



National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.: DCA-08-FR-006
Location: Chicago, Illinois
Date: May 28, 2008
Time: 10:05 a.m., central daylight time¹
Railroad: Chicago Transit Authority
Property Damage: \$338,000
Fatalities: 0
Injuries: 14
Type of Accident: Derailment

The Accident

On May 28, 2008, about 10:05 a.m., southbound Chicago Transit Authority (CTA) Green Line train 003 traveling on elevated track between Harlem/Lake Avenue station and Cottage Grove derailed after crossing switch 85A, which was lined against the direction of the train at south main track marker 338 in Chicago, Illinois. (See figure 1.) Train 003 consisted of four passenger cars coupled in sets of two. There were 24 passengers onboard. Fourteen passengers sustained minor injuries and were transported to area hospitals, where they were treated and released; the other 10 passengers declined medical attention. The total property damage to track, cars, and signal equipment was about \$338,000. At the time of the derailment, the winds were variable at 11 mph, visibility was 10 miles, and the temperature was 52° F.

Accident Sequence

On the day of the accident, train 003 had been making round trips from Harlem/Lake Avenue station to Cottage Grove. (See figure 2.) At 9:20 a.m., the train departed the Harlem/Lake Avenue station traveling southbound toward Cottage Grove. As it continued, it encountered several *clear* (green) signal indications.²

¹ All times in this brief are central daylight time.

² A *clear* (green) signal indication allows a train to operate at the maximum speed authorized for the track segment.



Figure 1. Derailed lead cars of train 003.

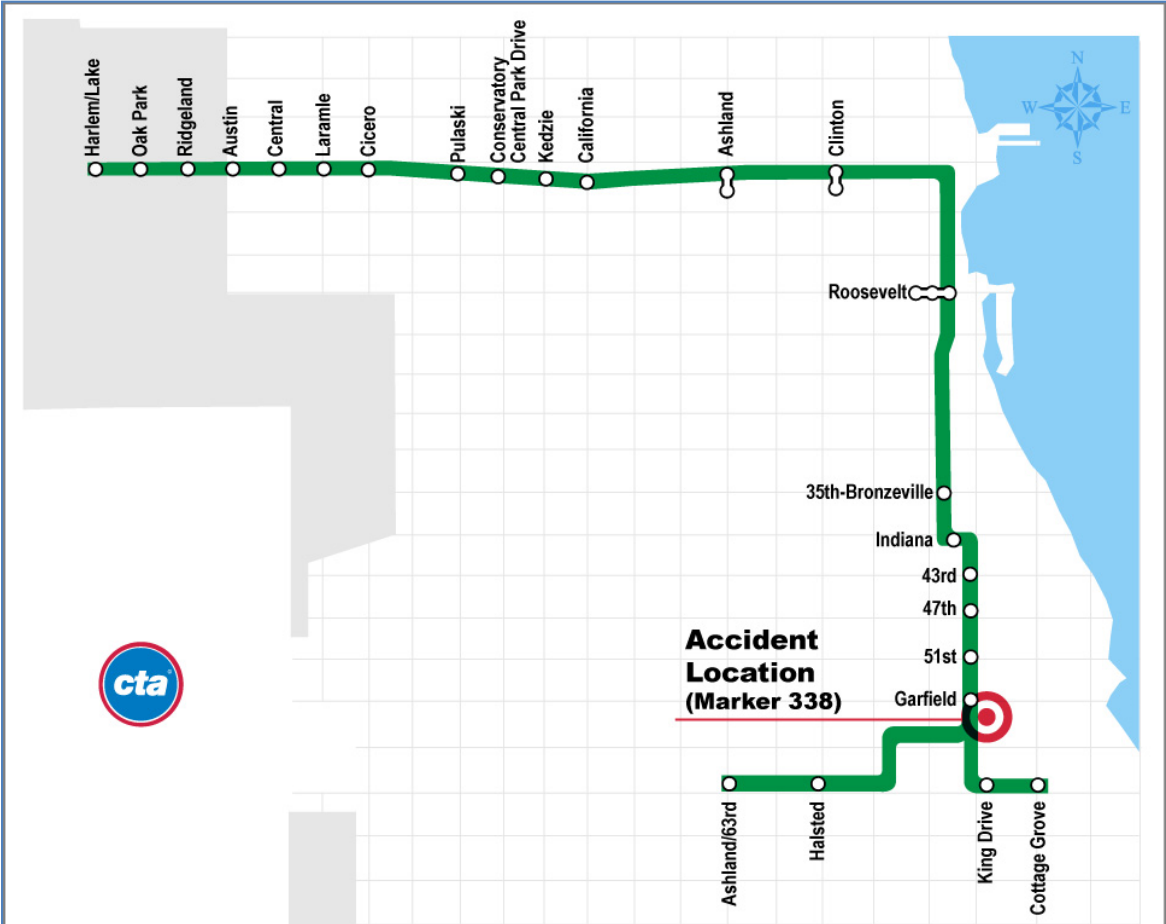


Figure 2. Accident location shown on CTA Green Line route.

At the same time, an eastbound work train approached the 59th Street interlocking,³ which was operating in automatic mode, meaning that all routes were initiated either by track circuit occupancy or by a train operator using wayside route selectors. The work train entered the interlocking and proceeded onto the northbound main track. (See figure 3.) It then stopped to make a reverse move southbound toward Cottage Grove. The work train operator used the signal 82 wayside route selector to select a reverse route from the northbound main track to the southbound main track. (See figure 4.)

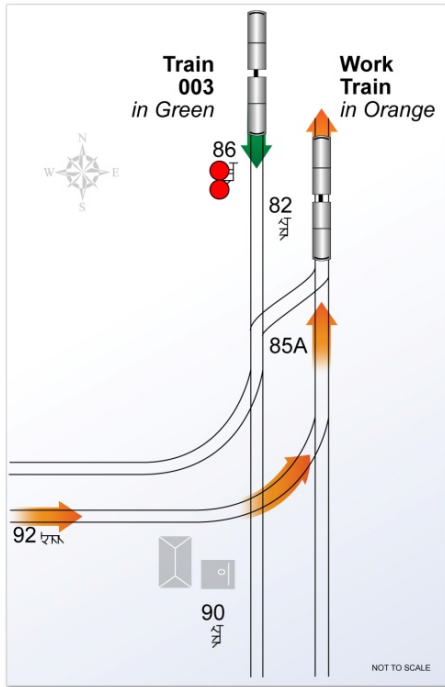


Figure 3. Positions of work train and train 003 before derailment. Orange arrows indicate work train movement to northbound main track. Green arrows indicate train 003 southbound movement. Signal 86 displays a *stop* (red) signal indication for train 003.

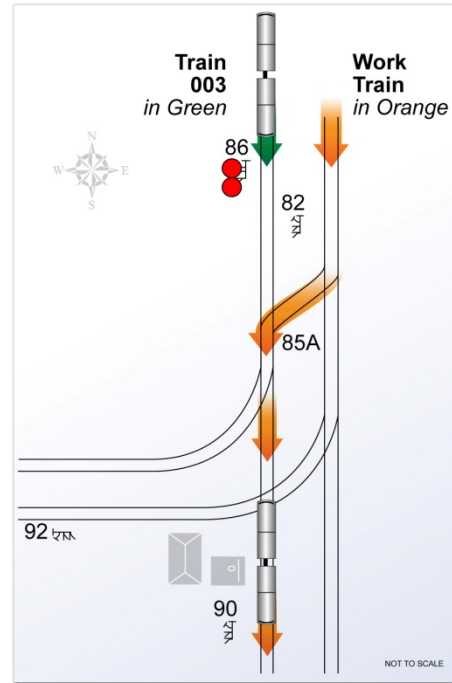


Figure 4. Reverse movement of work train and position of train 003 before derailment. Orange arrows indicate work train turn-back move to southbound main track. Green arrows indicate train 003 southbound movement. Signal 86 displays a *stop* (red) signal indication for train 003.

³ The 59th Street interlocking consists of power-operated switches and signals that can be manually controlled by a tower operator while in manual mode or by a train operator using wayside route selectors, which allow train operators to select routes for train movements, while in automatic mode. The 59th Street interlocking extends from signal 86 to signal 90.

Before the work train crossed over to the southbound track, train 003 approached the 59th Street interlocking, where signal 86 was displaying a *stop* (red) signal indication⁴ and the corresponding track trip⁵ was raised. The work train then proceeded from the northbound track to the southbound track. Instead of stopping at the No. 86 signal, the train 003 operator continued past the signal. Because the track trip was in the raised position, when the lead car (2479) of the first pair of cars passed over the track trip, an emergency brake application was initiated. After train 003 came to a stop, the operator moved the train forward. When the lead car (2476) of the second pair of cars passed over the track trip, a second emergency brake application was initiated. After train 003 again came to a stop, the operator continued southbound, moving his train over switch 85A, which was still lined for the work train's reverse movement from the northbound track to the southbound track. Because the switch was lined reverse, or against train 003, the wheel did not have a path forward; it climbed the rail, damaged the switch, and began to derail the train.

The first and the fourth cars (2479 and 2475) of train 003 derailed heading in a straight direction toward Cottage Grove. The second car (2480) derailed heading in the direction of the curve. The third car (2476) did not derail. (See figure 5.) As the derailment occurred, the work train continued moving toward Cottage Grove on the southbound main track.

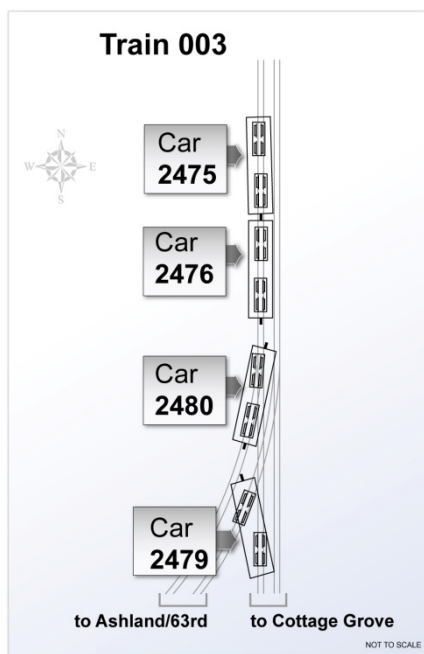


Figure 5. Cars of train 003 shown with wheel sets indicating resting positions after derailment.

⁴ A *stop (red) signal indication* requires the operator to stop his train and contact the Control Center to receive authorization to pass the signal.

⁵ A *track trip* is a mechanical device that is affixed to the track structure near the running rail. The track trip is in the raised position when the signal displays a “stop” aspect and in the lowered position when the signal displays a “proceed” aspect. If a train passes a track trip that is in the raised position, the track trip will strike a brake side trip arm lever on the side of the car trucks that will place the train in an emergency brake application.

Investigation

The investigation determined that the wayside signal system and equipment were functioning properly at the time of the accident. Weather conditions did not affect visibility. No impairing substances were found during postaccident toxicological tests of the train 003 operator, the work train operator, or the supervisor on duty. The emergency response was appropriate and effective.

Train and Track Information

Train 003 consisted of lead cars 2479 and 2480 and railcars 2475 and 2476. The lead cars had their last full periodic inspection on April 24, 2008, and their last safety inspection on May 19, 2008. The railcars had their last full periodic inspection on May 15, 2008, and their last safety inspection on May 21, 2008. The inspection reports did not note any exceptions or deficiencies.

The CTA owns, inspects, maintains, and operates the tracks where the accident occurred. The tracks are constructed of 115-pound 39-foot rail fastened to wooden ties with 6-inch cut track spike fasteners.

Near the accident scene, the track is oriented north-south. The track is an elevated structure, which is 15 feet 9.75 inches above the street, and the top of the rail is 21 feet 1.25 inches above the street. After derailling at switch 85A, the lead cars came to rest at a curve, which has a 250-foot radius at the point of rest at tangent grade. The maximum authorized speed through the curve is 15 mph.

The physical evidence showed that the train had derailed as it passed through a switch that was lined against the direction of movement. National Transportation Safety Board (NTSB) investigators found paint transfer marks from a track trip on the track trip switches on cars 2479 and 2476. The track trip across from signal 86 showed that it had been struck. Event recorder data from the signal system showed that signal 86 was indicating *stop* and that track trip 86 was in its raised position.

The brake cables (electric and pneumatic) on car 2479 were damaged, and as a result the investigators were unable to perform a running test of the train brakes of cars 2479 and 2476. Investigators also were unable to determine whether the train's brakes would apply when commanded because the train did not have an event recorder or any other mechanical means of determining how the operator had controlled the train. Investigators did not observe any damage to the derailed railcars, the signal equipment, or the track structure that would have contributed to the accident.

The mechanical brake components were inspected, measured, and operated. The four cars of train 003 were found to be within CTA brake maintenance measurement tolerances. The investigators removed the side cover of the track trip switch on car 2479 and visually inspected the switch's electrical components. When the track trip was manually "flipped," the electrical contacts showed that the brake actuators were engaged and had operated as intended (that is, the information was transmitted to the brake indicator lights on the car that confirmed the electrical contact).

CTA Operating Personnel Information

Train 003's operator was qualified to perform his duties. He was hired on February 20, 1976, and he had 32 years of service at the time of the accident. He had passed a physical examination that included a vision test. CTA records indicated that he had been properly trained and tested and was determined to be knowledgeable about the operating rules.

On May 27, the day before the accident, the operator had worked for 9.2 hours; he had been on vacation for the previous 8 days. On the day of the accident, he boarded his train and began work at 4:20 a.m. At the time of the accident, he had been on duty for about 5 hours 45 minutes.

Operating Rules

According to CTA operating rules, when an emergency brake application is initiated, the operator is required to notify the Control Center and to follow the steps outlined in CTA Rail System Rule R9.4, which is as follows:

R9.4 When a train goes into emergency.

Whenever a standing train has an indication that brakes are applied when they should be released, the operator may reset the brakes and proceed, provided that it is safe to do so. Whenever a moving train goes into emergency for an unknown reason, the operator, before proceeding, must take these steps:

- Immediately notify the controller.
- Attempt to find and correct the trouble. If the trouble is not in the cab, walk the length of the train, checking all side trips, jumper switches, emergency switches and to look for any other defects.
- If the trouble is found, contact the controller for permission to proceed or for instructions.
- If the trouble cannot be found and visual inspection shows everything normal, contact the controller for instructions.

The operator of train 003 did not contact the Control Center until after the train had derailed. He did not walk his train to look for defects, and he did not ask the Control Center for permission to proceed after coming to a stop following each emergency brake application, as required by CTA Rail System Rule R9.4.

Postaccident Interviews

The operator of train 003 told NTSB investigators that he did not remember either making any mistakes or coming to a complete stop before the derailment.

Of the 24 passengers onboard the accident train, investigators contacted 14, and 8 agreed to be interviewed. When asked how the train had been operated just before the derailment, six of the eight passengers agreed that the train had come to a complete stop either once or twice just before the derailment. Another passenger stated that she had been very tired and did not remember the train stopping before the derailment, and the eighth passenger interviewed also could not remember the train stopping.

Signal System

The CTA signal system employs audio-frequency-based track circuits with loop transmitters to detect trains and transmit speed commands to the operator via an aspect display unit that is mounted in the operator's cab in the lead car. The operating cab receives continuous signals that display the permitted speed (or a *stop* command). Trains typically are manually operated. The signal system regulates the train operator's action by comparing the train's permitted speed to the train's actual speed. If a train exceeds the permitted speed, the system gives an audible warning. The operator must acknowledge the warning by applying the brakes, which is done by moving the control handle to either the B2 or the B3 position. Once the train's speed is below the permitted speed, the operator may move the control handle to either a coast or a power position. If the operator does not initiate the required braking within 2.5 seconds of the warning, the system automatically applies the brakes (at the B3 position rate) until the train stops. To release the brakes, the operator must set the control handle to the B3 position.

The signal system in place on the CTA Green Line is designed to stop a train if it passes a red signal. After the train stops, the operator can then put the train in motion. This is in contrast to a positive train control system, which stops the train prior to the red signal and does not permit the train to move again until it is safe to do so.

Postaccident Actions

Following the accident, the CTA reduced the maximum authorized speed for a train approaching a red signal at signal 86 from 25 mph to 15 mph, even though the braking distances were calculated to be adequate for 25 mph. The CTA reduced this speed to give train operators a more noticeable speed restriction as they approach the signal and more time to observe the signal.

On June 4, 2008, the CTA issued General Bulletin G32-08, which reiterated that employees who disobey signals or otherwise violate safety rules are subject to accelerated⁶ discipline. Examples of safety violations that warrant accelerated discipline are listed below:

⁶ In this case, *accelerated* refers to the severity of discipline when an operator fails to comply with a red signal and could result in termination of employment.

- Failure to honor any signal
- Improper or unauthorized backing up of a train
- Operating a switch under a train
- Operating on R6.4 without authorization
- Overrunning a flagmen's stop signal/trip
- Split switch⁷
- Unauthorized operation of a train without signal protection

This general bulletin emphasizes that an operator should not pass a red signal without the controller's authorization. Within 2 weeks after the accident, the operator of train 003 retired; no discipline hearing was held.

Prior NTSB Safety Recommendations

As a result of its investigation of a rear-end collision on the Massachusetts Bay Transportation Authority Green Line in Newton, Massachusetts, that occurred on May 28, 2008,⁸ the NTSB issued Safety Recommendation R-09-8 to the Federal Transit Administration (FTA):

Facilitate the development and implementation of positive train control systems for rail transit systems nationwide. (R-09-8)

This safety recommendation is currently classified "Open—Initial Response Received."

As a result of its investigations of two separate rear-end collisions on the CTA (the first on June 17, 2001, and the second on August 3, 2001),⁹ the NTSB issued Safety Recommendation R-02-19 to the FTA:

Require that new or rehabilitated vehicles funded by Federal Transit Administration grants be equipped with event recorders meeting Institute of Electrical and Electronics Engineers Standard 1482.1 for rail transit vehicle event recorders. (R-02-19)

After exchanging several letters, on January 16, 2008, the FTA explained in detail that its authorizations do not allow it to regulate equipment or operations unless Congress has given it explicit authority to issue regulations. In a letter dated August 29, 2008, the NTSB stated that it does not challenge the FTA's interpretation; however, the NTSB noted that the FTA had issued

⁷ A *split switch* is a switch that is in neither the normal (closed) nor reverse (open) position.

⁸ *Collision Between Two Massachusetts Bay Transportation Authority Green Line Trains, Newton, Massachusetts, May 28, 2008*, Railroad Accident Report NTSB/RAR-09/02 (Washington, DC: National Transportation Safety Board, 2009) <<http://www.nts.gov/publictn/2009/RAR0902.pdf>>.

⁹ *Two Rear-End Collisions Involving Chicago Transit Authority Rapid Transit Trains at Chicago, Illinois, June 17 and August 3, 2001*, Railroad Special Investigation Report NTSB/RAR-02/01 (Washington, DC: National Transportation Safety Board, 2002) <<http://www.nts.gov/publictn/2002/SIR0201.pdf>>.

rules in the past that had affected safety. The NTSB considered the use of vehicle event recorders to fall within that purview. Based on the FTA's perceived limitations of its authority and its subsequent lack of action to address Safety Recommendation R-02-19, the recommendation was classified "Closed—Unacceptable Action."

Probable Cause

The National Transportation Safety Board determines that the probable cause of the May 28, 2008, derailment of Chicago Transit Authority Green Line train 003 was the train operator's failure to observe, recognize, and act on the *stop* (red) signal indication at signal 86. Contributing to the accident was the operator's failure to comply with the operating instructions that specified the required actions to be taken after an emergency brake application. Also contributing to the accident was the lack of a positive train control system that would have stopped the train before the red signal when the operator did not respond properly, thereby preventing the derailment.

Adopted: March 31, 2011