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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 24, 1983

Forwarded to:

Mr. R. F. Stewart
Acting President
Illinois Central Gulf Railroad
233 North Michigan Avenue
Chicago, Illinois 60601

SAFETY RECOMMENDATION(S)

R-83-93 through -95

About 4:42 a.m. on March 22, 1983, 13 cars (including 3 tank cars and 10 boxcars) of Illinois Central Gulf Railroad Company (ICG) train SML-4-21, 1st No. 64, engine 702, derailed in a 2° left curve at Fort Knox, Kentucky, while moving about 28 mph over an excessively worn, badly shelled rail which tripped and broke. During the derailment, two tank cars containing chloroprene overturned and chloroprene began leaking from a dome valve of one of the cars. At 9:00 a.m., three E. I. DuPont hazardous material experts from Louisville, Kentucky, arrived at the derailment site. About 9:45 a.m., the leak was stopped. Evacuation of the area was not necessary. There were no injuries as a result of the accident. Damage was estimated at \$199,831. 1/

The flange marks on the web of the rail stopped abruptly at the first break in the rail. The batter marks on the piece of rail further indicates that the rail broke initially at that point and allowed the wheels of DUPX 20879 to move to the outside of the rail. Apparently when the wheel struck the railhead at the initial break, the impact force caused the rail to break at other points. Also when the rail broke, the unbroken rail reseated itself into position and provided usable rail for following cars. Wheel batter marks on portions of the railhead and web portions of other pieces of the broken rail indicate that the cars immediately following DUPX 20879 initially passed over the segmented rail and remained on the track until the emergency brake application. The broken rail then was displaced, and the following cars derailed.

Investigators determined that the initial break in the outside curve rail was caused by lateral force on the excessively worn, shelly rail. The break occurred at a detail fracture which resulted from shelling. The progressive fracture started from a longitudinal separation close to the running surface of the railhead and then turned downward to form a transverse separation substantially at right angles to the running surface. According to Sperry Rail Service's Rail Defect Manual, this condition is most frequently found on the gage corner of the railhead and is caused by metal flow at the gage corner of the head which breaks away and leaves a shallow cavity.

1/ For more information, read Railroad Accident Report—"Derailment of Illinois Central Gulf Railroad Company Freight Train, Fort Knox, Kentucky, March 22, 1983" (NTSB/RAR-83/7).

It is particularly important to maintain good cross level and good rail on the outside curve when there is no superelevation to compensate for the lateral forces by a train. When a train moves around a curve without superelevation, irregular cross level with low spots in the outside rail more readily tends to increase the lateral force applied to the outside rail of the curve.

Although the ICG's practice of maintaining 2° curves in main track without superelevation is not prohibited by American Railway Engineering Association (AREA) recommended practices, it is not a general industry practice. Former ICG curve superelevation requirements recommended 7/8-inch superelevation for a 2° curve over which trains were allowed to operate at 30 miles per hour.

When superelevation is not incorporated in a curve, the equilibrium speed is at or near zero miles per hour. Therefore, when trains are operated through a curve with no superelevation even at minimal speeds, rail condition and track geometry must be maintained at optimal values. The Safety Board believes that, in light of the stringent trackage maintenance requirements mandated by zero superelevation, the ICG should seriously consider the practice of elevating the outside rails of curves to compensate for less than optimal track conditions.

On July 25, 1980, train No. 64, the "chemical dispatch," consisting of 4 locomotive units and 17 cars, including 7 placarded tank cars containing hazardous materials, derailed in a 6° curve at Muldraugh, Kentucky. ^{2/} The train derailed about milepost 26.6, located about 5 miles north of Fort Knox. Two tank cars transporting vinyl chloride were punctured, and the contents were ignited and burned. Four crewmembers received minor injuries in the derailment, and about 6,500 persons were evacuated from the surrounding area. The Safety Board determined that the probable cause of the accident was "the tipping of the outside rail and widening of track gage in the 6° curve because of the combined effects of defective cross-ties, excessively worn rail, irregular alignment and gage, and the lateral forces produced by the train's speed. Inadequate maintenance and inspection practices of the Illinois Central Gulf Railroad allowed these conditions to remain uncorrected. Contributing to the accident was the inadequate Federal Track Safety Standards which failed to provide for a track structure commensurate with the permitted train speeds."

Following the investigation of the Muldraugh accident, the Safety Board recommended that the Illinois Central Gulf Railroad Company:

Establish and implement procedures to maintain mainline tracks and sidings to a level of safety not less than that which is prescribed by Federal regulations governing carrier-designated track classes.
(R-81-32)

On November 15, 1982, the ICG responded that a greater emphasis was being placed on track inspection programs and correction of defects by maintenance forces. The Safety Board accepted this action as responsive to the recommendation and classified it as "Closed—Acceptable Action." However, in the track near the site of the March 22, 1983, derailment, Safety Board investigators found low joints, loose track bolts, and a broken joint bar. Based on this evidence, the Safety Board believes the ICG management has

^{2/} For more detailed information, read Railroad Accident Report—"Illinois Central Gulf Railroad Company Freight Train Derailment, Hazardous Material Release, and Evacuation, Muldraugh, Kentucky, July 26, 1980" (NTSB-RAR-81-1).

shown a lack of compliance with its own track inspection and maintenance programs. The fact that the railroad's actions are contradictory to its stated intent as set forth in the November 18, 1982, response is of great concern to the Safety Board. Therefore, the Safety Board is of the opinion that the thorough review of the qualifications of the ICG track inspectors, their lengths of assigned territories, and the methods used in inspecting the track is needed to be certain that an adequate inspection and maintenance program is ongoing which will improve the safety of train operations.

The ICG's track inspection procedures conforms to Section 213.233. Track inspections, and 213.235, Switch and Track Crossing Inspections, of the Federal Track Safety Standards. The Safety Board is aware that most or all of the major railroads conduct track inspections using either a hy-rail vehicle or a motor car traveling about 15 mph to detect track abnormalities. Although this procedure is allowed under the Federal Railroad Administration's (FRA) track safety standards, only easily visible or glaring defects, such as missing track bolts or a highly visible broken rail can be detected from a moving vehicle. It may be coincidental, but ICG train derailments in the Fort Knox area occurred on track located between switches and track frogs which may indicate that because track inspectors are required to slow or stop the inspection vehicle for a standing inspection of these components the procedure produces better results. Therefore, the Safety Board believes that the ICG, and for that matter all railroads, can enhance their track inspection procedures by requiring track inspectors to systematically walk sections of the track, including areas through curves so as to observe track conditions more critically.

As a result of the Muldraugh accident, the Safety Board also recommended that the ICG:

Establish and implement track maintenance standards which designate the limit of acceptable rail wear and which require rail removal when worn beyond the acceptable limits. (R-81-33)

On November 15, 1982, the ICG responded that it had issued Special Instruction T-10-82 entitled "Curve Worn Rail." Special instruction T-10-82 paragraph 3, Instruction, states the following:

At such time as any track rail in main track service has worn to the extent that 1/4" of the design section metal has been removed at the gage line, the Track Supervisor shall notify the Division Engineering Manager in writing noting the following:

1. Location, by Mile Post to the tenth of a mile.
2. Wear at Gage Line.
3. Weight of Rail
4. Year Layed

The Safety Board acknowledged the issuance of Special Instruction T-10-82, and based upon its content believed that the ICG fulfilled the intent of recommendation R-81-33, even though the instruction did not specify that the worn rail be removed from service. Therefore, recommendation R-81-33 was classified as "Closed--Acceptable Action." During the investigation of the Fort Knox accident, however, ICG supervisory personnel who were asked about the instruction which specified the maximum allowable rail wear stated that they were not aware of the special

instruction. Based on statements of the supervisory personnel, the Safety Board believes that the special instructions have not been widely circulated and that the importance of the instruction has not been brought to the attention of supervisory personnel and track inspectors that would ensure enforcement.

The curve rail at Fort Knox was worn about 7/8 inch which is over three times more than the 1/4-inch maximum wear allowed in Special Instruction T-10-82. As previously discussed, wear on the rail head changes the design characteristics of the rail and its response to loading is different. Also, the current trend toward railroad's transporting heavier loads and using heavier locomotives places greater stress on lighter rails. The railhead wear exhibited on the curve rail at Fort Knox indicated that the margin of safety was decreased and that the rail's load carrying capability was well below the limits imposed by the design criteria. Excessive wear also leads to shelling which is conducive to detail fractures. The Safety Board is aware that following the Muldraugh accident, the ICG implemented a program to replace excessively curve worn rails in the sharper curves on the Louisville District and that the curve rails with less curvature are to be replaced after work has been completed on the more severe curves. However, the Safety Board believes that the ICG must expedite this program and urges it to replace the curve worn rails.

Therefore, as a result of its investigation, the National Transportation Safety Board recommends that the Illinois Central Gulf Railroad Company:

Expedite the program for the replacement of rails in curves and all rails that fall within the criteria established by the Chief Engineer Maintenance of Way Department set out in Special Instruction T-10-82. (Class II, Priority Action) (R-83-93)

Reestablish the practice of superelevating main track curves where it has been discontinued. (Class II, Priority Action) (R-83-94)

Upgrade the maintenance level of the track in the Louisville District to meet fully the Federal Railroad Administration's Track Safety Standards for Class 3 track. (Class II, Priority Action) (R-83-95)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY and ENGEN, Members, concurred in these recommendations. McADAMS, Member, did not participate.


By: Jim Burnett
Chairman