



# National Transportation Safety Board

Washington, D.C. 20594

## Highway Accident Brief

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**Accident Number:** HWY-06-MH-007

**Accident Type:** Commuter train highway-railroad grade crossing accident

**Location:** West Grand Avenue, Elmwood Park, Illinois

**Date and Time:** November 23, 2005; 4:43 p.m.

**Vehicles:** General Motors EMD F40PH locomotive with 6 passenger cars (train 107)  
18 private motor vehicles

**Owner/Operator:** Northeast Illinois Regional Commuter Railroad (METRA)

**Fatalities/Injuries:** 10 injured, no fatalities

### Accident Description

About 4:41 p.m. on November 23, 2005, the day before Thanksgiving, in Elmwood Park, Illinois, a traffic queue formed within the 366-foot-wide signaled METRA highway-railroad grade crossing on eastbound West Grand Avenue.<sup>1</sup> (See figures 1 through 3.) At the same time, METRA train 107 was approaching the crossing on the westbound tracks at a speed of 70 mph, as indicated by event data recorder information. The crossing lights activated and the crossing gates lowered 54 seconds before the train arrived. The traffic queue trapped some stopped vehicles within the grade crossing.

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<sup>1</sup> The width of the crossing was determined by measuring the distance from the eastbound crossing gate to the farthest rail, as measured from the right lane of eastbound West Grand Avenue along a vehicle's path of travel.

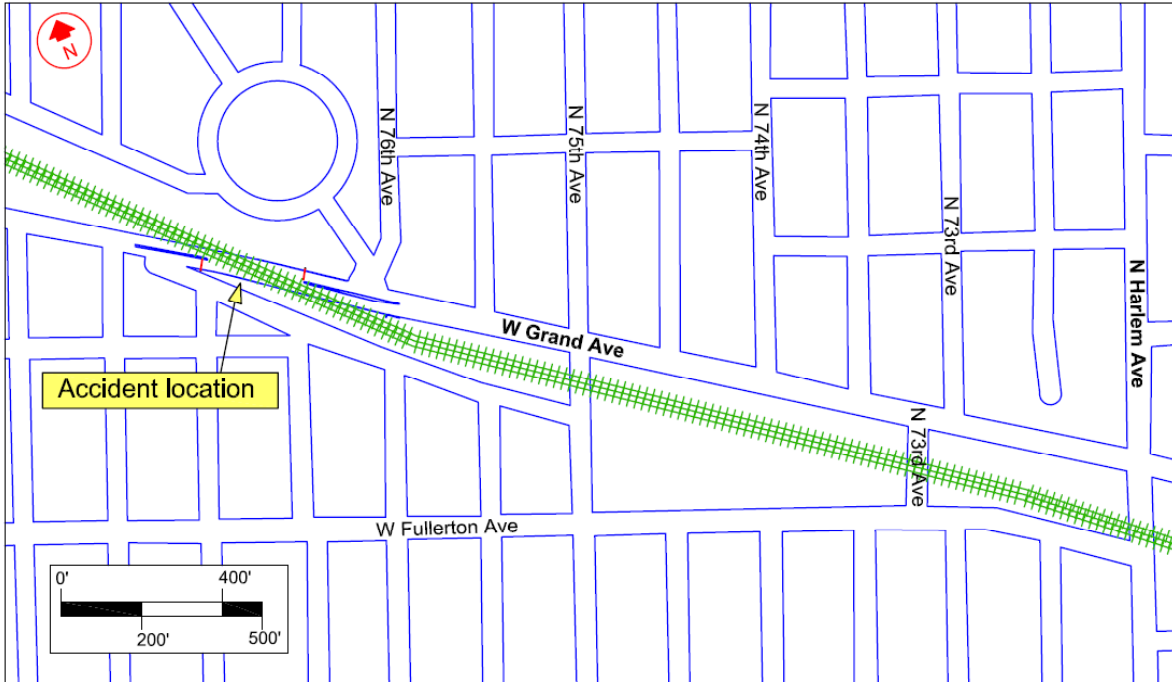


Figure 1. Location of the Elmwood Park grade crossing accident.

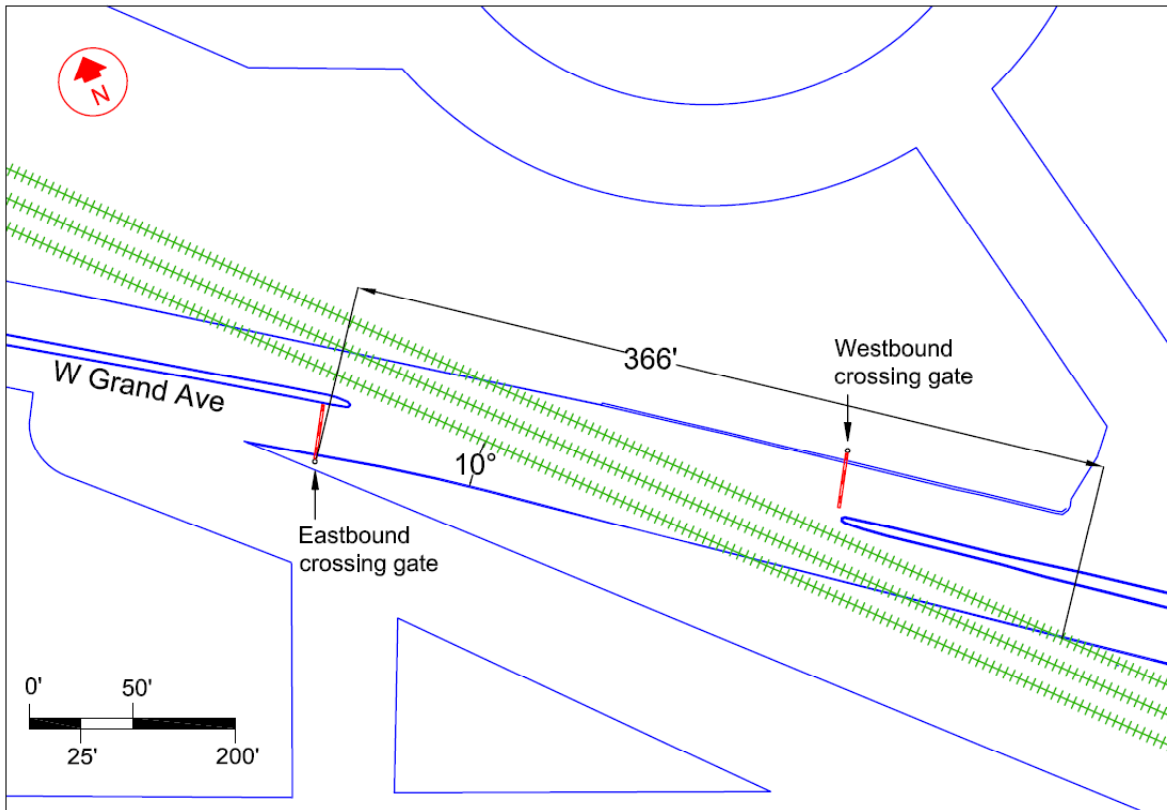


Figure 2. Diagram of the Elmwood Park grade crossing.



Figure 3. Eastbound view of the Elmwood Park grade crossing.

As METRA train 107 approached the crossing, the engineer recognized the hazard and put the train into emergency braking. The train was unable to stop before colliding with approximately 6 of the stopped vehicles, pushing them into secondary impacts with 12 other vehicles about 4:43 p.m. (See figure 4.) Seven automobile occupants received minor-to-serious injuries, and 3 of the approximately 400 train passengers reported minor injuries. The impact destroyed 6 vehicles, and 12 vehicles had minor-to-extensive damage. The locomotive incurred minor damage and did not derail.

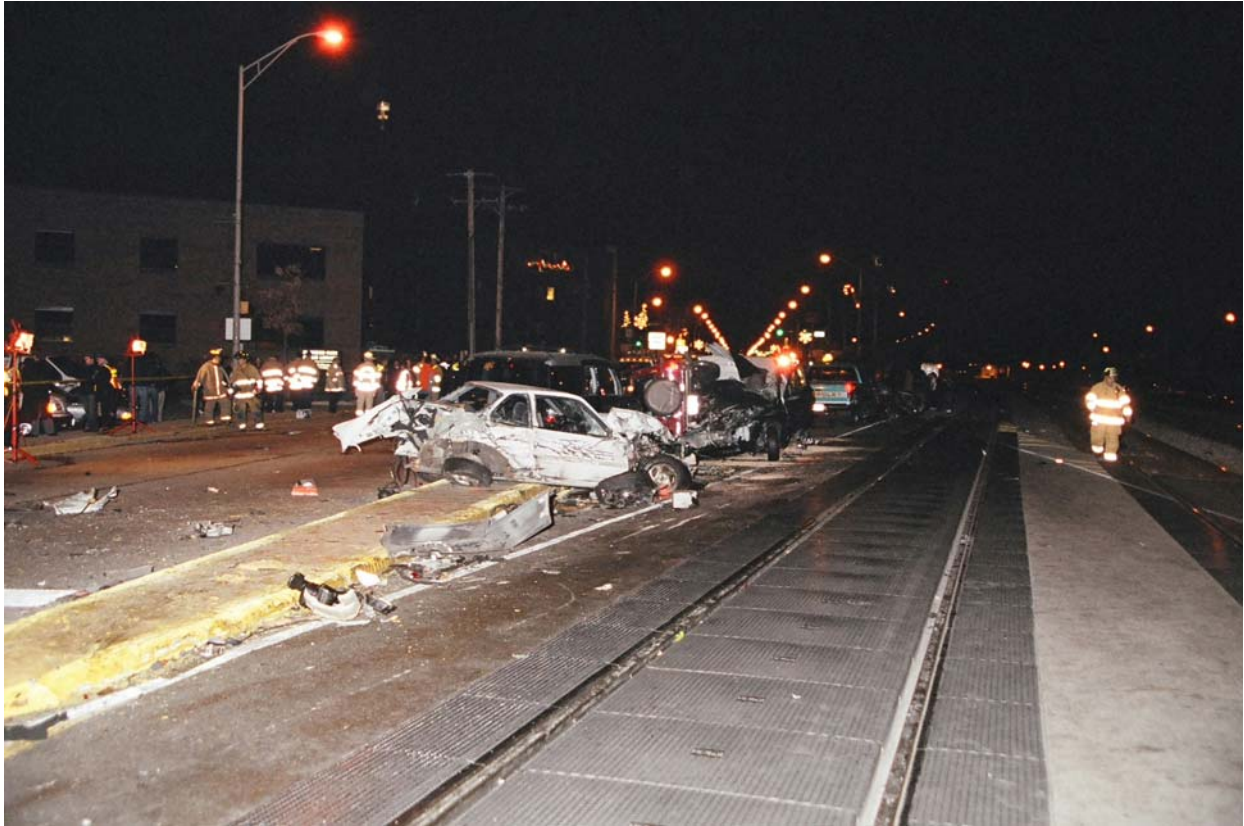


Figure 4. View of the postcrash scene.

An Elmwood Park Police Department video surveillance camera near the crossing recorded the sequence of events that culminated in the accident. Table 1 details the sequence of traffic queue development within the crossing and how congestion beyond the intersection of 76th and West Grand Avenues impeded queued vehicles from clearing the crossing before the METRA train arrived.

Table 1. Sequence of events leading to the accident, recorded on surveillance video on November 23, 2005.

<b>Event</b>	<b>Time (24-hour clock)</b>
76th and West Grand Ave. intersection signal, located about a block east of the grade crossing, turns red <sup>a</sup>	16:41:23
Queue of eastbound vehicles on West Grand Ave. develops over the railroad tracks	16:41:41
76th and West Grand Ave. intersection signal turns green; eastbound vehicles continue to queue on the tracks due to traffic gridlock beyond the intersection	16:42:00 <sup>b</sup>
Flashing lights and gates activate at the West Grand Ave. grade crossing	16:42:43 <sup>c</sup>
Crossing gates lower; vehicles are still queued on the tracks	16:42:47 to 16:42:55
76th and West Grand Ave. intersection signal turns amber	16:43:10
76th and West Grand Ave. intersection signal turns red	16:43:13
METRA train 107 enters the West Grand Ave. grade crossing and collides with six vehicles	16:43:38
<sup>a</sup> The 76th and West Grand Ave. intersection signal in the video was for westbound vehicles. Timing for the eastbound signals may have differed slightly due to the presence of an advance left-turn signal. <sup>b</sup> The eastbound green light lasted approximately 1 minute 10 seconds. The advance left-turn signal may have added several seconds to this total. <sup>c</sup> When the gates activated, 27 seconds of green light time remained at the signal for the 76th and West Grand Ave. intersection.	

According to the Illinois Commerce Commission (ICC), several factors probably caused the heavy congestion on West Grand Avenue at the time of the accident. First, West Grand Avenue is a main travel route to and from Chicago, and the accident occurred on the day before the Thanksgiving holiday, one of the busiest travel days of the year. Second, the sequencing of the traffic signals for several nearby streets contributed to the congestion. The railroad tracks also intersect 75th, 73rd, and Harlem Avenues just south of where these three roads intersect West Grand Avenue. (See figure 1.) The traffic signals and the railroad crossing signals of these three avenues are interconnected, so an approaching train would cause the traffic signals governing northbound travel to stay green to allow traffic queues to clear the crossings. At the same time, the response of these interconnected signals to the train's approach would result in a string of red traffic signals for motorists traveling along this portion of West Grand Avenue, resulting in heavy traffic congestion. Third, although the intersection signal lights along West Grand Avenue are synchronized to ease traffic flow in the eastbound and westbound directions, synchronization is preempted at 75th, 73rd, and Harlem Avenues whenever a train approaches. It may take several cycles for the traffic signals to resynchronize. During periods of heavy train activity, as was the case prior to this accident, the traffic signals along West Grand Avenue

might not have enough time to resynchronize before the arrival of the next train, contributing further to traffic congestion on West Grand Avenue. Finally, activation of the 75th, 73rd, and Harlem Avenue grade crossings impedes eastbound vehicles on West Grand Avenue from turning right, causing these vehicles to continue queuing in the right lane of West Grand Avenue until the crossings are clear. This situation effectively reduces the number of through lanes on eastbound West Grand Avenue from two to one.

## **West Grand Avenue Grade Crossing**

The 366-foot-wide West Grand Avenue grade crossing is the widest in the State of Illinois. This width is due to the acute 10° angle at which the four divided lanes of West Grand Avenue intersect the three rail tracks at the crossing. Because of the angle of this intersection, vehicles must cross 179 feet of rail, measured from the outer rails along a vehicle's path of travel, to get from one side of the crossing to the other. By contrast, about 0.5 mile east, the three rail tracks intersect the four lanes of Harlem Avenue at a 70° angle; at this grade crossing, vehicles traverse 35 feet of rail to get from one side to the other.

At the time of the accident, the maximum track speed was 70 mph for passenger trains and 30 mph for freight trains. Passenger trains used this crossing 82 times per day (Monday through Friday), and freight trains used it 25 times per day (Monday through Friday). The average daily vehicle traffic at this section of West Grand Avenue was 20,900 vehicles.

The highway-rail grade crossing signal configuration consisted of a crossbuck sign with an indication of the number of tracks, post-mounted flashing light signals, an overhead structure with flashing light signals, and an automatic gate consisting of a drive mechanism operating a fully retro-reflectorized red-and-white-striped gate arm with lights. Activation of the signalized crossing provided motorists at least 54 seconds of warning before a train entered the intersection. The configuration of the warning signals at this grade crossing conformed to guidance in the 2003 edition of the *Manual on Uniform Traffic Control Devices* (MUTCD).<sup>2</sup>

Table 2 lists the grade crossing warning signs for the eastbound lanes of West Grand Avenue at the time of the accident, as well as their distances from the grade crossing gate arm.

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<sup>2</sup> U.S. Department of Transportation, Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways*, Part 8, "Traffic Controls for Highway-Rail Grade Crossings" (Washington, DC: FHWA, 2003).

Table 2. Signage for the eastbound lanes of West Grand Avenue approaching the grade crossing at the time of the accident.

<b>Signage</b>	<b>Distance to grade crossing gate arm</b>	<b>Location</b>
Highway-rail grade crossing advance warning sign (W10-1)	430 feet	Mounted on right side of West Grand Avenue
Highway-rail grade crossing pavement marking	326 feet	Pavement marking extended across right and left lanes
“Long Crossing Do Not Stop On Tracks” sign	123 feet	Mounted on right side of West Grand Avenue
“Caution Railroad Tracks No Turns” sign	53 feet	Mounted on right side of West Grand Avenue
“Long Crossing Do Not Stop On Tracks” sign	29 feet	Mounted on cantilevered support of grade signal over travel lanes

Accident records provided by the Federal Railroad Administration (FRA) and the Illinois Department of Transportation (IDOT) indicated that 45 accidents occurred at this grade crossing between 1956 and November 2005, resulting in a total of 7 fatalities and 27 injuries. Prior to November 23, 2005, the last accident at this location occurred on November 24, 2004—the day before Thanksgiving 2004—and resulted in two injuries.

On November 28 and 29, 2005, National Transportation Safety Board investigators spent a total of 6 hours observing the traffic flow across the West Grand Avenue grade crossing during morning and evening rush hours. Investigators noted that traffic queues often formed on the eastbound side of the West Grand Avenue grade crossing when the traffic signal lights at West Grand Avenue and 76th Avenue turned red. Most eastbound drivers slowed or stopped before entering the grade crossing and proceeded only when the traffic signal turned green or when they perceived that there was enough space to join the traffic queue on the east side of the grade crossing. Sometimes, drivers farther back in the queue would sound their horns and gesture in an attempt to move the queue forward. Occasionally, the traffic queued onto the West Grand Avenue grade crossing. On two separate occasions during their 6 hours of observation, investigators saw a vehicle trapped in the area between the crossing gates and the tracks when the gates were down and crossing signals were active.

Before the November 2005 accident, the Village of Elmwood Park, in conjunction with IDOT and the ICC, had undertaken several initiatives to improve the safety of the grade crossing. These projects included installing a fiber optic network on West Grand Avenue in 2002 to improve the coordination of the traffic signals at the 76th, 75th, and 73rd Avenue intersections and traffic flow along West Grand Avenue;<sup>3</sup> initiating “Operation Lifesaver” public education

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<sup>3</sup> This initiative did not include interconnecting the 76th Avenue traffic signals with the grade crossing signals for West Grand Avenue.

efforts in 2002; and erecting “Long Crossing Do Not Stop On Tracks” signs above the travel lanes of West Grand Avenue in both travel directions in 2003. Elmwood Park representatives stated that they believed these improvements had alleviated some of the traffic congestion around the crossing. Evidence from the FRA’s Web-Based Accident Prediction System (WBAPS)<sup>4</sup> supports this belief. Based on highway-rail grade crossing collision data gathered for 1998–2002, WBAPS predicted that the West Grand Avenue crossing would incur about 0.47 collision per year. This WBAPS value was the highest for any public grade crossing in the State of Illinois for the period. The 2002–2006 WBAPS value for the crossing was 0.28 collision per year, a decrease from the previous period’s accident prediction value but still the third highest for a public grade crossing in the State.

Safety Board investigators met with representatives from the Village of Elmwood Park, the ICC, and IDOT on November 25, 2005, to discuss the possibility of interconnecting the 76th Avenue traffic signals with the West Grand Avenue grade crossing signals. State and local representatives stated that the traffic density on West Grand Avenue exceeded the design capacity of the road, resulting in backups of 0.5 mile or more. Interconnection of the grade crossing signals with the 76th Avenue traffic signals would require interconnection with the nearby grade crossing and traffic signals on 75th Avenue. The State and local authorities at the meeting estimated that if the West Grand Avenue grade crossing signals were interconnected with the traffic signals at 75th and 76th Avenues, the signal warning time for the West Grand Avenue grade crossing would be about 2 minutes 40 seconds. This interval would require motorists to wait behind the lowered gates for nearly 3 minutes before a train arrived and would result in the crossing being closed for more than 4 hours per day for train passage. The meeting representatives stated that this would lead to increased traffic congestion, which would probably cause more motorists to ignore the grade crossing signals, and thereby result in more grade crossing accidents. They stated that the only effective way to prevent these types of accidents is to provide a grade separation of West Grand Avenue at the rail grade crossing.

### **Grade Crossing Modifications Since the Elmwood Park Accident**

Postaccident, METRA and the State of Illinois took steps to reduce the potential for grade crossing accidents at the West Grand Avenue crossing. METRA restricted track speed in the vicinity of West Grand Avenue<sup>5</sup> to 30 mph on November 28, 2005. METRA stated that the restriction would remain in effect until substantial safety improvements were made at the crossing. In December 2005, the Governor of Illinois announced interim improvements for the West Grand Avenue grade crossing until a more permanent solution is realized; the following improvements have been fully implemented:

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<sup>4</sup> WBAPS ranks each crossing based on its 5-year accident history, as well as basic data on each crossing’s physical and operating characteristics. According to the FRA, WBAPS is a tool to help State officials decide where best to direct scarce highway-rail grade crossing resources.

<sup>5</sup> The speed restriction covers the area from mile marker 10.4 to 10.6.



- December 2005: Installed a changeable message (warning) sign for eastbound West Grand Avenue in advance of the crossing.
- February 2006: Removed all eastbound “No Right Turn” blank-out signs from both the 75th and 73rd Avenue traffic signals.
- April 2006: Modified traffic signal timings and sequences for the 76th, 75th, and 73rd Avenue intersections located east of the crossing to improve traffic flow for eastbound West Grand Avenue.
- May 2006: Installed low-mount “Do Not Stop On Tracks” signs and amber warning flashers on both sides of the crossing.
- By March 2007: Installed crosshatch pavement marking within the crossing area.
- By March 2007: Removed an eastbound transit bus stop that had been located between the grade crossing and the intersection of 76th and West Grand Avenues.
- Ongoing: Trimmed tall vegetation from the landscaped area near the southeast quadrant of the crossing to improve the sight distance for train engineers approaching the crossing.
- Ongoing: Increased Illinois Operation Lifesaver public education efforts in the Elmwood Park area.

In March 2007, IDOT completed a feasibility study, which had been initiated at the direction of the Governor of Illinois, to identify engineering options for improving the West Grand Avenue crossing. IDOT selected three options as being most feasible, each of which would result in grade separation between the METRA rails and West Grand Avenue.<sup>6</sup> According to IDOT, a preliminary engineering and environmental study is needed to identify the preferred option among these three alternatives. Funding was not allocated for this purpose for the 2007 or 2008 fiscal years.

The May 2008 WBAPS value for the West Grand Avenue grade crossing is 0.25, which reflects the absence of accidents on the crossing since November 23, 2005. Although no accidents have occurred recently, vehicles are still being trapped within the crossing gates. On March 22, 2007, a METRA safety official told Safety Board investigators that a school bus loaded with students that was traveling westbound on West Grand Avenue had become trapped in the area between the railroad tracks and the crossing gate 8 days earlier.<sup>7</sup> A METRA signals supervisor who happened to be at the crossing was able to radio the oncoming train to warn it about the bus. Because there was enough room between the crossing gate and the tracks to accommodate the school bus safely while the train passed, a collision would not have occurred.

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<sup>6</sup> The three options selected were (1) to raise West Grand Avenue over the METRA rails, (2) to lower West Grand Avenue under the METRA rails, or (3) to simultaneously lower West Grand Avenue and raise the METRA rails.

<sup>7</sup> Per telephone conversation with the METRA safety chief, March 22, 2007. A photo of the trapped school bus was published in *Elm Leaves*, Volume 37(1), page 3.

## **Probable Cause**

The National Transportation Safety Board determines that the probable cause of the Elmwood Park accident was a combination of factors that led to the development of a traffic queue on the West Grand Avenue highway-rail grade crossing and prevented queued vehicles from exiting the crossing prior to the arrival of a Northeast Illinois Regional Commuter Railroad (METRA) train: the factors were the acute angle of intersection between West Grand Avenue and the railroad tracks, which resulted in an exceptionally wide grade crossing; the unusually heavy vehicle traffic that preceded the Thanksgiving holiday; and the complex street and rail pattern and related signal interactions between Harlem Avenue and the West Grand Avenue grade crossing, which frequently desynchronized the traffic signals along West Grand Avenue during peak travel times.

## **Recommendation**

As a result of this accident investigation, the National Transportation Safety Board made the safety recommendation listed below. For more information about the Safety Board's recommendation, see the accompanying safety recommendation letter.<sup>8</sup>

### **To the Governor of Illinois:**

Require the Illinois Commerce Commission and the Illinois Department of Transportation to construct a grade separation in place of the West Grand Avenue grade crossing, and provide the necessary resources to effect this change. (H-08-2)

## **BY THE NATIONAL TRANSPORTATION SAFETY BOARD**

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**Adopted: June 10, 2008**

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<sup>8</sup> The recommendation letter is available on the Safety Board's website at <http://www.nts.gov/Recs/letters/2008/>.