



U.S. Department
of Transportation

Federal Highway
Administration

July 25, 2000

400 Seventh St., SW.
Washington, D.C. 20590

Refer to: HSA-I

Richard J. Sesny, P.E.
Manager, Regulations and Control Section
Bureau of Highway Safety and Traffic Engineering
Pennsylvania Department of Transportation
P. O. Box 2047
Harrisburg, PA 17105-2047

Dear Mr. Sesny:

Thank you for your March 28 letter requesting the Federal Highway Administration (FHWA) acceptance of the Pennsylvania Type III Barricade/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 the Pennsylvania Transportation Institute (PTI), photographs, and videos of the crash tests. You requested that we find the barricade 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."

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 tested Type III barricades each consisted of a large sign, a small sign, three plastic rails, and a warning light. The battery pack for the light is placed on the ground and secured to the barricade's vertical post. The height to the bottom of the large sign is 1.5 m (5 feet). It is of A-C plywood; 13 mm thick (1/2 inch) and is supported on two vertical posts made of 3 8.1 mm (1 1/4 inch) square perforated steel tubing spaced 760 mm (30 inches) on center. Three 6 mm thick (1/4 inch) plastic rails are also supported on the vertical posts. The smaller plywood sign is bolted to two of the three plastic horizontal rails. The base consists of two 1.8 m (6-foot) long pieces of steel tubing supporting the vertical posts. In the head-on test, two bags of ball bearing shot, each bag being 22.7 kg (50 lbs.), were placed on each of the forward legs of the barricade to prevent it from blowing over. In the edge-impact test, two bags of shot were placed one each of the legs, one on the front and one to the rear. Detailed drawings of the test article are enclosed.

Full-scale automobile testing was conducted on these barricades. Two stand-alone examples of the device were tested in separate impacts. One was struck head-on and the next was hit at an angle 90 degrees relative to the first. Because Type III barricade-mounted signs are rarely, if ever, used in close sequence, we consider this an acceptable variation to the procedures in our guidance memoranda which call for both devices to be struck in the same test.

The crash test is summarized in the table below:

Test Number	#1	#2
Test Article Orientation	Head-On	90-Degrees
Height to Top of Rails	1.5 meters	
Height to Top of Sign	3251 mm	
Width of Barrier unit	1.8 meters	
Flags or lights	Yes, one warning light affixed to the large sign	
Test Article Mass (each)	59 kg	
Mass of light	0.5 kg	
Mass of battery pack	4.5 kg	
Mass of large sign	11.3 kg	
Mass of Ballast	45.4 kg	90.8 kg
Vehicle Inertial Mass	815 kg	845 kg
Impact Speed	102.5 km/h	103.4 km/h
Velocity Change	1.17 m/s	3.39 m/s
Vehicle crush	Crushing of grille and hood. Minor dent to roof	Crushing of grille and hood. Dents to hood and roof
Occupant Compart. Intrusion	None	50 mm deformation of roof
Windshield Damage	None	Significant localized cracking near the roof line

Damage to the vehicle was limited to the denting of the grille, hood, and roof. The only impact of concern was the edge of the sign panel impacting the roof. This left a dent but did not tear the metal. This impact also shattered the windshield to the extent that glass particles ended up in the passenger compartment, but there was no penetration of the windshield, nor did it make a hole through the glass. In general, the test articles did not show potential for penetrating the

occupant compartment. The results of this testing met the FHWA requirements and, therefore, the subject barricades are acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a State.

You also asked that this barricade be acceptable if a) smaller signs were used, or b) if the large sign was mounted at 2.1 meters, or c) if aluminum sign blanks were acceptable. We concur in these requests as noted:

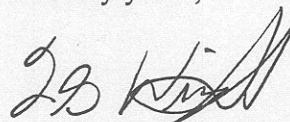
- A) The smaller size sign (900 x 900 mm, 36 x 36-inches) would be acceptable-height to the top remained the same as the signs used in the crash tests. This would require mounting the smaller sign approximately 450 mm above the top rail of the barricade.
- B) At a mounting height of 2.1 meters, the increased height of the 1200 x 1200 mm sign would improve the crash performance because it would be further removed from the windshield. The slight increases in mass of the barricade necessary to mount the sign higher would not significantly affect the occupant impact speed. Therefore, the 2.1 meter sign height is also acceptable.
- C) Aluminum signs have a mass of 8.4 kg as compared to the tested plywood signs which are 11.3 kg. We believe the performance would be acceptable because the aluminum blanks would impact the vehicle with less force (due to less inertia) and would have more of a tendency to bend under dynamic loads than plywood blanks would.

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.

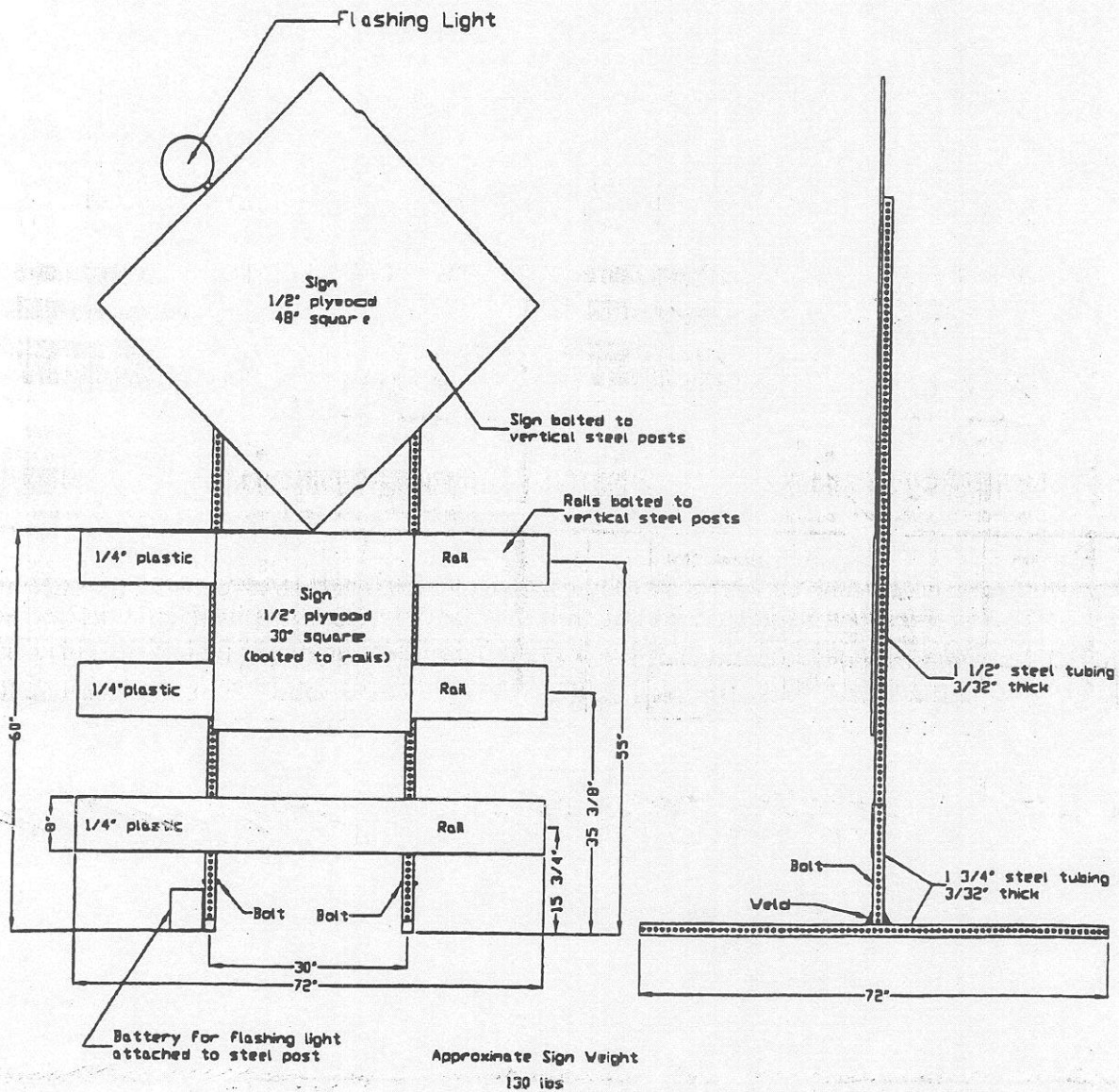
- To prevent misunderstanding by others, this letter of acceptance , designated as number WZ-44, will not be reproduced except in full.

Sincerely yours,



Frederick G. Wright, Jr.
Program Manager, Safety

Enclosure



Drawing:	Type III Barricade Dimensions	Date:	11/29/99
Project:	PTI Crash Tests	Scale:	1/2" = 1'-0"

Figure C1. Detailed drawing of test article