

Refer to: HSA-10/WZ-127

Mr. Leo J. Yodock  
Yodock Wall Company  
623 N.E. Fifth Terrace  
Fort Lauderdale, Florida 33304

Dear Mr. Yodock:

This is in response to Dr. Dean Alberson's letter of April 29, 2002, and your e-mail message of August 15, 2002, requesting Federal Highway Administration (FHWA) acceptance of a variation to your company's Type III barricade device as a crashworthy traffic control device for use in work zones on the National Highway System (NHS). Dr. Alberson indicated that you wish to omit the striped barricade rails but retain the sign panel, resulting in a temporary sign support. He requested that we find this device 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 "Yodock 2001 Barrier with T3 apparatus" with no water ballast was successfully tested as a Type III barricade and found acceptable in our March 23, 2000, letter to you designated as **WZ-34**. A modified version with the barricade rails mounted higher, and supporting a 48 x 48 inch diamond sign, was crash tested head-on with the unit filled with water. This version was found acceptable for use as a road-closure device, subject to limitations of the volume of water used as ballast, in our February 7, 2002, letter to you designated as **WZ-107**.

### **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.

The subject sign stand would support the sign at 60 inches from the ground to the base of the sign. The stand consists of a Yodock Model 2001 segment, two two-inch schedule 80 PVC posts, a striped horizontal barricade panel supporting two lightweight warning lights, and the plywood sign panel. The striped barricade panel is hollow plastic lumber weighing approximately 3.5 pounds per six-foot length.

#### **Testing – WZ-34**

Full-scale automobile testing was conducted on the “**Yodock 2001 Barrier with T3 apparatus**”. Two stand-alone examples of the 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. Each barricade consisted of a polyethylene plastic segment with three barricade rails and warning lights. Each Model 2001 segment had a base 610 mm (24 inches) wide, and was 1170 mm (46 inches) tall. Each segment is 1820 mm long (71.5 inches). Inserted at the top of each segment were two poles for the top “T3” apparatus consisting of the barricade rails and the warning lights. Two barricade rails are mounted on the face of the barrier segment while the third is affixed to the poles. The mass of the 2001 segment itself was 61 kg (135 pounds), increasing to 81 kg (180 pounds) with the addition of the T3 apparatus. Although the Yodock 2001 segments are made to hold water, no water was used in the test.

Upon impact the T3 units separated from the “2001” plastic base segments and traveled over the roof of the test vehicle. The first plastic base segment traveled over the vehicle and the second (90 degree hit) pushed the hood upwards into the windshield. There was moderate cracking of the windshield but was judged not severe enough to prevent the driver from navigating the vehicle to a safe stop. There was no occupant compartment intrusion or significant deformation observed, nor did any test article debris show potential for penetrating the occupant compartment.

#### **Testing – WZ-107**

One head-on, full-scale automobile test was conducted with the Yodock Barrier Model 2001 **Energy Dispersement Cell Barricade** (EDCB) units. The EDCB units are rotomolded, low-density polyethylene (LDPE), water-filled containers. Overall dimensions on these New Jersey barrier-shaped units are 1830 mm (72 inches) long, 1170 mm (46 inches) tall, 610 mm (24 inches) width at the base, and 280 mm (11 inches) wide at the top. There are two forklift holes at 530 mm (21 inches) above ground level that nominally measure 150 mm x 280 mm (6 x 11 inches). The bottom vertical face of the device is 230 mm (9 inches) in height. For this test, water ballast was placed in the units to the maximum capacity. The approximate full mass of each unit is 708 kg (1560 pounds.) A total of three units were placed adjacent to each other and coupled with Polyethylene couplers. The total length of the installation was 5.5 m (18 ft.)

The Type III barricade atop each water filled unit was fabricated with two 50 mm (2 inch) schedule 80 PVC pipes, 2.59 m long (102 inch) supports. The center of the support pipes are placed 330 mm (13 in) from each end of the units. Hollow plastic lumber measuring 20 mm (3/4 inch) thick, 195 mm (7.7 inches) tall, by 1840 mm (72.4 inches) long was attached to the PVC

pipe with 6 mm (1/4 inch) “U” bolts. The top of the middle horizontal panel was 1940 mm (76.4 inches) above the ground. The top of the upper horizontal panel was mounted 2440 mm (96 inches) above grade. In addition, a 1220 mm x 1220 mm x 12 mm (4 foot x 4 foot x 7/6 inch) plywood sign panel was bolted to the middle Type III barricade. The top of the sign panel was 3250 mm (128 inches) above grade. Four battery powered warning lights were attached to the top of the pipe supports.

In the EDCB test, the vehicle broke through the middle barricade, pulling those to the right and to the left along with it for a short distance. The impact forced the hood back into the windshield, causing a hole in the glass. Even though the test resulted in a hole in the windshield, parts of the device itself did not show potential for penetrating the occupant compartment. Because of the mass of the water in the filled cells, Occupant Impact Velocity exceeded that for a breakaway work zone traffic control device. However, it was within the desirable limit for a crash cushion impact and is considered survivable

### **Findings**

The damage sustained by the test vehicles was moderate, with no occupant compartment intrusion caused by the barricade rails, uprights, or the sign. The velocity change in the unit filled with water was unacceptable, and therefore was limited to 363 kg (800 pounds) of water. The results of the testing met the FHWA requirements.

In his letter Dr. Alberson explains that the modification you requested would perform in an acceptable manner because the sign would break free and follow a trajectory over the vehicle. Based on the crash testing of the Type III Barricade variations, we concur that the Yodock Sign Support described above and shown in the enclosed drawings for reference is acceptable for use on the NHS under the range of conditions tested, when proposed by a State.

We also concur that a similar sign support system, using the smaller **Yodock 2001m** module, would also be acceptable under the same conditions. The 2001m module with T3m apparatus was successfully crash tested and found acceptable in our letter WZ-22 dated October 19, 1999.

This letter also supercedes WZ-34 as the acceptance letter for the “**Yodock 2001 Barrier with T3 apparatus**”. This device, also described above and illustrated in the enclosed drawings, is 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 FHWA letters of acceptance:

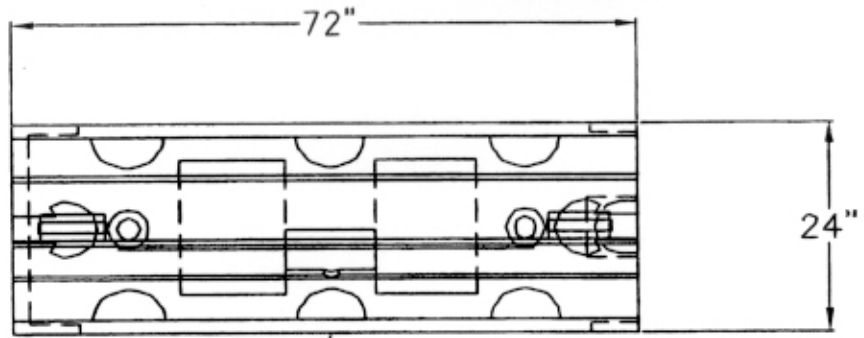
- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance 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-127 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 Yodock walls are patented components and are 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.

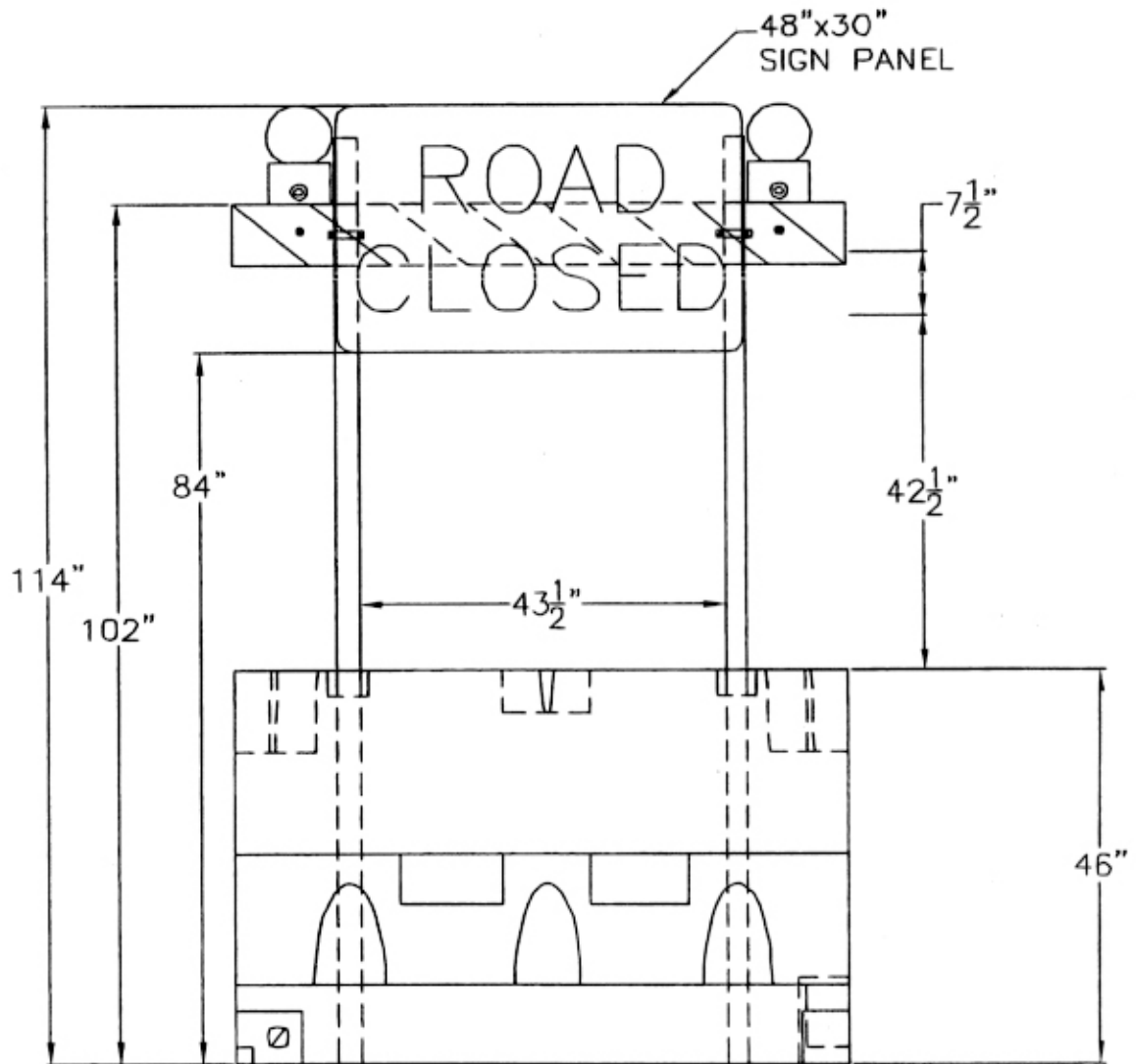
Sincerely yours,

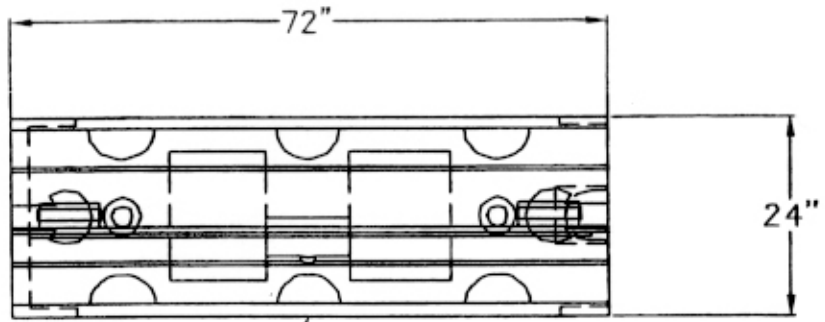
Carol H. Jacoby, P.E.  
Director, Office of Safety Design

Enclosure



YODOCK BARRIERS





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