x 102mm inch dimensional pressure treated wood cross braced with nominal 51 mm x 102 mm dimensional lumber having 16 and 20 penny nailed connections. The signs are attached to 2438 mm long 2.98 kg/m steel u-channel supports which are in turn bolted to the uprights such that the bottom edge of the signs are a nominal 2134 mm above ground level. The signs are bolted to the u-channels with four 7.94 mm GD 2 fasteners that pass through drilled holes in the supports. The u-channels for the

aluminum signs are attached with five bolts, nuts, and washers on each side and those for the plywood sign use four on each side. Each sign is equipped with two 2.3 kg warning lights and the base of the test articles are ballasted with six 16 kg sand bags.

Testing

Full-scale automobile testing was conducted on the devices. Two stand-alone examples of the device were tested in separate vehicle runs, one head-on and one turned to 90 degrees, as called for in our guidance memoranda.

The tests are summarized in the table below.

Test Number	50-3327-001	50-3317-002
Sign Stand Tested	Diamond Sign (1219 x 1219 mm) 2.54 mm Aluminum Perpendicular Orientation	Rectangular Sign (1219 x 1524 mm, vertical) 12.7 mm Plywood Head-on Orientation
Weight of Tested Stand	95.5 kg	111.1 kg?
Mounting heights	2134 mm	2134 mm
Flags? Lights?	Yes, two lights	Yes, two lights
Mass of Test Vehicle	819 kg	
Impact Speed	100.4 km/hr	98.3 km/hr
Velocity Change (OIV)	2.4 m/s	2.6 m/s
Extent of contact	Dents in bumper, grill, and hood	Dents in bumper, grill, and hood
Windshield Damage	No windshield contact	No windshield contact

OIV: Occupant Impact Velocity (max allowable is 5.0 m/s).

Findings

Damage was limited to dents in the bumper, grill, and hood areas of the test vehicles. The results of the testing met the FHWA requirements and, therefore, the devices 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 asked that this stand be accepted with the following variations:

1. Any sign substrate weighing up to and including 1.40 pounds per square foot (i.e., 0.080, 0.100 solid aluminum, Safetycore, ½ inch thick CDX or MDO plywood)
2. Any size sign up to and including 20 square feet.
3. With or without one or two standard warning lights weighing up to and including 5.069 pounds each.

These variations will be acceptable for use on the NHS when requested by a State, with the restriction that the mounting height of 2134 mm from the groundline to the bottom of the sign be maintained.

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 NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number WZ-187 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 Harry W. Taylor***/

~for~

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

FHWA:HSA-10:NArtimovich:tb:x61331:7/13/04
File: h://directory folder/nartimovich/WZ187-ThreeRiversFin
cc: HSA-10 (Reader, HSA-1; Chron File, HSA-10;
N. Artimovich, HSA-10)

WOOD SIGN STANDARD (SIDE VIEW UPRIGHT)

A - 2" X 4" DIMENSIONAL LUMBER, SPF
B - 4" X 4" DIM.L LUMBER,, PRESSURE TREATED
C - 16 PENNY NAIL CONNECTION, (3) PER TYP.
D - 20 PENNY NAIL TOENAIL CONNECTION

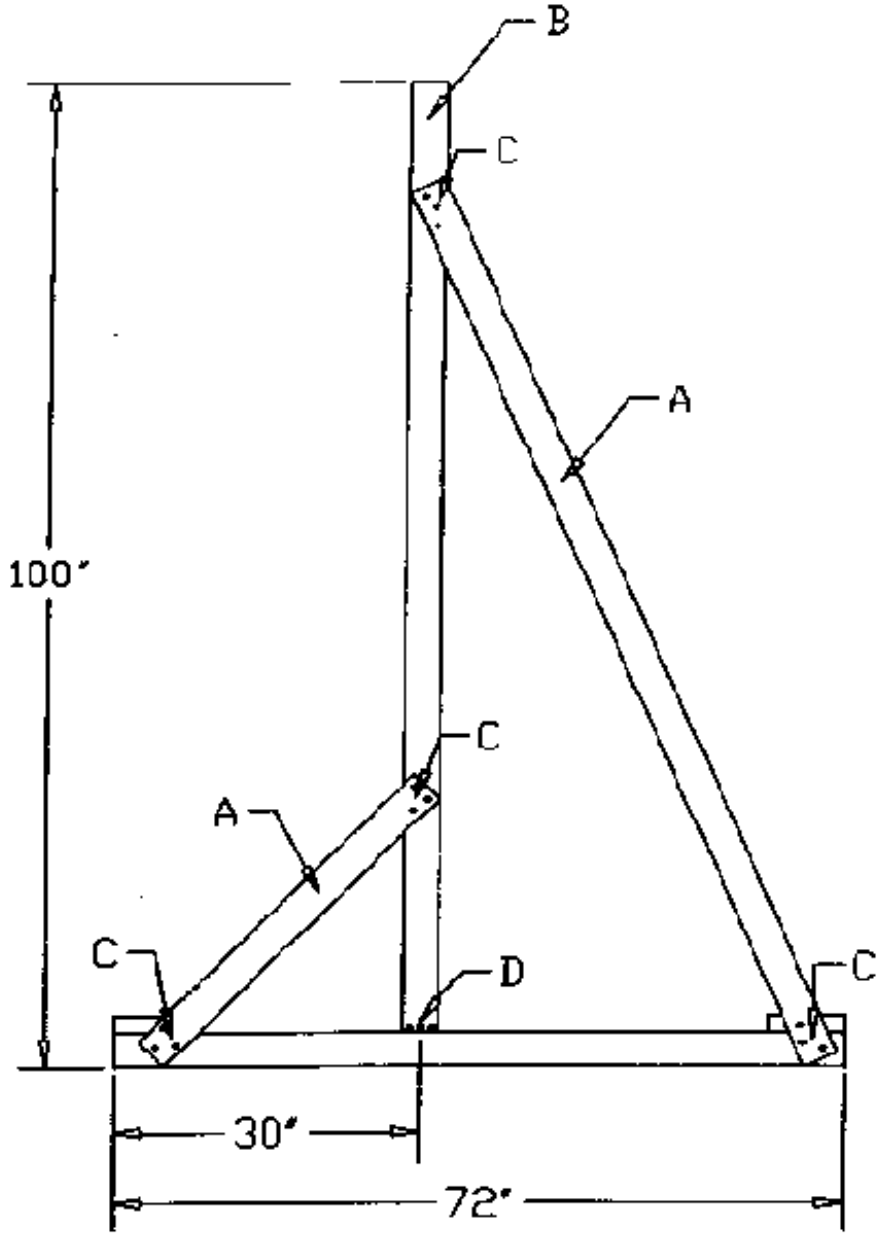

Illustration D-1. KMAC Sign Stand Drawing (1 of 3)

WOOD SIGN STANDARD (REAR VIEW SIGN HEIGHT)

A - 2" X 8" DIMENSIONAL LUMBER
B - (6) 35# SAND BAGS BALLAST
C - 5/16" GD 2 BOLT W/1" OD WASHER
(4) FOR PLYWOOD SIGN, (5) FOR ALUM.

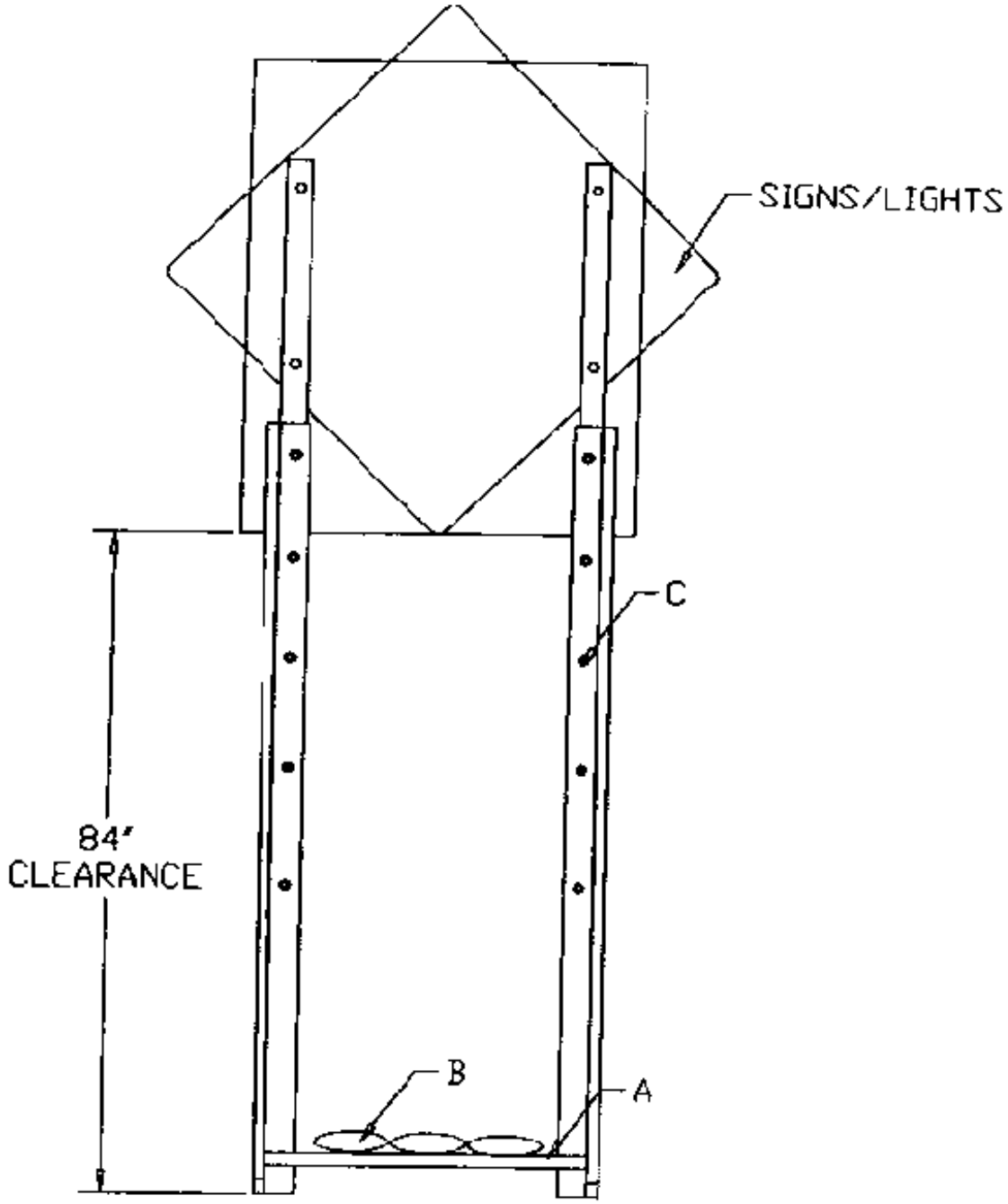

Illustration D-1. KMAC Sign Stand Drawing (3 of 3)

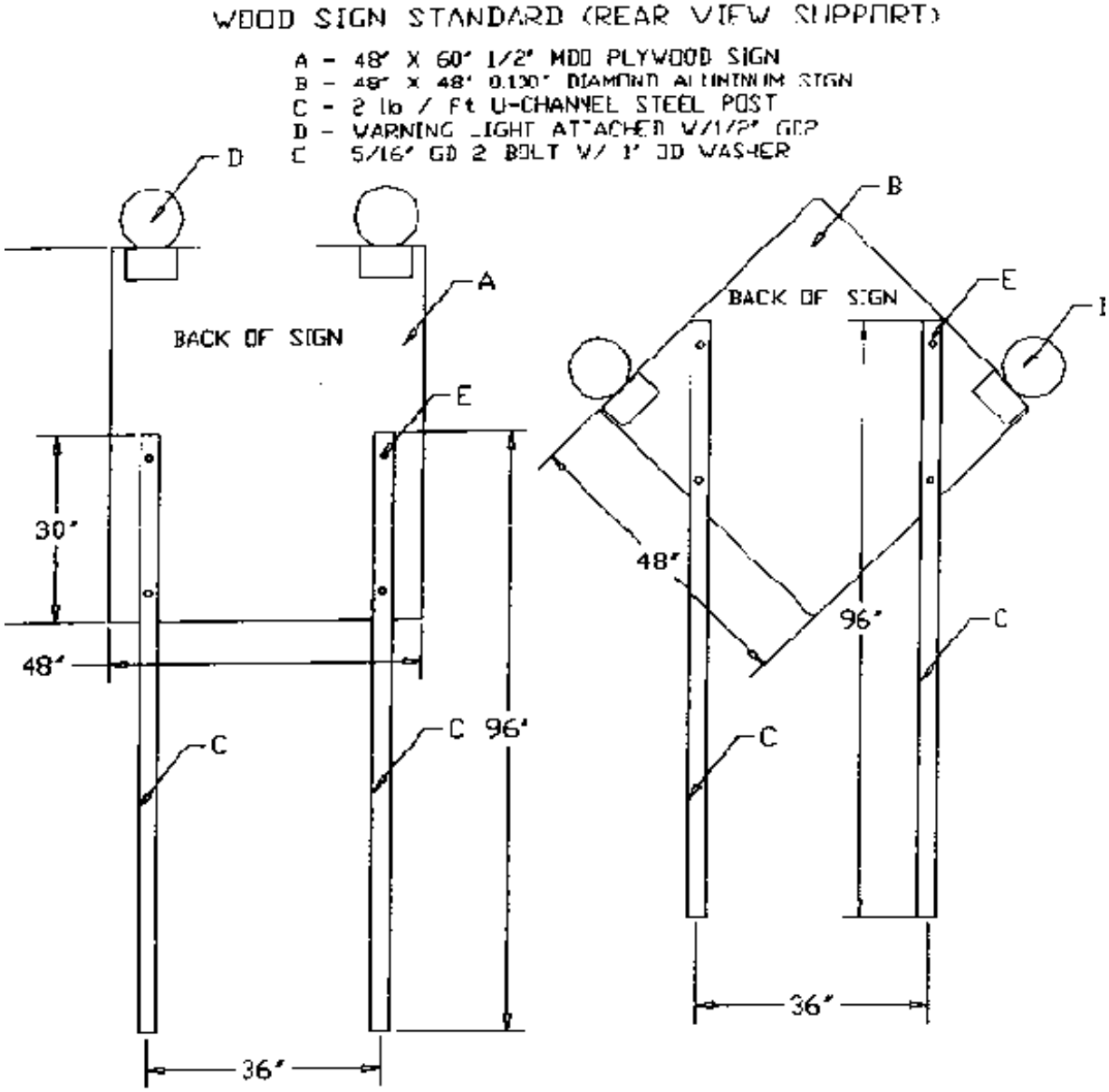

Illustration D-1. KMAC Sign Stand Drawing (2 of 3)