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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: NOV 14 1996

In Reply Refer To: I-96-6 through -11

Honorable Federico Peña
Secretary
U.S. Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

On October 25, 1995, at 7:10 a.m., the Northeast Illinois Regional Commuter Railroad Corporation (d/b/a Metropolitan Rail) express commuter train 624 struck the rear left side of a stopped Transportation Joint Agreement School District 47/155 school bus at a railroad/highway grade crossing in Fox River Grove, Illinois.¹ After the school bus crossed the railroad tracks and stopped for a red traffic signal, its rear extended about 3 feet into the path of the train. Of the 35 school bus passengers, 7, 24, and 4 passengers sustained fatal, serious to minor, and no injuries, respectively; the busdriver received minor injuries. The 120 passengers and 3 crewmembers aboard the commuter train were uninjured.

Based upon review of the train event recorder data, railroad and highway signal system design and calculations, postaccident testing, and witness statements, the National Transportation Safety Board considers that the following event sequence likely occurred immediately prior to the accident. Train 624 approached the railroad/highway grade crossing on a clear signal. Traveling 64 mph, it crossed the narrow band shunt, which was 3,080 feet from the crossing, 32 seconds² before impact. Then, 24 seconds before collision, the railroad system signaled the highway system of the approach of the train, which was 2,400 feet from the crossing and traveling 66 mph. The preemption cycle began 1 second later for the highway traffic signal system; about the same time, the train engineer first saw the school bus on the grade crossing. Still traveling 66 mph, the train was 2,300 feet from the crossing. The pedestrian phase in the highway traffic signal system ended 12 seconds before impact; the train was then traveling 69 mph and was 1,200 feet from the crossing. Ten seconds before the collision, the train engineer began sounding the horn as well as making a throttle reduction to idle and a full-service brake

¹For more information, see Highway/Railroad Accident Report—*Collision of Northeast Illinois Regional Commuter Railroad Corporation (METRA) Train and Transportation Joint Agreement School District 47/155 School Bus at Railroad/Highway Grade Crossing in Fox River Grove, Illinois, on October 25, 1995* (NTSB/HAR-96/02).

²Approximate values are used for this discussion because timing values can fluctuate within railroad and highway signal systems as designed.

application; at this point, the train was still traveling 69 mph and was 1,000 feet from the crossing. The U.S. Route 14 (US 14) yellow indication and the intersection red indication ended 7 ½ and 6 seconds, respectively, before impact. Concurrently, the train was traveling 67 mph and was 600 feet from the crossing when a green indication would have been displayed for Algonquin Road. The engineer placed the train into emergency braking 500 feet from the collision site and 5 seconds before the collision.

The school bus had stopped on the south side of the tracks, proceeded across the tracks, and stopped at US 14 for a red signal indication. The crossing warning devices activated with the lights flashing, the bell sounding, and the gates descending. The passengers in the rear of the bus initially joked about the northern crossing gate descending and striking the school bus on its left side near the 10th window. Then, seeing the train, they yelled warnings about its approach to the busdriver. Traveling about 60 mph, the train struck the bus at a 75-degree angle in the left-side rear and penetrated as much as 3 1/3 feet into the passenger area. The bolts that secured the bus body and chassis sheared; the body and chassis separated. The bus body rotated counterclockwise, scraped the ground, struck and knocked down a traffic light stanchion, and came to rest about 195 degrees from its original orientation. The chassis rotated counterclockwise also, struck the side of the train, and came to rest in the road approximately 45 degrees from its original orientation.

The Safety Board considers that the highway traffic signal sequence may have taken 21 seconds and would only apply when the light for US 14 displayed a green indication within 3 seconds of the preempt signal. However, the school busdriver indicated that the traffic signal displayed a red indication as she approached the crossing and proceeded slowly across the railroad tracks. The train engineer first observed the school bus on the crossing about the same time that the preempt signal was transmitted to the highway signal system. The traffic signal for northbound Algonquin Road displayed a red indication for 3 seconds or more; therefore, US 14 would have had a green indication before the preempt signal. The occurrence of a 21-second traffic signal sequence at the time of the accident is unlikely. The Safety Board determined that the traffic signal had an 18-second cycle before the green indication for northbound Algonquin Road displayed and that the US 14 traffic signal displayed a red indication for several seconds before the collision.

The investigation further determined that on October 11, 1995, the Union Pacific Railroad Company (UP) reset the thumb wheel³ at the railroad/highway crossing in question from 30 to 25 seconds but did not notify the Illinois Department of Transportation (IDOT) of the change. IDOT and the railroad exchanged various documents before the accident that included information about the warning times of the railroad signal system. After the accident, IDOT reviewed the documents and thought that they had been given 30 and 25 seconds of warning time, respectively, before and after October 11, 1995. During this review, the most misunderstood term was "warning time." IDOT personnel had concluded from the construction

³Warning time switch for a crossing signal.

prints, numerous letters and memos, and thumb wheel setting, that a minimum warning time of either 25 or 30 seconds was provided between the time the crossing warning devices were activated and a train reached the crossing.

The warning time provided by the railroad signal system does not always equate to the thumb wheel setting (25 seconds at the time of the accident). Postaccident testing found that the warning time may have been less than 25 seconds, although never less than 20 seconds, as required. Although IDOT acknowledged that it understood the railroad terminology for "preempt" and "interconnect," it did not understand that additional time must be built into the thumb wheel setting to ensure the minimum warning time because of delay times in the circuitry. IDOT officials, according to testimony, did not understand that the railroad was only providing a 20-second minimum warning time through the thumb wheel setting.

Before the accident, State and railroad signal technicians had discussed the signal systems, and a number of design reviews of the accident grade crossing had also been conducted. IDOT representatives had responded to the intersection on several occasions to check for short green indications. However, until the day of the accident, they had checked the operating program of the traffic signal system and not recognized that Algonquin Road did not receive a signal in time for traffic to clear the railroad tracks. IDOT did not understand the timing. According to the IDOT engineering technician who programmed the highway signal system conforming to his experiences of 20 to 30 seconds, he never used any written information on the warning time from the railroad. Therefore, the Safety Board concludes that IDOT had programmed its highway signal system without applying the minimum warning time information from the railroad.

When the UP reset the thumb wheel on October 11, 1995, it did not notify IDOT of the change. The Safety Board is unable to determine whether IDOT would have reacted had they been notified. Even after the accident, IDOT considered that the 25-second thumb wheel setting meant 25 seconds of warning time. Also, it had not modified the programming previously, even though the 25-second warning time was referenced before the change in the thumb wheel setting.

IDOT had opportunities to identify the short green indication for northbound Algonquin Road during 70-mph train operations and, as a result, could have modified the highway traffic signal system or requested more time from the railroad to ensure a sufficient interval for traffic to clear the grade crossing. However, the communication process about the interconnected signal systems was not effective between the State and the railroad. Had an effective communication system existed between IDOT and the UP about the interconnected signal systems, IDOT might have understood that the railroad had provided through the thumb wheel setting only a minimum of 20 seconds of warning time before the arrival of a train at the grade crossing.

In three previous Safety Board investigations, ineffective communications between highway departments and the railroads had caused or contributed to grade crossing accidents.

First, in a March 1993 Fort Lauderdale, Florida, accident,⁴ highway engineers designed a work zone causing traffic to congest at the railroad/highway grade crossing. The Safety Board found that the highway engineers had not “adequately considered either the traffic congestion or the resulting obstruction of the railroad/highway grade crossing.” Then, in the November 1993 Intercession City, Florida, accident⁵ involving a low clearance, overdimension, overweight vehicle, the Safety Board found that the Florida Department of Transportation did not ensure that the railroad had been notified of the movement of this vehicle over its grade crossing. Finally, in the May 1995 collision at a grade crossing near Sycamore, South Carolina,⁶ the Safety Board reported:

Interviews and previous accident investigations conducted by the Safety Board revealed that the degree of communication and cooperation between railroads and public entities regarding grade crossing activities varies widely. Railroad and public officials tend to communicate more on activities that involve funding of active crossings or the installation and maintenance of active warning devices, or that are likely to generate public complaints. The same level of communication does not exist when it comes to other crossing maintenance activities, particularly as they relate to passive crossings. CSX Transportation (CSXT), which operates more than 20,000 miles of track, performs crossing profile maintenance to ensure track vertical and horizontal alignment and adequate drainage, while State, local, and sometimes private entities are responsible for maintaining the alignment of the crossing approaches. When crossing maintenance is performed, the CSXT does not always advise respective entities of these activities. By the same token, in some cases, local entities perform work to realign crossing approaches without informing the railroads. Thus, the Safety Board concludes that railroads and public entities do not routinely communicate with each other on grade crossing maintenance activities.

Misunderstandings about grade crossing systems can be manifested through differences in terminology, construction and maintenance designs and practices, and inspection and operation methods. Although many efforts have been made to address grade crossing safety, no single coordinated program has been available to ensure effective communication on all aspects of grade crossing safety between transportation modes. The Safety Board concludes that, had a coordinated program to ensure effective communication between transportation modes about all aspects of grade crossing safety been in operation, the ineffective communication between IDOT and the railroad might never have occurred.

⁴Highway Accident Report--*Gasoline Tank Truck/Amtrak Train Collision and Fire in Fort Lauderdale, Florida, March 17, 1993* (NTSB/HAR-94/01).

⁵Highway Accident Report--*Collision of Amtrak Train No. 88 with Rountree Transport and Rigging, Inc., Vehicle on CSX Transportation, Inc., Railroad near Intercession City, Florida, on November 30, 1993* (NTSB/HAR-95/01).

⁶Highway Accident Report--*Highway/Rail Grade Crossing Collision near Sycamore, South Carolina, May 2, 1995* (NTSB/HAR-96/01).

Clearly, a comprehensive railroad/highway grade crossing safety inspection program is needed. The development of an inspection program for the more than 314,000 railroad/highway grade crossings will be a significant challenge. However, the U.S. Department of Transportation has successfully implemented a similar national inspection program. As a result of recommendations from the Safety Board investigation of the 1967 Silver River Bridge collapse in Point Pleasant, West Virginia,⁷ and other bridge collapses, the Federal Highway Administration developed the National Bridge Inventory and inspection programs. These efforts have resulted in the inspection and safety review of over 577,000 bridges nationwide.

Therefore, based on all of the foregoing findings, the National Transportation Safety Board makes the following safety recommendations to the U.S. Secretary of Transportation:

Develop a comprehensive and periodic railroad/highway grade crossing safety inspection program to be conducted jointly by railroads and public entities and also require railroads and public entities to coordinate any changes to railroad/highway grade crossings before implementation. (I-96-6)

Notify, in cooperation with the American Association of State Highway and Transportation Officials, the National Association of County Engineers, the American Public Works Association, the Institute of Transportation Engineers, the Association of American Railroads, the American Short Line Railroad Association, and the American Public Transit Association, railroads and public entities about the importance of exchanging information about railroad/highway grade crossings. (I-96-7)

Develop a common glossary of railroad/highway grade crossing terms and disseminate this glossary to railroads and public entities. (I-96-8)

Develop a training program in the design and operation of railroad/ highway grade crossings that includes the interaction between rail and highway signal systems. Require representatives of the railroads, public entities, and others who design and maintain grade crossing signal systems to complete the training program. (I-96-9)

Require the use and maintenance of railroad and highway traffic signal recording devices on all new and improved installations at railroad/ highway grade crossings that have active warning train detection systems and are interconnected/preempted to highway signal systems. These devices should record sufficient parameters to allow railroad and highway personnel to readily determine that the highway signals and railroad-activated warning devices are coordinated and operating properly. Require that the information from these devices be used during comprehensive and periodic joint inspections. (I-96-10)

⁷Highway Accident Report--*Collapse of U.S. 35 Highway Bridge, Point Pleasant, West Virginia. December 15, 1967* (NTSB-HAR-71/1).

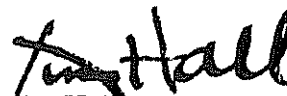
Require that existing recording devices for railroad and highway signals systems at interconnected/preempted grade crossings be retained or upgraded as necessary. Require that these recording devices be maintained and that the information from these devices be used during the comprehensive and periodic joint inspections. (I-96-11)

The National Transportation Safety Board is also making safety recommendations to the Federal Highway Administration, the Federal Railroad Administration, the National Highway Traffic Safety Administration, the State of Illinois, the Illinois Department of Transportation, the Transportation Joint Agreement School District 47/155, the National Association of State Directors of Pupil Transportation Services, the American Association of State Highway and Transportation Officials, the National Association of County Engineers, the American Public Works Association, the Institute of Transportation Engineers, the Association of American Railroads, the American Short Line Railroad Association, the American Public Transit Association, and Operation Lifesaver, Inc. (The Safety Board issued urgent action recommendations following this accident to the Federal Highway Administration, the Federal Railroad Administration, and the State Directors of Transportation.)

The Safety Board is 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 I-96-6 through -11. If you have any questions, you may call (202) 314-6448.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By:


Jim Hall
Chairman