



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

# Memorandum

Subject: **INFORMATION:** Crashworthy Work Zone Devices  
as of October 1, 2000

Date: September 13, 2000

Original signed by  
From: Frederick G. Wright, Jr.  
Program Manager, Safety

Reply to  
Attn. of: WZ-45

To: Directors of Field Services  
Division Administrators  
Federal Lands Highway Division Engineers

## **INTRODUCTION:**

This memorandum provides guidance for Category IV work zone devices: trailer mounted arrow panels, changeable message signs, and similar portable devices. It also provides supplemental information to assist in meeting the October 1, 2000, deadlines for Category II channelizing devices and Category III portable concrete barriers. The Federal Highway Administration (FHWA) memorandum "INFORMATION: Crash Tested Work Zone Traffic Control Devices," dated August 28, 1998, detailed crash tested and accepted work zone hardware. It also recognized the revised deadline dates established by the AASHTO/FHWA agreement accepted by FHWA on August 28, 1998. The AASHTO/FHWA agreement established October 1, 2000, as a date significant to Categories II, III, and IV of work zone safety hardware.

Additional FHWA guidance on crash testing of work zone traffic control devices is contained in the memorandum dated July 25, 1997, titled "Information: Identifying Acceptable Highway Safety Features." It established the 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 but with minimum instrumentation, 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.

## **CATEGORY IV DEVICES**

The AASHTO/FHWA agreement stated that time is needed to conceive and evaluate alternative measures for making these trailer-mounted devices crashworthy, to examine the use and crash histories of existing devices, and to review and, if needed, develop safer, cost-effective strategies for the placement or replacement of these devices that will provide motorists with needed information for

driving in work zones. An announcement of an implementation date was anticipated by October 1, 2000.

#### POLICY:

Category IV work zone devices should be delineated or shielded. A determination of a requirement for crash testing will be delayed until October 1, 2003. The FHWA will be considering whether to establish crash test requirements for some types of Category IV devices such as flashing arrow panels. The FHWA will continue to monitor the in-service crash performance of Category IV devices and encourage the design and testing of crashworthy versions. This memorandum also reiterates good placement practices for these devices.

#### Background:

Flashing arrow panels and changeable message signs (CMS) have been used more frequently in the last two decades because of the mileage of high speed and high volume highways undergoing maintenance or reconstruction work under traffic. They are high visibility signs that can give clear, conspicuous direction or information when used properly. However, these massive devices need to be placed within the typical highway clear zone to be most effective. Because of their location they are subject to being hit by errant vehicles. In our memorandum of July 25, 1997, we addressed the implementation of crashworthy work zone traffic control devices in category IV by concluding:

In the interim, as should be done with these devices even if proven crashworthy, they should be positioned and operated in as safe a manner as practical. This would mean, where reasonable, placing them behind crashworthy barriers or shielding them with a TMA or crash cushion. For those devices that it is decided appropriate to operate unshielded within the clear zone, they should be highly visible, both in and out of service, and be removed from the clear zone as soon as practicable after they are no longer needed.

There has yet to be a formal study of the relative risk of using arrow panels and CMS to provide guidance versus the number and severity of roadside impacts with them. While we pursue such data through industry surveys and formal research, the following guidance may be used.

#### Placement Guidance:

In order to reduce the likelihood that they will be struck by errant vehicles, placement of arrow panels and CMS should to be carefully considered out. One state's policy on CMS is repeated here as an example of the precautions that can be taken to ensure safe deployment:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
POLICY FOR USE OF CHANGEABLE MESSAGE SIGNS  
(Transmitted via memo of July 15, 1999)

### 3. SIGN PLACEMENT AND INSTALLATION

#### 3.3 DELINEATION AND POSITIVE PROTECTION

Where possible, CMS should be placed behind existing rigid or semi-rigid protection (barrier or guardrail). This will help to avoid potential injury to errant motorists, while simultaneously aiding in the protection of this valuable equipment. When CMS are required for long terms in locations where no protection exists, temporary guardrail or barrier should be considered.

Where positive protection is not feasible CMS should be delineated with drums. If a CMS is placed on a 10' shoulder, a shoulder closure should be installed. If a CMS is placed adjacent to a 4' shoulder, it should be delineated with a minimum of three drums. If possible, CMS should not be placed closer than 6' or farther than 20' from the edge of the travelway. A sign placed closer than 6' from the edge of the travelway becomes an obstruction which causes a reduction in traffic flow. A sign placed farther than 20' from the edge of the travelway becomes unreadable for many motorists.

[We thank the North Carolina DOT for their permission to reprint this policy, which is available on-line at:

<http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/docs/cmsopera.pdf>]

Arrow panels are usually less massive than CMS and often placed closer to the traveled way. The Manual on Uniform Traffic Control Devices (MUTCD) states:

For a stationary lane closing, the arrow display should be located on the shoulder at the beginning of the taper.

Where the shoulder is narrow, the arrow should be located in the closed lane. If arrow displays are used when multiple lanes are closed in tandem, the preferred position for additional arrow displays is in the closed lane at the start of the merge taper. Under various situations, such as for narrow shoulders, placement may be in the middle or at the end of the merge taper but always behind the channelizers. The panel shall be located behind any channelizing devices used to transition traffic from the closed lane.

The MUTCD Part VI shows various layouts of traffic control devices including arrow panels. Figure TA-33 shows channelizing devices deployed on the shoulder to further separate approaching traffic

from the hazard of the arrow panel itself. This shoulder taper is being proposed as an optional traffic control treatment in every scenario where an arrow panel is shown on the shoulder in the forthcoming edition of the MUTCD. From a roadside safety viewpoint it is an option that is strongly recommended.

#### Nighttime Delineation:

Both arrow panels and CMS are highly visible when in use, but have little or no target value when turned off at night. The addition of retroreflective delineation may allow drivers to see the darkened device and avoid the hazard. Trailers should be delineated on a temporary basis by placing a perimeter of channelizing devices, and on a permanent basis by affixing retroreflective material, known as “conspicuity” material, in a continuous line on the face of the trailer as seen by oncoming traffic.

#### Crash Testing:

Because of the mass of most CMS and of larger arrow panels, developing these into crashworthy devices may not be practical with current technology. If further research shows these devices to be a growing crash problem, then FHWA will take action and call for use of crashworthy CMS and arrow panels or shielding when used within the clear zone. Manufacturers who are able to redesign their hardware to be lighter and more forgiving if struck by an errant vehicle will have a distinct advantage. If the redesigned devices are shown to be crashworthy, the manufacturers will be able to market them without the need for shielding via a longitudinal barrier or crash cushion.

### **CATEGORY II DEVICES**

Work zone Type I, II, and III barricades, plastic drums with lights, vertical panels, portable sign stands and other lightweight traffic control devices purchased after October 1, 2000, need to be crash tested, and meet the evaluation criteria in NCHRP Report 350. Existing untested devices may remain in use until the end of their service life. The FHWA web site, <http://safety.fhwa.dot.gov>, lists a large number of crashworthy devices in this category. Testing by industry has concentrated on portable sign stands and barricades. Various Type I, II, and III barricades have been crash tested by industry, some with warning lights attached.

A suite of “Generic” Type I, II, and III barricades have been tested by a private manufacturer who agreed to allow the designs to be used by the industry. These barricades will be the subject of acceptance memo “WZ-54” to be issued in the near future, but are the same as those found acceptable in our letter “WZ-6” to Bent Manufacturing dated November 23, 1998. Barricades built according to those specific designs and specifications by any agency, organization, or contractor will be considered crashworthy. Because variations to the tested design are not permitted, these “generic” barricades are still considered “Category II” devices, although the supplier’s certification that the barricades conform to the tested design is similar to a “self-certification” used for Category I channelizers.

Plastic drums with warning lights have been moved to Category I because of their acceptable performance in crash tests, and because of the limited variability in the component parts. For Category I lighted drums, some variability is allowed, but the supplier must certify that the light and drum combination is crashworthy. This action is also to be covered in our memo “WZ-54” discussed above. As with other Category I devices, we believe that MUTCD Type A and C flashing and steady-burn

lights, when firmly attached to the top of the drum, do not make a drum more hazardous to an impacting vehicle. Type B high intensity lights should not be used on drums unless found to be crashworthy through testing.

The differences between crashworthy Category II traffic control devices and devices not accepted under NCHRP Report 350 are not always readily apparent. States have asked how they can be assured that Category II traffic control devices on a project comply with NCHRP Report 350. A State could require the contractor to have a process to ensure the devices used on a project either meet Report 350 criteria or that they were purchased prior to October 1, 2000.

One process that a contractor may propose is to maintain an inventory of devices showing purchase date and Report 350 status. The individual devices would carry a label for inventory control or a mark or tag to indicate their status.

There is no national cut-off date for phasing out non-Report 350 Category II devices, but individual State Departments of Transportation may choose to do so over some specified time period. Most States setting policy for this category established a cutoff date 2 or 3 years after October 1, 2000.

### **CATEGORY III DEVICES**

After October 1, 2000, temporary barriers must have a positive connection between adjacent segments that can transfer tension and moment in a vertical plane across the joint. The five designs shown in the 1996 AASHTO Roadside Design Guide (Section 9.1.1.1, “Tested and Operational Connections” numbered 1 through 5) were acceptable under Report 230 test criteria and may continue to be used on the National Highway System (NHS) as long as they remain in serviceable condition. Again, there is no national cut-off date for these designs, however individual States may choose to phase out non-Report 350 barriers during a specified time period. The remainder of the barriers shown in Section 9.1.1.1 (“Other Connections in Use”) may not be used on NHS projects advertised for bid after October 1, 2000. For all NHS projects advertised after October 1, 2002, newly-purchased concrete barriers must have been successfully crash tested to meet NCHRP Report 350 evaluation criteria. As previously noted, existing temporary barriers tested under NCHRP Report 230 can continue to be used if the contracting agency permits. To date several designs, both generic and proprietary, have been accepted under Report 350 guidelines.

### **CONTACT INFORMATION**

For information on work zone traffic control devices (Category I, II, and IV), you may contact Mr. Nicholas Artimovich at (202) 366-1331 or [nick.artimovich@fhwa.dot.gov](mailto:nick.artimovich@fhwa.dot.gov). For information on work zone category III barriers and truck mounted attenuators, contact Mr. Richard Powers at (202) 366-1320 or [richard.powers@fhwa.dot.gov](mailto:richard.powers@fhwa.dot.gov). Information on all devices tested to NCHRP Report 350 may be found on our web site at [http://safety.fhwa.dot.gov/programs/roadside\\_hardware.htm](http://safety.fhwa.dot.gov/programs/roadside_hardware.htm).

