National Transportation Safety Board
Washington, D.C. 20594

Railroad Accident Brief

Accident No.:	DCA-08-FR-001
Location:	Painesville, Ohio
Date:	October 10, 2007
Time:	12:02 p.m., eastern daylight time[1]
Railroad:	CSX Transportation
Property Damage:	$1.4 million
Environmental Cleanup:	$7.08 million
Fatalities:	None
Injuries:	None
Type of Accident:	Derailment

The Accident

On Wednesday, October 10, 2007, about 12:02 p.m., eastbound CSX Transportation (CSX) freight train Q380-09 derailed 31 cars in Painesville, Ohio, while being operated on main track 1. The train was traveling 48 mph at the time of the derailment. The crew's last train operation had been made about 1 1/2 miles before the derailment. The train consisted of 2 locomotives and 112 cars (106 loaded and 6 empty). The 31st through 61st cars in the train derailed. The derailed cars included seven tank cars carrying ethanol, one tank car carrying liquefied petroleum gas, and one tank car carrying phthalic anhydride. Also among the 31 cars that derailed were covered hoppers carrying corn, wheat, feed, plastic, and lumber. The ethanol tank cars and many of the other freight cars caught on fire. Twenty-six of the derailed cars were destroyed. (See figure 1.)

As a precaution, about 1,400 area residents were evacuated from an area of approximately 3 square miles. There were no reported injuries. The temperature at the time of derailment was 51° F, and it was daylight. Estimated damages and environmental cleanup costs were $8.48 million.

At 10:00 a.m., about 2 hours before the accident, the engineer and conductor had gone on duty at CSX's Collinwood Yard in Cleveland, Ohio, to relieve the inbound crew of the train. The crew received new train documentation and the current dispatcher bulletin. The engineer performed the required air brake test, contacted the train dispatcher for permission to depart, and departed at 11:28 a.m.

[1] All times in this brief are eastern daylight time.

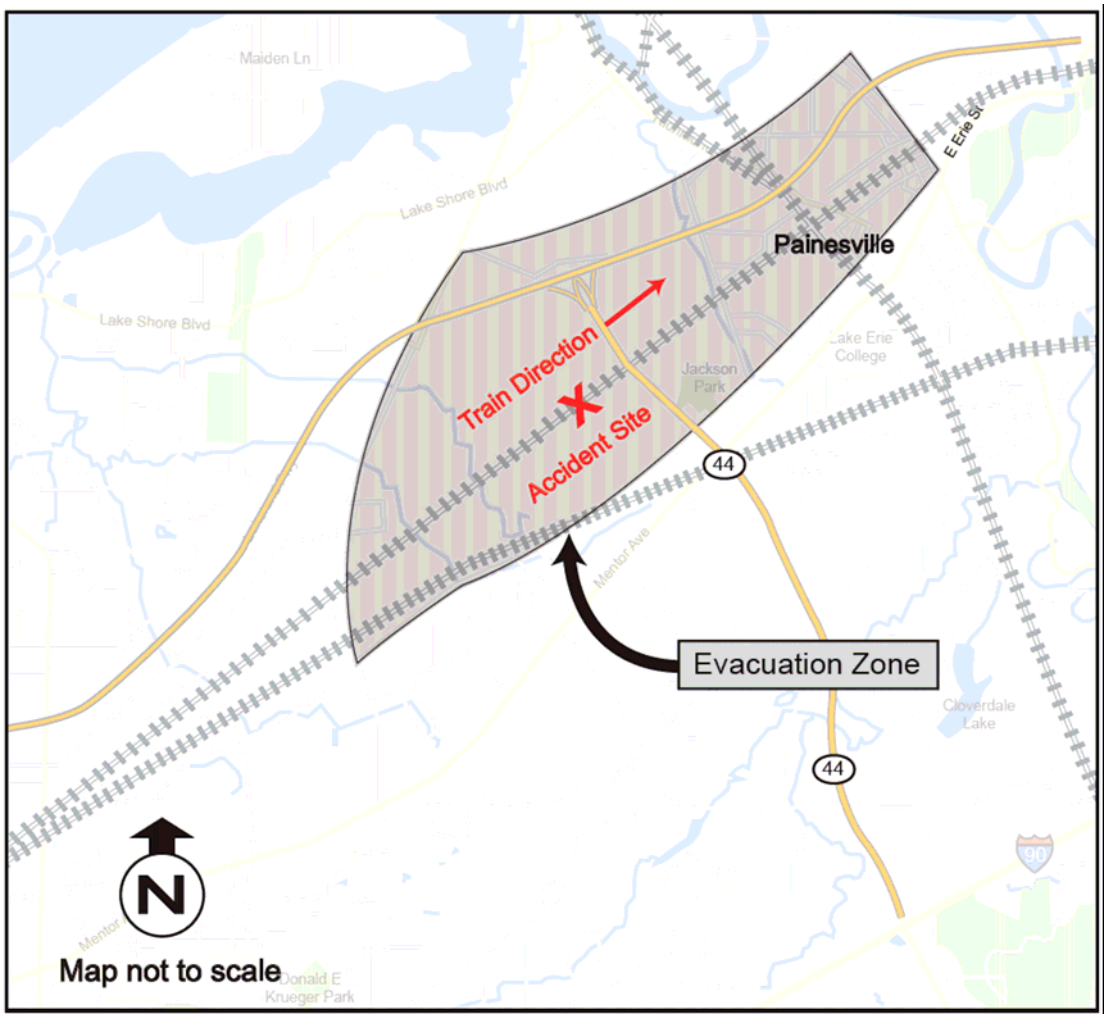

Figure 1. Accident site.

About 6 1/2 miles before the accident, at control point (CP) 162, the train passed a *limited clear* signal. The train crossed over to main track 1 and proceeded east. The train's speed increased to 48 mph. After the train's locomotive passed a *clear* signal at CP 155, the engineer said he felt "a nudge, like a jerk" in the train. The nudge was followed by an emergency application of the train's air brakes, caused by a train line separating during the derailment.

The engineer said that after he saw a large fireball in the middle of the train reflected in the side mirror, the train came to a stop. (See figure 2.) He immediately used the radio to broadcast an emergency notification three times, and he asked officials to come to the scene. The train crew provided the emergency responders with the train consist and information about the hazardous materials on the train.

Figure 2. Derailment.

Investigation

The derailment occurred at milepost 155.62 on main track 1, which was made of 132-pound continuous welded rail (CWR). At the point of derailment, a plug rail[2] had been installed in the south rail on December 15, 2006. The plug rail was 136-pound rail and was 20 feet 5 inches long. To install the plug rail, two pairs of 132- to 136-pound rail compromise joint bars[3] and eight bolts were used. No rail certification[4] was visible on the plug rail. The west end of the plug rail had evidence of multiple fractures and rail end batter.[5] Rail fragments from this joint area were found at the point of derailment, about 125 feet west of the point of derailment, and about 200 feet east of the point of derailment.

The bottom side of the side frames of the leading end of the 32nd car showed signs of rail burns, indicating that it was first car to derail. Its trailing end also had rail burns on both side frames, and the track was damaged as the train continued to move. A piece of rail was imbedded in the south side frame of the 33rd car, as a result of damage to track ahead of it.

[2] *Plug rails* are used to replace and span a rail defect in CWR. The plug rail is normally temporarily fastened in place by joint bar connections until the plug rail can be welded in place.

[3] *Compromise joint bars* connect and align rail of unequal size or weight.

[4] A r*ail certification* is used to show that a plug rail is free of internal defects.

[5] *Batter* is the deformation of the surface of the railhead, usually close to or at the end of the rail.

About 4 1/2 hours before the train derailed, a westbound train (Q377-09) had traveled over the same track. Its lead locomotive had a forward facing image recorder.[6] The National Transportation Safety Board's Vehicle Recorder Division reviewed the recorder's video and audio of the derailment area. The rail at the point at which the accident train later derailed appeared on the recording to be shaded, which suggests that a rail segment was missing. The track ballast appeared to be darker than usual, consistent with the vertical movement of the rail joint and mud pumped onto the ballast. As the westbound locomotive passed over the dark spot, the locomotive deflected noticeably downward, and the wheels made a squealing and banging sound. The engineer of the westbound train said that the track at the dark spot had felt a little rough and that it had been that way for some time.

The CSX track inspector for the area said that during his normal twice-a-week track inspections he had conducted maintenance three times on this rail joint, which had initially been installed as a temporary fix on December 15, 2006. In early September 2007, he removed a compromise joint bar that had cracked and replaced it with a straight joint bar. On the Friday before the accident, he had had to raise, tamp, and re-spike the supporting rail joint crossties. During this effort, he noted that the rail ends exhibited rail end batter. During his last track inspection, 2 days before the accident, he had replaced one joint bar bolt. His statements regarding the three maintenance activities correlated with the information in the CSX's joint inspection records.

When the CSX installed the plug, it drilled 1 1/4-inch holes into the rail ends and fastened the joint bars to the ends with 1-inch-diameter bolts. For a 1 1/4-inch hole, the American Railway Engineering and Maintenance-of-Way Association recommends a 1 1/8-inch-diameter bolt. A bolt with a smaller diameter is more likely to allow longitudinal movement of the rail, which can result in a larger gap between the rail ends. As the gap between the rail ends widens, more impact force is transferred to the rail ends, which in turn creates additional rail end batter.

The CSX division engineer responsible for the overall track maintenance of the division said that the rail joint involved in the accident—the temporary joint[7]—had been installed about 10 months before the accident. However, he was not able to provide a date when the temporary rail joints would have been welded and the joint bars removed.

The Safety Board's Materials Laboratory examined the joint bars at the west end of the plug and found that one was a compromise bar and the other was a straight bar. (See figures 3 and 4.) When the track inspector changed the broken compromise joint bar in September, he incorrectly replaced it with a straight bar. The two types of bars have similar marks. The Materials Laboratory found that the straight bar had "132-136" in raised letters on its side, which means it could be used with either 132-pound rail or 136-pound rail. The compromise bar also had "132-136" in raised letters on its side. In addition, the compromise bar had one end that was stamped "132," and the other end was stamped "136."

[6] A *forward facing recorder* can digitally record views of tracks, crossings, and signals in front of a train. This recorder also recorded sounds.

[7] A temporary joint uses four bolts, instead of six bolts, to join a plug rail and the continuous welded rail ends. Also, the rail ends are suspended above the ballast and between the ties to allow for future welding.

Figure 3. Broken rail and joint bars from the west end rail plug joint at accident site.

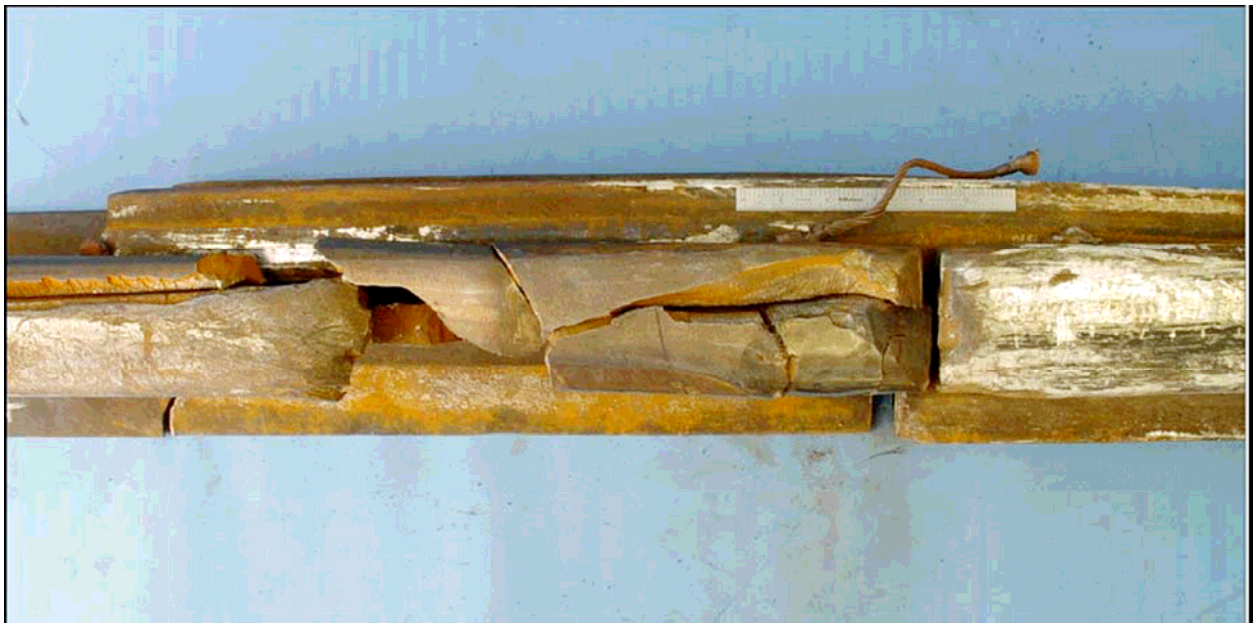

Figure 4. Reconfiguration of plug rail pieces from accident site.

In the Safety Board's Materials Laboratory, the 132-pound rail and the 136-pound rail were joined using a straight bar and a compromise bar similar to the accident joint. During the examination, the rail end of the 136-pound rail was found to be about 1/4 inch higher on the tread of the rail end than the tread end of the 132-pound rail. When tread rail ends are mismatched by 1/4 inch, Federal track safety standards require the track to be designated class 2

track, which reduces the maximum authorized speed of a freight train from 60 mph to 25 mph. Reducing a train's speed reduces wheel impact forces on uneven rail ends.

Operations Information

Train movements were governed by the signal indications of a traffic control system. The CSX's operating rules and timetable instructions provided specific instructions for train movements over the CSX's Great Lakes Division, Erie West Subdivision, where the accident occurred. Both train crewmembers had passed the CSX operating rules test in 2007. The train was operated in accordance with signal indications. The CSX's operating rules require train crews to report any unusual condition that may affect the safe, efficient operation of the railroad. The CSX's records of reported rough riding track conditions from March 8, 2007, through February 13, 2008, do not include any reports about the area of the derailment.

Emergency Response

The initial call for emergency assistance came from a local resident about 12:02 p.m., immediately after the accident. The first responders—2 chief officers and 17 firefighters—arrived at 12:09 p.m. The on-scene commander was the chief of the Painesville City Fire Department. He implemented an incident command system, which he located at Cherrywood, Ohio. Command, operations, hazardous materials personnel, and the police used different radio channels. After the initial response, most of the responders communicated via cellular telephone.

The derailment was not accessible from a public road. The emergency responders accessed the derailment from the south; they used ladders to cross the ditches. The closest hydrant was approximately 1,500 feet south of the derailment. The chief of the Painesville City Fire Department officially declared the fire under control on October 12, 2007, at 6:00 p.m.

Event Recorders

The accident train had a lead locomotive and a trailing locomotive; each locomotive had an onboard event recorder. The data from the two event recorders were downloaded at the accident scene. On October 17, 2007, the Safety Board's Vehicle Recorder Division analyzed the data and found that at the time of the derailment, the train had been traveling 48 mph and that there had been no unusual operating activities. (The maximum operating speed for freight trains over the accident area was designated by CSX as 50 mph.)

CSX Track Inspector

The CSX track inspector responsible for the track maintenance in the accident area began working for CSX on September 3, 1976, as a trackman. In 1979, he became a class II machine operator. In 1986, he was promoted to track foreman, and he also did various types of track maintenance. For about 13 years, he worked as a welder. During his CSX employment, he worked various track jobs. About 6 years before the accident, he became a track inspector on the accident territory.

The track inspector said that Mondays were his main track inspection days. On Mondays, he typically started his track inspection at CP 167 and inspected eastward. He usually traveled on main track 2 and inspected both main tracks simultaneously. He said that he usually worked about 3 hours of overtime each Monday. On Tuesdays, he inspected siding tracks. On Wednesdays, he inspected track switches. On Thursdays, he inspected main track again, but to the west, starting at CP 97 and usually traveling on main track 1. On Fridays, he inspected siding tracks and, sometimes, track switches. At the time of accident, he was responsible for inspecting and maintaining 928 rail joints.

Wayside Equipment Detectors

The train had passed five wayside equipment detectors before the accident. None had recorded an alarm.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the October 10, 2007, derailment of CSX Transportation freight train Q380-09 in Painesville, Ohio, was a broken rail due to a track inspector's installation of an incorrect type of rail joint bar. Contributing to the derailment was CSX Transportation's failure to weld the rail and, thereby, remove the temporary joint before the accident.

Adopted: June 1. 2009