



109# H-497
H-469

National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: July 22, 1987

In reply refer to: H-87-42

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Executive Director
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On February 7, 1986, a 1982 schoolbus was southbound on I-294 (Illinois Tollway) when it swerved left and struck a 79-foot-long section of portable concrete barrier. Seven sections of 10-foot barrier and one section of barrier 8 feet 7 inches long had been placed between permanent concrete median barriers. Portable barrier sections were used so that they could be removed while detouring traffic across the median. The portable barriers were not anchored in place, nor were their ends attached to the permanent barrier. The sections of the portable barrier were joined to each other with a pin and loop connection. The impact of the schoolbus caused the barrier to deflect and, as the bus moved forward, expose the blunt end of the permanent barrier. The blunt end penetrated the bus, ripped open its side, and caused serious injury to four children seated on the left side. After the impact with the end of the permanent barrier, the bus was deflected into the middle lane of the three-lane southbound roadway, where it was struck by a police vehicle.

Crash tests have shown that a pin and loop connection allows the sections to deflect under impact. ^{1/} Since sections were not fixed, lateral movement relative to the fixed barrier could be expected.

After the accident, Illinois Tollway Authority maintenance crews realigned the portable barriers and installed splice plates between the stems of the portable and fixed barriers. The plates were fabricated of 1/2-inch-thick steel of various dimensions and connected with bolts of two different sizes. The splice was not a standard detail but a homemade fabrication which attempted to prevent future displacements between the portable end sections and the fixed barriers. The splice does not appear to be able to transmit sufficient moment, shear, or torsion across the joint from expected impacts and, therefore, deflection of the portable end section would be expected.

^{1/} Report No. FHWA/RD-86/092, "Barriers in Construction Zones," April 1986.

The most widely used connector between such portable barriers is the pin and loop system. However, in using this connector system, significant deflection occurs before restraining moments develop between the two-barrier section. These restraining moments would resist the barrier's deflection. Other types of connectors may better control deflection, but to reduce it to a very small amount, perhaps only a few inches, a fairly rigid shear connection between the portable barrier and the ground surface is required.

There is little guidance on how a connection should be made. However, the Federal Highway Administration (FHWA) has transmitted a memorandum on the subject "Portable Concrete Barrier Connection Systems" over the signatures of the Directors of the Offices of Highway Operations and Traffic Operations, addressed to all Regional Federal Highway Administrators and dated November 20, 1985, that addresses the problem of improper connections between two sections of portable concrete barriers. The Safety Board realizes that the specific focus of the FHWA memorandum is on portable-to-portable section connections for use in construction and work areas; however, the concepts described would provide more safety on a portable-to-permanent connection than the bolted steel plate connection installed at the accident site after the accident.

A separate letter with Safety Recommendations H-87-43 and H-87-44 is being sent to the FHWA to identify and evaluate the portable barrier connection systems for use between portable and permanent barriers and to issue a technical advisory concerning the use on some connection systems.

In the meantime, the National Transportation Safety Board recommends that the Illinois Tollway Authority:

Apply the engineering concepts of the November 20, 1985, Federal Highway Administration memorandum on Portable Concrete Barrier Connection Systems to the portable-to-permanent connection locations under the jurisdiction of the Illinois Tollway Authority. (Class II, Priority Action) (H-87-42)

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 actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation H-87-42 in your reply.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, NALL, and KOLSTAD, Members, concurred in this recommendation.

By: 
Chairman