



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

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

Refer to: HSA-1\WZ-55

Mr. Craig Mittlestadt  
Minnesota Department of Transportation  
Room 120, Mail Stop 650  
395 John Ireland Boulevard  
Saint Paul, MN 55155-1899

Dear Mr. Mittlestadt:

Thank you for your letter of September 21 requesting Federal Highway Administration (FHWA) acceptance of your State's Type III barricades as a crashworthy traffic control devices for use in work zones on the National Highway System (NHS). Via a letter from Dr. Ronald K. Faller, dated September 15, we received a draft of the crash test report from the Midwest Roadside Safety Facility (MWRSF), drawings of the device, and videos of the crash tests. A final corrected copy, dated October 19 was recently submitted by MWRSF. You requested that we find your State's Type III barricades and Type III barricades with aluminum signs 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 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. Two of each device were fabricated from nominally identical materials. There were slight variations which are detailed in the test report but which have no significant affect on performance.

Type III Barricades:

A 1829 mm wide x 1528 mm deep x 1594 mm tall (72 x 60 x 62.75 inches) Type III barricade. Vertical uprights are 38.13 mm x 38.13 mm x 3.07 mm wall x 1524 mm long (1.5 x 1.5 x 1/8 x 60 inches) galvanized steel Telespar posts. Horizontal legs are 44.67 mm x 44.67 mm x 1.93 mm

wall x 1528 mm long (1.75 x 1.75 x 14 gage x 60 inches) galvanized steel Telespar posts. To each

leg is welded a 305 mm long (12 inches) stub of like Telespar post. The uprights are inserted into these stubs with no bolts or other fasteners being used. Three 230 mm wide x 1829 mm long (9 x 72 inches) aluminum extruded panels are fastened to the uprights using 50.8 mm (1 inch) corner bolts. When completed the uprights are 1257 mm (50 inches) apart, out-to-out. A 20.4 kg (45 pound) bag of sand was placed as ballast near the end of each leg.

#### Type III Barricade Sign Support:

The test articles were nominally the same as the barricades described above, with the addition of a sign of aluminum measuring 765 mm x 1219 mm x 2.70 mm thick (30 x 48 x 0.106 inches). It was bolted to the top barricade rail at a height of 1410 mm (55.5 inches) from the ground using 7.9375 mm diameter x 25.4 mm long (5/16 x 1 inch) hex-head bolts with square washers on the reverse of the rail.

#### Testing

Full-scale automobile testing was conducted on these devices. Two stand-alone examples of each device 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 Enclosure 1.

The crash test is summarized in the table below:

Test Number	MNB-1 and MNB-2	MNB-3 and MNB-4
Test Article	Type III Barricade	Type III Barricade with Sign
Height to top of Top Rail	1594 mm	1594 mm
Height to Bottom of Sign	n/a	1449 mm
Height to Top of Sign	n/a	2210 mm
Flags or lights	None	None
Test Article Mass (each)	24.5 kg	31.3 kg
Vehicle Inertial Mass	818 kg	808 kg
Impact Speed, Head-on	105.1 km/hr	105.9 km/hr
Impact Speed, 90 Deg.	99.3 km/hr	97.4 km/hr
Velocity Change, Head-on*	1.61 m/s	2.36 m/s
Vehicle crush	**	***
Occupant Compart. Intrusion	None	None
Windshield Damage Head-on	Very Minor cracking	Moderate Cracking
Windshield Damage 90 Deg.	Very Minor cracking	Moderate Cracking

\* 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.

\*\* The vehicle suffered numerous scrapes and dents, dislodging of the bumper, and a 51-mm (1 inch) long hole in the hood near the center of the left quarter-panel. There were no contacts that would indicate a potential for any part of the barricade to penetrate the occupant compartment.

\*\*\* The vehicle suffered numerous scrapes and dents including a major dent in the hood, dislodging of the bumper, and a 279-mm (11 inch) long cut in the hood along the left side quarter point. There was also a tear in the right front fender near the parking light. Two lights were broken by the impacts. The windshield sustained spider-web cracking but the cracking was not extensive enough to hinder visibility nor cause weak spots in both layers of glass.

### **Findings**

The damage sustained by the test vehicles was well within that we consider acceptable for crashworthy work zone traffic control devices, as were the vehicle velocity changes. The results of these tests met the FHWA requirements and, therefore, the devices described above and shown in the enclosed drawings for reference are acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a State.

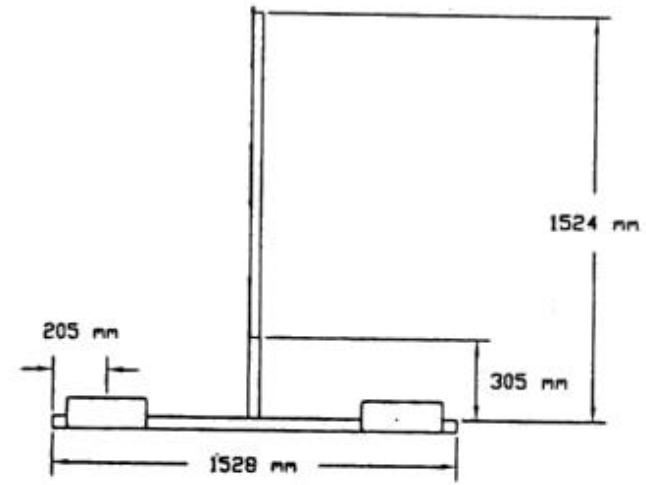
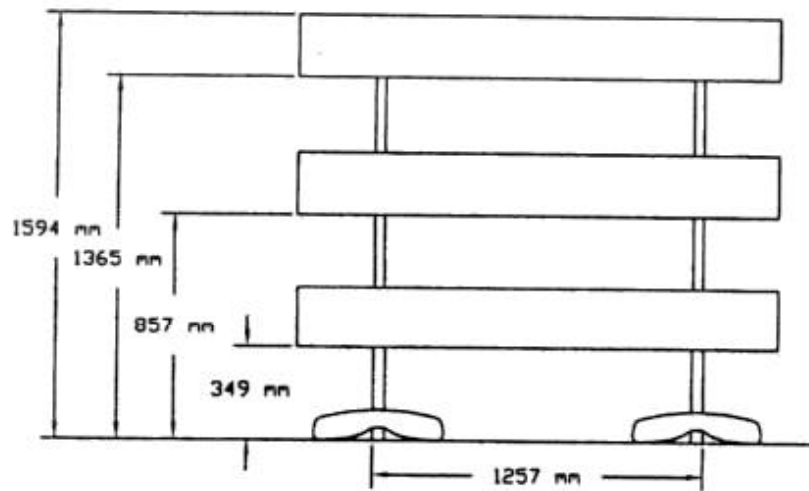
Please note the following standard provisions which apply to FHWA letters of acceptance:

- ! 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-55 shall not be reproduced except in full.

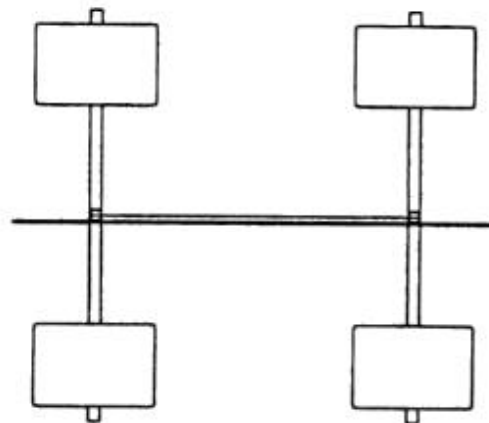
Sincerely yours,

Frederick G. Wright, Jr.  
Program Manager, Safety

Enclosure



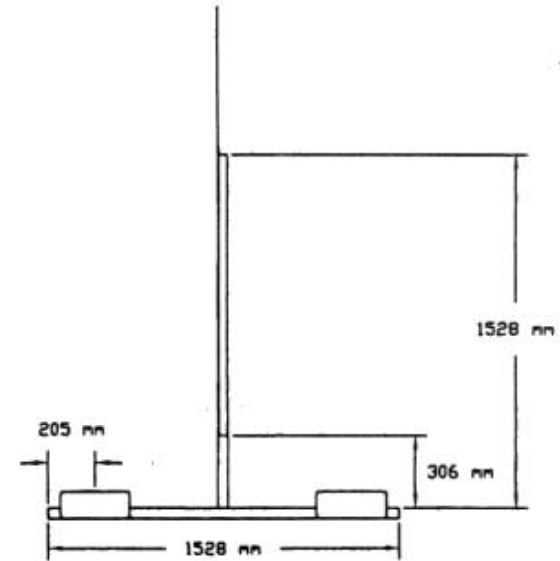
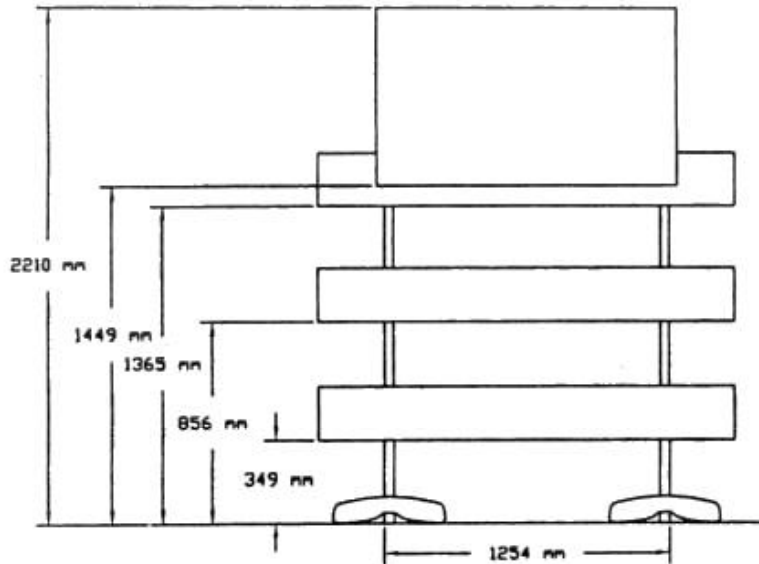
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#### ALUMINUM TYPE III BARRICADE

- Vertical Upright Masts - 38.13 mm x 38.05 mm x 3.07 mm wall x 1524 mm long telespar galvanized steel
- Legs, Horizontal Portion - 44.67 mm x 44.45 mm x 1.93 mm wall x 1528 mm long telespar galvanized steel
- Legs, Vertical Portion - 44.36 mm x 44.28 mm x 1.94 mm wall x 305 mm long telespar galvanized steel
- All telespar steel tubing contain 11.35 mm diameter punched holes, spaced 25.31 mm on center, along the total length
- Small Panels - aluminum "dog-bone" extrusions
  - Top Panel - 229 mm wide x 1829 mm long
  - Middle Panel - 229 mm wide x 1829 mm long
  - Bottom Panel - 230 mm wide x 1829 mm long
- Ballast - 20.4-kg sandbag at end of each leg
- Panels fastened to vertical supports with 50.8 mm corner bolts
- Vertical portion of leg is welded to horizontal portion on all four sides
- Masts slide inside vertical portion of legs -- No bolt or fastening device used

Figure 1. System No. 1 Barricade Details, Test MNB-1



#### ALUMINUM TYPE III BARRICADE

- Vertical Upright Masts - 38.17 mm x 38.07 mm x 3.05 mm wall x 1528 mm long telespar galvanized steel
- Legs, Horizontal Portion - 44.60 mm x 44.50 mm x 1.93 mm wall x 1528 mm long telespar galvanized steel
- Legs, Vertical Portion - 44.30 mm x 44.27 mm x 1.92 mm wall x 306 mm long telespar galvanized steel
- All telespar steel tubing contain 11.34 mm diameter punched holes, spaced 25.24 mm on center, along the total length
- Small Panels - aluminum "dog-bone" extrusions
  - Top Panel - 230 mm wide x 1829 mm long
  - Middle Panel - 230 mm wide x 1829 mm long
  - Bottom Panel - 229 mm wide x 1829 mm long
- Ballast - 20.4-kg sandbag at end of each leg
- Panels fastened to vertical supports with 50.8 mm corner bolts
- Vertical portion of leg is welded to horizontal portion on all four sides
- Masts slide inside vertical portion of legs -- No bolt or fastening device used

#### RIGID SIGN

- Panel - Reflective aluminum, 765 mm x 1219 mm with 2.70 mm thickness
- Attached to top barricade panel with 7.9 mm x 57.2 mm pan head bolts with a 76.2-mm square washer on back side of barricade panel

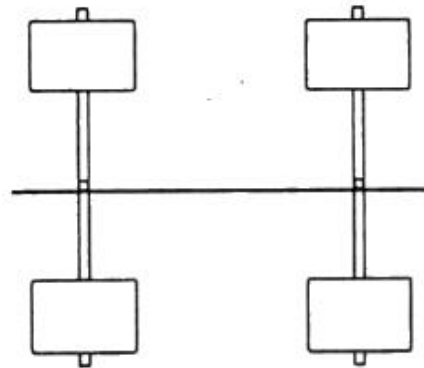


Figure 5. System No. 3 Barricade Details, Test MNB-2