



# National Transportation Safety Board

Washington, D. C. 20594

## Safety Recommendation

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Date: June 20, 1991

In reply refer to: H-91-15 through -21

Mr. Arthur L. Gleason, Jr., Secretary  
West Virginia Department of Transportation  
Division of Highways  
State Capitol Complex, Building 5  
Charleston, West Virginia 25305

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About 5:40 p.m. on July 26, 1990, a truck operated by Double B Auto Sales, Inc., transporting eight automobiles entered a highway work zone near Sutton, West Virginia, on northbound Interstate Highway 79 and struck the rear of a utility trailer being towed by a Dodge Aspen. The Aspen then struck the rear of a Plymouth Colt, and the Double B truck and the two automobiles traveled into the closed right lane and collided with three West Virginia Department of Transportation (WVDOT) maintenance vehicles.

Fire ensued, and the eight occupants in the Aspen and the Colt died. The Aspen, Colt, Double B truck, and two of the three WVDOT vehicles were either destroyed or severely damaged. The Double B truckdriver and one firefighter sustained minor injuries.<sup>1</sup>

Although the traffic control devices at the accident site were in substantial compliance with the Manual on Uniform Traffic Control Devices (MUTCD) and West Virginia guidelines, the Safety Board believes that improvements in work zone safety are possible and practical. The Safety Board is presently examining 52 other work zone accidents and may recommend additional remedial measures later. In the interim, the following safety improvements are being suggested as a result of the Safety Board's investigation of this accident.

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<sup>1</sup>For more detailed information, read Highway Accident Report--"Multiple Vehicle Collision and Fire in a Work Zone on Interstate Highway 79 near Sutton, West Virginia, July 26, 1990" (NTSB/HAR-91/01).

A Federal Highway Administration (FHWA) study conducted in 1982<sup>2</sup> showed that cones perform as well as any device for long detection and adequate lane change distances during the day. However, during the day and at night, drums are highly visible and detectable from long distances. Drums can also promote lane changes farther up the taper and prompt motorists to reduce speeds.

The MUTCD points out that drums give the appearance of a formidable obstacle and, therefore, command the respect of drivers. One study on drivers' attitudes toward construction zones noted that "unless the driver perceives himself in danger, he will not change his driving pattern."<sup>3</sup> The greater size of the drum or barrel, compared to the cone, may increase perception of danger and help reduce speeds. The Safety Board concludes that if drums had been used instead of cones, the Double B truckdriver would have had better advance visual warning of the work zone and may have slowed his speed in time to reduce the severity of, or possibly avoid, the collision.

The flagger at the accident site was positioned 200 to 210 feet before the bump. The MUTCD states, "Flagger stations shall be located far enough in advance of the work site, so that approaching traffic will have sufficient distance to reduce speed before entering the project. This distance is related to approach speed and physical conditions at the site; however, 200 to 300 feet is desirable." In addition, the WVDOT manual recommends that the flagger station should be in advance of the work site so that the "approaching traffic will have sufficient distance to reduce speed before entering the project . . . 500 feet is desirable." The placement of the flagger complied with MUTCD guidelines, but not with the WVDOT manual.

The FHWA is currently revising the MUTCD pertaining to work zone flagger placement. The Safety Board believes that the MUTCD should provide for flagger placement based on actual vehicle approach speed, pavement conditions, commercial vehicle deceleration rates, and the "design driver" concept. This concept assumes that some drivers traveling through the work zone may be impaired due to a medical condition or the use of alcohol or other drugs.

Both the MUTCD and WVDOT manuals also state that the flagger should be in a position to warn workers of approaching danger, such as out-of-control vehicles. However, the greater the distance of flagger placement ahead of the actual work area, the more difficult it becomes to warn workers in the zone of an erratic vehicle's approach. The Safety Board concludes that the MUTCD and WVDOT manuals should also be revised to encourage the use of audible devices, such as warning horns, by flaggers to warn highway workers of the approach of erratic vehicles. The sounding of such a device may also serve to alert an inattentive driver.

The MUTCD discourages reductions of speed limits through work zones and notes the need to consider vehicular speed differentials. Nonetheless, the MUTCD does point out that drivers slow when they perceive a need to do so. Drivers at the accident site observed the bump or other cars bouncing through the milled section and slowed, possibly because they perceived the need to do so. The traffic counts indicated that 5,000 to 7,000 vehicles a day traveled through the accident site work

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<sup>2</sup>"Synthesis of Safety Research Related to Traffic Control and Roadway Elements," vol. 2, FHWA-TS-82-233, December 1982.

<sup>3</sup>"Study Concerning Driver's Attitudes Toward Construction Zones," for Deere and Company, Moline, Illinois, by Marketing Consultants, Inc., Elkhart, Indiana, April 30, 1990.

zone, and the available evidence shows that alert drivers who heeded the speed reduction signs traveled through without incident. When the Double B truckdriver did not perceive a need to slow, he continued at a high speed and created a dangerous speed differential between his truck and the other vehicles in the zone.

The Traffic Control Devices Handbook<sup>4</sup> states that in reducing travel speeds in work zones, when a speed reduction greater than 10 mph is unavoidable, the transition to the lower limit should be made in increments of no more than 10 mph. Since the speed limit approaching the zone was 65 mph, a 55 mph speed should have been the first speed reduction encountered by a motorist in order to be in compliance with the above guideline.

Although the ideal is a work zone with no speed reduction and any speed reduction automatically creates a potentially dangerous speed differential, elimination of speed reductions in work zones is an unrealistic expectation. However, in those work zones in which the approach speed is 65 mph and the speed limit must be reduced to less than 55 mph, the Safety Board believes that an initial speed reduction of 10 mph, followed by another 10 mph reduction after an appropriate interval, may be a more effective approach than the single 15-mph reduction at the accident site.

A gradual reduction of the speed limit would have afforded the Double B truckdriver more opportunity to note the need for reducing speed and may have led him to reduce the speed differential between his and the other involved vehicles, thereby either preventing the accident or at least substantially reducing the impact severity.

In 1987, the American Association of State Highway and Transportation Officials released a work zone study<sup>5</sup> that stated, "Special signing, lane delineation, and speed control measures may be required" for work zones. The Minnesota Department of Transportation is currently using a 7- by 10-foot speed limit sign in moving maintenance projects and reports good compliance with reduced speed limits through the zones. The Safety Board believes that oversized speed limit signs in work zones may prompt inattentive drivers, such as the Double B truckdriver, to slow their vehicles.

Driver reactions to the bump at the north end of the bridge varied as they observed other vehicles traveling over it. The truckdriver traveling in front of the Colt reported that he slowed to about 35 mph as he approached the bump. Safety Board investigators saw other vehicles at the site slow to 30 mph or less. The slowing of vehicles to a speed below the reduced speed limit exacerbated the speed differential between the Double B truck and the other involved vehicles. The decrease in speed increased the rate of closure of the speeding truck.

The Safety Board believes that the approaching drivers' perception of pavement irregularities could be eliminated by milling one lane at a time and doing the final

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<sup>4</sup>This manual was published by FHWA in 1983 to augment the MUTCD. It does not establish policies or standards. The handbook offers guidelines for implementing the standards and applications contained in the MUTCD.

<sup>5</sup>"Summary of Work Zone Accidents," American Association of State Highway and Transportation Officials, Standing Committee on Highway Traffic Safety, April 1987.

resurfacing of the milled area before reopening the lane. If this procedure had been followed, it may have reduced the speed differential of the vehicles, thereby giving the inattentive Double B truckdriver additional time to perceive slowing traffic ahead and properly react to it.

The number of accidents that occur in work zones indicates the need for a nationwide educational program on the dangers of work zones. California's "Give 'Em a BRAKE" program attempts to provide work zone safety information. Although its original emphasis was on worker safety, California has recognized the need for programs directed toward motorist safety and has developed videos and educational programs for high schools. About 28 States have adopted programs similar to California's. The Safety Board believes that West Virginia should adopt and implement a program similar to California's to educate the motoring public of the hazards of highway work zones.

Because West Virginia accident data indicate large trucks are overrepresented in work zone accidents, special emphasis should be directed toward educating commercial vehicle drivers of the hazards of highway work zones. This special emphasis area could become part of the "Give 'Em a BRAKE" program.

Therefore, the National Transportation Safety Board recommends that the West Virginia Department of Transportation:

Use drums instead of traffic cones on all interstate highway work zones. (Class II, Priority Action)(H-91-15)

Place flaggers far enough in advance of work zones to accommodate longer stopping and slowing distances for heavy trucks. (Class II, Priority Action)(H-91-16)

Provide audible warning devices, such as horns, to all flaggers posted in work zones. (Class II, Priority Action)(H-91-17)

Establish policies that set speed limit reductions at 10 mph increments in work zones in which the difference between the approach speed and the speed limit in the zone is more than 10 mph. (Class II, Priority Action)(H-91-18)

Require the use of oversized signs to encourage compliance with reduced speed limits in work zones. (Class II, Priority Action)(H-91-19)

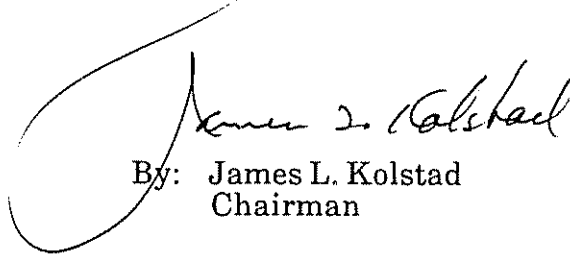
Restore the surface of a required lane closure before reopening the lane to prevent large approach speed differentials. (Class II, Priority Action)(H-91-20)

Adopt and implement a program similar to California's "Give 'Em a BRAKE" program. (Class II, Priority Action)(H-91-21)

Also, the Safety Board issued Safety Recommendations H-91-14 to the Double B Auto Sales, Inc.; H-91-22 through -25 to the State of New York; H-91-26 to the National Automobile Transporter's Association; and H-91-27 through -31 to the Federal Highway Administration.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations H-91-15 through -21 in your reply.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, LAUBER, BURNETT, and HART, Members, concurred in these recommendations.

A handwritten signature in cursive script, reading "James L. Kolstad". The signature is written in dark ink and is positioned above the typed name and title.

By: James L. Kolstad  
Chairman