

R-431E

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 28, 1983

Forwarded to:

Honorable Robert Blanchette
Adminstrator
Federal Railroad Administration
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

R-83-14 through -16

About 9:50 p.m., P.s.t., on Thursday, January 7, 1982, Southern Pacific Transportation Company (SP) freight train No. 01-BSMFF-05, derailed 14 cars at Thermal, California, while traveling about 57 miles per hour on the tangent single main track. Four transients riding on the train were seriously injured, a fifth transient died as a result of injuries. No crewmembers were injured as a result of the accident. The presence of radioactive material in the derailed Trailer-On-Flat-Car train was discovered about 1 hour after the accident occurred, resulting in the handling of the emergency response effort as a serious radiological emergency. Contributing to misdirected emergency response efforts was erroneous and conflicting information concerning hazardous material on the train. Accurate information regarding the precise nature of the radioactive material shipment was not available at the accident site until about 5 hours after the derailment occurred; at that time, radiological emergency procedures were terminated. Damage was estimated to be about \$1,015,350. 1/

Metallurgical analysis of the broken rail indicated that two of the fractures were detail fractures which originated from shelling. Shelling is a condition which occurs when contact stresses between wheels and the railhead exceed the elastic limit of the steel, and can result in deformation and subsurface shear in the railhead. The subsurface shear normally originates in a longitudinal plane, but then turns downward to a transverse plane. Detail fractures are unique in contrast to other transverse defects because they are not the result of metallurgical factors such as inherent inclusions in the rail steel. Rather, they are the result of the excessive contact stresses of heavy wheel loads over an extended time frame, and as such are fatigue-related defects. The growth of a detail fracture from shelling occurs rapidly in contrast to other transverse fissures. The remaining rail fractures were caused by instantaneous overstress, which probably occurred during the derailment. The fact that the rail fracture surfaces displaying detail fractures were battered also indicated that the detail fractures preceded the instantaneous overstress fractures. Although the precise moment of the rail failure could not be established, the signal's momentary flash from green (clear) to red (stop) to green (clear), as train No. 01-BSMFF-05 approached, indicated a momentary disruption of the signal circuit, which was conveyed through the rails. The dynamics imposed on the rails by the approaching train could have caused a slight longitudinal motion of the rails inducing the momentary disruption of the signal circuit. The Safety Board believes that the initial rail failure most likely occurred before the passage of train No. 01-BSMFF-05.

1/ For more detailed information, see Railroad Accident Report--"Derailment of Southern Pacific Transportation Company Train No. 01-BSMFF-05, Carrying Radioactive Material, at Thermal, California, January 7, 1982" (NTSB-RAR-83-1).

The shelling condition precipitating the detail fractures was visually evident and should have served as a warning to SP of a potential rail failure. At the time of the accident, Section 213.113(b) of the Federal Railroad Administration's (FRA) Track Safety Standards prescribed the remedial action to be taken when shelly spots became evident in rails. The prescribed remedial action depended on the track inspector's subjective determination of whether or not the condition required that the rail be replaced. If the inspector decided that the shelling condition required that the rail be replaced, a 20-mph speed restriction was to be imposed and the rail was to be scheduled for replacement. If the inspector decided that the condition did not require that the rail be replaced, the rail then had to be inspected for internal defects at intervals of not more than every 12 months. Since the carrier determined that the rail did not require replacement and had inspected the rails for internal defect conditions on April 27, 1981, it considered itself to be in compliance with the Federal regulations. The degree or limits of surface defects listed in Section 213.113(b) are not defined by the FRA. The condition becomes a deviation from the FRA track standards only if the track owner's designated inspector decides that the rail condition is serious enough to require replacement of the rail. In this regard, the FRA track standards can have the effect of tacitly condoning excessive delay by a railroad in the replacement of defective rail.

On April 27, 1981, the SP inspected the rails for internal defects to comply with Section 213.237 of the FRA's Track Safety Standards, which require that once a year a search for internal defects be made on Classes 4 through 6 track. The report of that inspection contained a footnote stating, ". . .cut off work. . .acct. too many defects. . . ." The discovery of 10 separate internal rail defects within the 15 miles of track internally inspected on April 27, 1981, should have served as a warning that the rails were approaching their service life limits for main track use and would require more frequent internal inspection for defects in order to assure continued safe use of that rail. Although there is no standard method to determine the point at which the rate of rail fatigue failures indicates an approaching limit on safe operation, the Safety Board believes that owners of track need to recognize the risks associated with train operations on rails containing internal defects, and especially for rails which have been subjected to gross tonnage of the magnitude carried on the SP's main track at Thermal.

The Safety Board investigated a derailment of a freight train at Grande, New Mexico, on May 9, 1981, which was caused by detail fractures in the rail. The broken rail in that accident had been internally inspected for rail flaws less than 3 months before the accident occurred, but the inspection did not discover the detail fractures in the rail. A visual track inspection performed earlier in the day of the accident did not reveal any defects. The rails at that location had also been subjected to heavy gross tonnages in unit ore train operations. The rail showed evidence of head checking, which is a condition that also precipitates rail failure by detail fractures.

The Safety Board believes that these types of occurrences indicate that the FRA should reassess Paragraph 213.113 of the Track Safety Standards, "Defective Rails," with regard to detail fractures and their diagnosis to provide for the integrity of high speed main tracks through effective internal and visual inspection of rails. Currently, prescribed remedial actions depend on the subjective evaluation of the track owner's determination of need for rail replacement. The Safety Board concludes that a defined limit of allowable external rail conditions, which serves as a warning of potential rail failure, and that more frequent internal rail defect inspections of rails that have had histories of detail fracture are required.

The Safety Board has made several recommendations to the FRA regarding the detection of defects. As a result of a Special Study regarding broken rails, the Safety Board recommended that the FRA:

Study the factors that affect rail failures and develop criteria that will promote effective rail inspection procedures and regulations. (R-74-4)

The recommendation has been placed in a "Closed--Unacceptable Action" status. The FRA initially responded that studies in fracture mechanics and investigation of rail failures would be implemented to generate data to be used in the development of standards. On June 25, 1981, the FRA withdrew its Notice of Proposed Rule Making (NPRM) stating it was not at that time practicable to develop final rules on the basis of that NPRM.

As a result of an accident which occurred at Belt, Montana, on November 26, 1976, the Safety Board recommended that the FRA:

Revise 49 CFR 213.237, Inspection of Rail, to ensure the discovery of internal defects in all tracks, Classes 3 to 6, inclusive, before those defects develop into failures. (Class II, Priority Followup) (R-77-29)

The recommendation has been placed in a "Closed--Unacceptable Action" status. The FRA initially responded that it was undertaking a number of projects that would specifically address internal rail defects, and that based on comments from a public hearing and research results, amendments would be proposed. On June 25, 1981, the FRA withdrew its NPRM stating it was not at that time practicable to develop final rules on the basis of that NPRM.

As a result of an accident which occurred at Glacier Park, Montana, on March 14, 1980, the Safety Board recommended that the FRA:

Amend track safety standard 49 CFR 213.241, Inspection Records, to require railroad inspectors to list on their inspection records the location of rails which exhibit the external conditions listed in subpart (b) of 49 CFR 213.113, Defective Rails, and the remedial action they have taken. (Class II, Priority Action) (R-80-32)

The recommendation has been placed in a "Closed--Unacceptable Action" status. The FRA responded that "... Section 213.241 of the Federal Track Safety Standards already requires railroad inspectors to record the location and nature of any deviation from the requirements and the remedial action taken." The Safety Board notes, however, that the external conditions cited in Section 213.113(b) are not deviations until the track owner's designated inspector decides that the condition requires rail replacement, and that the degree or limits of the external conditions are not defined by the FRA.

On February 18, 1982, the FRA published NPRM "Track Safety Standards; Miscellaneous Amendments," Docket No. RST-3, Notice No. 3. The FRA proposed in that NPRM to eliminate Section 213.113(b) and Section 213.113(c) (12 through 14), among other revisions and deletions. The Safety Board believes that this action will adversely affect the safety of train operations and that accident history requires the FRA to strengthen and clarify its Track Safety Standards, rather than weaken them. The Safety Board expressed this view in testimony before and in correspondence with the FRA relative to

the NPRM. On September 7, 1982, the FRA published the revised Track Safety Standards, which among other revisions and deletions, eliminated the existing Section 213.113(b) and Section 213.13(c) (12 through 14).

The Safety Board concludes that in view of these recent revisions to the Track Safety Standards, the benefits of safety require the establishment of a model plan of recommended inspection practices for the use of industry employed inspectors to provide for a safety factor in track that the present standards do not provide.

As a result of its investigation of this accident, the National Transportation Safety Board recommends that the Federal Railroad Administration:

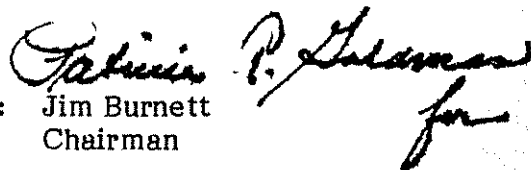
Develop, validate, and implement a model plan of recommended inspection practices containing clearly defined limits of allowable track structure conditions for the use of industry employed railroad track inspectors to facilitate uniform and knowledgeable appraisals of defective track structure conditions. (Class II, Priority Action) (R-83-14)

In conjunction with the Association of American Railroads, the Federal Highway Administration, the American Trucking Associations, Inc., and the Research and Special Programs Administration, develop, validate, and urge implementation of a model plan for use by railroads and motor carriers to make certain that waybills for Trailer-On-Flat-Car and Container-On-Flat-Car shipments containing hazardous materials include accurate information regarding the contents of the trailers and/or containers. (Class II, Priority Action) (R-83-15)

In conjunction with the Federal Highway Administration, initiate a regulatory compliance study which samples Trailer-On-Flat-Car and Container-On-Flat-Car shipments designated as Freight-All-Kind to determine if those shipments contain hazardous materials and take enforcement action as required in those cases of noncompliance. (Class II, Priority Action) (R-83-16)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and McADAMS, BURSLEY, and ENGEN, Members, concurred in these recommendations.

By: Jim Burnett
Chairman

A handwritten signature in cursive script, appearing to read "Jim Burnett", written over the typed name and title.