



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** February 24, 1998

**In reply refer to:** H-98-2

Honorable Gordon J. Linton  
Administrator  
Federal Transit Administration  
400 7<sup>th</sup> Street, SW  
Washington, D.C. 20590

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About 9:15 a.m. on June 11, 1997, a 1981 General Motors Corporation transit bus collided with seven pedestrians at a "park and ride" transit facility in Normandy, Missouri. The bus was being operated by a driver trainee who had just completed a routine stop at the station. After allowing the passengers to debark from the bus, the driver trainee began to move the bus forward to provide clearance for another bus to pass. The driver trainee, who was reportedly unable to stop the bus, allowed it to surmount the curb and continue onto the station platform. The resulting encroachment onto the platform resulted in the deaths of four pedestrians and injuries to three others.<sup>1</sup>

The National Transportation Safety Board determined that the probable cause of this accident was the driver trainee's misapplication of the accelerator, resulting in the bus's over-ride of the curb and travel onto the occupied pedestrian platform. Contributing to the deaths and injuries was the absence of effective positive separation between the transit facility roadway and the station's pedestrian platform.

While investigating this accident, the Safety Board found that the accident's most significant element was not its cause but its severity. In many instances, a similar momentary error on the part of a busdriver might have had far less serious consequences — such as damage to the bus and other property, slight injuries, or both. In this case, however, four people died and two suffered serious injuries. The crucial variable was the presence of unprotected pedestrians in the bus's path. Therefore, the Safety Board considered whether and how the effects of the accident could have been mitigated.

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<sup>1</sup>For more information, read Highway Accident Summary Report — *Bus Collision with Pedestrians, Normandy, Missouri, June 11, 1997* (NTSB/HAR-98/01/SUM).

The Bi-State Development Agency (BSDA) MetroLink line on which this accident occurred has a total of 18 stations, 4 of which are designed with saw-tooth bus parking bays similar to the accident location. A review of the BSDA's facility design requirements revealed that, during design development, attention was focused on avoiding conflicts and crossovers between buses and other vehicular traffic, as well as between buses and pedestrian traffic. The BSDA design specifications provided for, among other things, "standard saw-tooth bus bay" parking spaces and walkways to be paved and raised approximately 6 inches above the adjacent road surface.

No provisions were made for the construction of barricades or other devices to prevent vehicular traffic from entering areas of pedestrian congregation. The only barrier planned to be between the bus parking spaces and the pedestrian platforms was a raised 6-inch-high concrete curb. As a consequence of these design requirements and specifications, the facilities incorporating the saw-tooth parking bays were laid out in such a way that when buses pull into the parking spaces, their forward motion is directed toward areas where pedestrians tend to congregate.

According to the BSDA's deputy executive director and general manager of engineering and facilities management, the facility where the accident occurred was designed and built in accordance with guidelines common to the transit industry. The saw-tooth design is intended to facilitate station access by the passenger buses and minimize interference from pedestrian traffic. In 1981, the Urban Mass Transportation Administration (UMTA) publicized the design specifications for saw-tooth parking bays and illustrated their efficiency in providing parking for multiple buses. Additionally, the American Association of State Highway and Transportation Officials (AASHTO) guideline for park and ride facilities<sup>2</sup> states:

...where more than two buses are expected to be using a facility at one time, the saw-tooth arrangement is generally preferable, because it is easier for buses to bypass a waiting bus.

Although officials at neither the FTA nor the American Public Transit Association could estimate the percentage of stations using the saw-tooth configuration, the Safety Board is aware that station designs similar to the accident location have been used nationwide for many years. A consulting engineer employed by the BSDA told investigators that the design has been commonly used throughout his 40-year career.

While the Safety Board recognizes the efficiency of the saw-tooth station design for multiple bus parking, it is concerned that neither the design specifications followed by the BSDA nor the guidelines provided by UMTA or AASHTO include any type of positive separation that could prevent a defective or poorly driven bus from encroaching onto the pedestrian platform in normal (low-speed) operating conditions for parking lot facilities. A further selection from the AASHTO guideline for park and ride facilities states that:

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<sup>2</sup>AASHTO, *A Policy on Geometric Design of Highways and Streets*, 1994 edition.

...the area delineating the passenger refuge area should be curbed in order to reduce the height between the ground and the first bus step and reduce encroachment by buses on the passenger areas.

The Normandy station was designed in accordance with this guideline, which calls for a curb as the only separating device. The Safety Board considers that design guidelines should specify a positive separation barrier between the bus parking bay and the pedestrian platform sufficient to stop a bus operating under normal parking area speed conditions from progressing into the pedestrian area. The circumstances of the Normandy accident clearly illustrate that the curb-only separation cannot contain the forward movement of a large bus. Consequently, the Safety Board concluded that the current design guidelines for saw-tooth parking bay configurations commonly followed by the transit industry fail to provide adequate pedestrian safety.

Following this accident, the BSDA took immediate action to address the safety problem posed by inadequate protection between bus parking and pedestrian areas. The BSDA installed barriers at all its facilities with saw-tooth parking bay layouts. Bollards designed to prevent low-speed overruns have been placed at the forward ends of all saw-tooth bus parking spaces at each of the four stations with saw-tooth bus bays. Such bollards will be included in the designs of future BSDA stations. Safety Board investigators examined these bollard installations and found them adequate to have stopped the bus involved in this accident from reaching the pedestrian area. Therefore, the Safety Board concluded that, had the positive separation barriers now installed at the Normandy station been in place at the time of the accident, the collision with the pedestrians would not have occurred.


Therefore, the National Transportation Safety Board makes the following safety recommendation to the Federal Transit Administration:

Ensure, in cooperation with the Federal Highway Administration, the American Association of State Highway and Transportation Officials, the American Public Transit Association, and the Community Transportation Association of America, that future transit facility designs incorporating "saw-tooth" bus parking bays, or other types of designs that direct errant vehicular traffic toward pedestrian-occupied areas, include provisions for positive separation between the roadway and pedestrian areas sufficient to stop a bus operating under normal parking area speed conditions from progressing into the pedestrian area. (H-98-2)

The Safety Board also issued Safety Recommendations H-98-1 to the Federal Highway Administration, H-98-3 to the American Association of State Highway and Transportation Officials, H-98-4 and -5 to the American Public Transit Association, and H-98-6 and -7 to the Community Transportation Association of America.

Please refer to Safety Recommendation H-98-2 in your reply. If you need additional information, you may call (817) 652-7843.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

A handwritten signature in black ink, appearing to read "J. Hall". The signature is written in a cursive style with a large initial "J" and a long horizontal stroke extending to the right.

By: Jim Hall  
Chairman