U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION:** Commercial Passenger Vehicle Crashes Involving Roadside Point Hazards

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From: Tony Furst
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In Reply Refer To:
HSST

To: Division Administrators
Safety Field
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The purpose of this memorandum is to provide information concerning the safety issues associated with commercial passenger vehicle (CPV) crashes involving roadside point hazards, the associated potential for catastrophic loss of life, and the use of high performance level barriers to address the safety issues. Please share this information with your respective State DOT and encourage them to consider adding guidance on the use of higher performance level barriers (Test Level 4, 5, or 6) to their design policies or procedures that not only considers large trucks and tractor-trailer combinations, but also CPVs. While roadside crashes involving CPVs such as motorcoaches are rare, the proper selection of barriers along corridors that have high volumes of large CPV traffic may prevent future tragedies.

Background

The National Transportation Safety Board (NTSB) investigated a crash which occurred on March 12, 2011, in New York City. At about 5:38 a.m., a 56-passenger motorcoach was traveling southbound on Interstate 95 and departed from the travel lanes to the right, driving over the rumble strips on the right shoulder edge, crossing over the 10-foot-wide paved shoulder, striking a strong-post W-beam guardrail, and traveling about 480 feet alongside and on the guardrail before finally overturning 90° onto its right side and flattening the guardrail.

The front of the vehicle subsequently collided with an overhead highway signpost consisting of two vertical 8-inch-diameter steel tubular poles linked by cross-beam diagonal metal supports. After the motorcoach struck the signpost, the two poles entered the passenger compartment along the base of the passenger windows as the vehicle slid forward. The impact resulted in the roof panel being torn from the bus body for almost the entire length of the bus. As a result of this accident, 15 passengers were killed, 17 passengers received serious-to-minor injuries, and the bus driver received minor injuries.

The NTSB believes that the substantial volume of CPV traffic on this section of I-95 should have been considered when locating the overhead sign support and in selecting the

type of roadside barrier that was installed to shield it. While the likelihood of impact by a large CPV at any one location is slight, the potential for loss of lives in a run-off-road crash should be considered.

Discussion

The strong-post W-beam guardrail shielding the support of the overhead sign bridge at the Bronx crash location was the G4(1S) system with steel posts and steel offset blocks with the top of the rail mounted at approximately 28 inches. Because of the steel blockout, this barrier only qualifies as a Test Level 2 barrier under NCHRP Report 350. It is not expected to redirect large vehicles.

The NTSB subsequently made the following recommendation:

> Until barrier testing has been completed, selection guidelines have been developed, and barrier guidance has been updated in the American Association of State Highway and Transportation Officials Roadside Design Guide, provide information to state transportation agencies about (1) the unique considerations associated with commercial passenger vehicle "run-off-the-road" accidents involving point hazards, and (2) the associated potential for catastrophic loss of life. (H-12-24)

The NTSB has provided other recommendations on barrier selection concerning buses and trucks including:

- H-12-23: Establish performance and selection guidelines for state transportation agencies to use in developing objective warrants for high-performance barriers applicable to new construction and rehabilitation projects.
- H-11-23: Define the criteria for median barrier selection, including heavy vehicle traffic volume.
- H-11-21: Establish warrants and implementation criteria for the selection of Test Level Four and Test Level Five median barriers.
- H-09-17: Develop objective warrants for high-performance Test Level Four, Five, and Six bridge railings applicable to new construction and rehabilitation projects.

The AASHTO Roadside Design Guide (RDG) 4th Edition states, "...in certain locations it may be appropriate to utilize a higher performance barrier capable of redirecting large vehicles such as tractor-trailer combination trucks. Although objective warrants for the use of higher performance traffic barriers do not presently exist, subjective factors most often considered for new construction or safety upgrading include:

- High percentage of heavy vehicles in the traffic stream or a high concentration of trucks at an interchange
- Hazardous materials routes
- Adverse geometrics, such as sharp curvature, which are often combined with limited sight distance, or long downhill grades with horizontal curvature
- Severe consequences associated with penetration of a barrier by a large vehicle, such as multi-level interchange ramps, highly sensitive environmental areas, or critical highway components (nationally significant bridges or tunnels)."

As noted in the RDG, current guidelines on barrier test levels for redirecting larger vehicles are minimal, especially with respect to large CPVs. Crash testing of higher

performance barriers has been conducted with trucks and tractor-trailer combinations under NCHRP Report 350 and the AASHTO Manual for Assessing Safety Hardware. AASHTO has also noted that there are currently no criteria for crash testing barriers with buses, although Test Level 4 and Test Level 5 barriers increase the likelihood of redirection and a safer outcome.

Guidance for high performance barriers

NCHRP Report 638 "Guidelines for Guardrail Implementation" includes route-specific selection criteria for barriers up to Test Level 5 based on cost/benefit ratio, terrain type, highway functional class, and size of clear zone, however there is no further breakdown by vehicle types or speeds. As an example, the report recommends that Test Level 5 barriers are warranted at a benefit/cost ratio of 2 when the following conditions are met:

- Highway Functional Class is Freeway
- Clear zone is wide (18 feet or greater)
- Traffic volume is greater than 25,000 ADT.

The following National Cooperative Highway Research Program projects are underway which we expect will provide additional guidance for barrier selection:

- 17-44 "Factors Contributing to Median Encroachments and Cross-Median Crashes"
- 17-55 "Guidelines for Slope Traversability"
- 22-12(03) "Recommended Guidelines for the Selection of Test Levels 2 through 5 Bridge Rails"
- 22-22 "Placement of Traffic Barriers on Roadside and Median Slopes"
- 22-27 "Roadside Safety Analysis Program (RSAP)".

As these studies are completed, we will work with AASHTO to provide more objective guidance that the States can use to refine their selection criteria for high performance level barriers.