



National Transportation Safety Board

Washington, D.C. 20594-2000

Safety Recommendation

Date: November 23, 2005

In reply refer to: H-05-31 and -32

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The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the selection and use of high-performance median barriers and corresponding revisions to the *Roadside Design Guide*. The recommendations are derived from the Safety Board's investigation of two January 17, 2003, accidents in Fairfield, Connecticut, and are consistent with the evidence we found and the analysis we performed.¹ As a result of this investigation, the Safety Board has issued six safety recommendations, two of which are addressed to the American Association of State Highway and Transportation Officials (AASHTO). Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

On Interstate 95 (I-95) near Fairfield, Connecticut, two consecutive accidents occurred within 11 minutes in the early morning hours of January 17, 2003. About 4:50 a.m., a 1996 Freightliner tractor flatbed semitrailer, loaded with five portable compressor units, was involved in a nonfatal multivehicle accident. The truck was traveling in a work zone on I-95 north, near milepost (MP) 26.6, at a driver-estimated speed of 50 mph, when it slid out of control approximately 1,150 feet south of the exit 24 southbound off-ramp. The vehicle entered the median, overturned and overrode the portable concrete barrier, and collided with a southbound 1997 Dodge Avenger sedan. A southbound 2001 Freightliner tractor/refrigerated trailer combination unit struck the Dodge sedan and then struck the 1996 Freightliner tractor. The three

¹ For more information, read National Transportation Safety Board, *Multiple Vehicle Collision on Interstate 95, Fairfield, Connecticut, January 17, 2003*, Highway Accident Report NTSB/HAR-05/03 (Washington, DC: NTSB, 2005).

vehicles came to rest blocking the southbound lanes of the highway. During the accident sequence, the flatbed semitrailer separated from the 1996 Freightliner tractor. The semitrailer came to rest perpendicular to the roadway, straddling the portable concrete barrier and partially obstructing the left lane of I-95 north.

At 5:01 a.m., a 1999 Chevrolet Tahoe sport utility vehicle—occupied by nine students from Yale University and traveling north in the left lane—collided with and underrode the left side corner of the 1996 Freightliner tractor flatbed semitrailer. Following the impact, the Chevrolet disengaged from the semitrailer and entered the median, skidded along the concrete barrier, and came to rest about 450 feet northeast of the semitrailer. The driver and three passengers in the Chevrolet were fatally injured. The surviving occupants were seriously injured.

Witnesses reported that at the time of the accidents, light snow was falling, the roads were wet and icy, and snow covered the roadway shoulders.

The National Transportation Safety Board determined that the probable cause of the 4:50 a.m. accident was the 1996 Freightliner's loss of lateral stability, probably due to the operator driving too fast for conditions and to the presence of black ice on the roadway. Contributing to the accident were the inadequate roadway treatment provided by the Connecticut Department of Transportation in response to inclement weather and also its failure to provide a median barrier capable of preventing crossovers by heavy vehicles. The probable cause of the 5:01 a.m. accident was the failure of the Chevrolet driver to identify and avoid the flatbed semitrailer due to fatigue, in conjunction with the distraction from the median crossover accident in the southbound lanes.

When the driver of the 1996 Freightliner tractor flatbed semitrailer lost control of his vehicle near MP 26.6, the truck entered into a counterclockwise skid toward the unpaved and depressed highway median. It collided with and overrode a 32-inch-high portable concrete barrier system. The collision overturned and laterally deflected five barrier segments toward the south and visibly cracked one segment. The Safety Board examined issues associated with the type of barrier used at the accident site and its placement on an unpaved surface.

In 2002, heavy trucks accounted for between 26 and 28 percent of the 125,300 vehicles that traveled daily on the accident segment of I-95. However, the 32-inch-high standard portable concrete median barrier in use at the accident site was designed only to redirect cars and private-use trucks under 4,400 pounds. Safety Board investigators calculated that the 1996 Freightliner, including the compressors and the flatbed semitrailer, weighed over 42,000 pounds and had a center of gravity approximately 4 inches higher than the top of the median barrier. In addition:

- The cross-slope of the depressed median placed the truck at an angle, which increased its propensity to roll toward the barrier, creating an unstable condition.
- The unembedded barrier allowed the truck to tip and override it.

High-performance median barriers at least 42 inches high are heavier than standard portable barriers and are designed to redirect heavy trucks, such as the 1996 Freightliner. These

barriers exceed the center-of-gravity height of heavy trucks, making them less likely to overturn or be overridden during a collision, such as that which occurred in Fairfield.

The AASHTO *Roadside Design Guide* provides general information on standard and high-performance median barriers, but it does not include specific warrants for deciding when high-performance barriers are applicable (such as accident history, roadway geometry, average daily traffic volume, or percentage of heavy truck traffic). As a result, States may not be aware of the safety benefits of high-performance barriers. The Safety Board concludes that the *Roadside Design Guide* lacks specific guidance on the use of high-performance barriers, making it difficult for State transportation agencies to determine the circumstances, such as those present in the Fairfield accidents, in which such barriers should be used. The Safety Board believes that AASHTO should establish warrants in the *Roadside Design Guide* regarding the selection and use of high-performance barriers, including 42- and 50-inch concrete barriers, that are capable of redirecting heavy trucks.

The Safety Board previously addressed the incongruity between heavy trucks and roadside barrier design guidelines in the White Plains, New York, accident investigation report, in which it recommended that the Federal Highway Administration (FHWA) “require that highway geometric design and traffic operations of the National Highway System be based on heavy-truck operating characteristics” (Safety Recommendation H-95-32).²

Since the issuance of this recommendation, crash tests have been conducted on high-performance permanent concrete bridge railings 42 inches or higher using a 79,400-pound van-type tractor-trailer and an 80,120-pound tanker-type tractor-trailer. The FHWA issued a memorandum to its regional administrators to encourage States to use these barriers on urban freeways, on other freeway systems with significant volumes of heavy vehicles, on sharp curves, on interchange ramps with lower design speeds, and for shielding bridge piers susceptible to damage from heavy-vehicle impacts.

The FHWA requires that barriers used on the National Highway System be successfully tested in accordance with the crash test guidelines specified by the National Cooperative Highway Research Program (NCHRP).³ The Safety Board welcomes the progress that has been made in the testing and promotion of permanent high-performance barrier systems. However, specific warrants on the use of portable barrier systems are still lacking, and the Fairfield accidents demonstrate the need for expanded impact test scenarios.

In the Fairfield accidents, the portable concrete median barrier was not anchored to the ground and was located on an unpaved surface. Even though contractors commonly place portable concrete barriers on unpaved surfaces for the short term to complete highway construction projects, no impact tests have been carried out to measure the effectiveness of this practice. Moreover, no impact tests have been conducted on any type of portable

² See National Transportation Safety Board, *Propane Truck Collision With Bridge Column and Fire, White Plains, New York, July 27, 1994*, Highway Accident Report NTSB/HAR-95/02 (Washington, DC: NTSB, 1995).

³ See National Cooperative Highway Research Program, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*, NCHRP Report 350 (Washington, DC: Transportation Research Board, National Research Council, 1993).

high-performance barrier on unpaved surfaces. The AASHTO *Roadside Design Guide* gives little guidance on the placement of portable concrete median barriers on unpaved surfaces.

The mass of a portable concrete barrier and the frictional properties between it and the underlying surface can be critical in preventing movement or overturn. But until impact testing is conducted on barriers placed on unpaved surfaces, it will be difficult to quantify the manner in which the frictional properties or slopes of unpaved surfaces affect barrier performance. The Safety Board concludes that the current Federal impact testing parameters for portable concrete median barriers are inadequate because they do not account for the use of the barriers on unpaved surfaces. The Safety Board believes that upon completion of FHWA testing of standard and high-performance portable concrete median barriers on unpaved surfaces, AASHTO should provide clear guidance in the *Roadside Design Guide* on the placement of portable concrete median barriers on unpaved surfaces.

The National Transportation Safety Board therefore makes the following recommendations to the American Association of State Highway and Transportation Officials:

Establish warrants in the *Roadside Design Guide* regarding the selection and use of high-performance barriers, including 42- and 50-inch-high concrete barriers, that are capable of redirecting heavy trucks. (H-05-31)

Upon completion of Federal Highway Administration testing of standard and high-performance portable concrete median barriers on unpaved surfaces, provide clear guidance in the *Roadside Design Guide* on the placement of portable concrete median barriers on unpaved surfaces. (H-05-32)

The Safety Board also issued safety recommendations to the Federal Highway Administration and to the Connecticut Department of Transportation. In addition, the Safety Board reiterated a recommendation to the Governor and legislative leaders of Connecticut.

In your response to this letter, please refer to Safety Recommendations H-05-31 and H-05-32. If you need additional information, you may call (202) 314-6177.

Acting Chairman ROSENKER and Members ENGLEMAN CONNERS and HERSMAN concurred in these recommendations.

[Original Signed]

By: Mark V. Rosenker
Acting Chairman