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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

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President and Chief Executive Officer
Association of American Railroads
1920 L Street, N.W.
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SAFETY RECOMMENDATION(S)

R-85-86

About 7:15 a.m. on February 23, 1985, Seaboard System Railroad (SBD) train No. 690, en route from Savannah, Georgia, to Augusta, Georgia, derailed while travelling westbound at about 53 mph on a single main track at Jackson, South Carolina. The accident resulted in the derailment of 29 cars, including 8 DOT specification 111A100 W tank cars laden with cyclohexane, a flammable liquid. All of the tank cars were severely damaged and their contents were ignited. The release of the hazardous material led to the evacuation of all residences within a 1-mile radius of the accident site. Although no injuries resulted from the accident, preliminary estimates of property damage exceed \$2 million.

The engineer and head brakeman of train No. 690 stated that they felt and heard their locomotive strike something on the track immediately before the accident. After the derailment, a cushion underframe 1/ unit (cushion unit) was found in the vicinity of the initial point of derailment; the unit's female portion was found inside the track gage and the male portion was found outside the track gage. About 5 hours before the accident, an eastbound freight train containing cushion underframe boxcar SBD 156678 had passed over the track. A postaccident inspection of boxcar SBD 156678 revealed that the cushion unit and a brake rod were missing, among other damage. The support plate assembly which retains the cushion unit was missing and broken portions of only three securement bolts were found in place. The brake rod from boxcar SBD 156678 later was found just east of the site where train No. 690 derailed.

On December 4, 1984, the original cushion unit on boxcar SBD 156678 was replaced at the SBD's mechanical repair shop at Charlotte, North Carolina. According to Rule 59 of the Field Manual of the Association of American Railroads Interchange Rules, the replacement unit, designated as a FREIGHT-SAVER 20B and manufactured by Joy Manufacturing Company, was an acceptable replacement for the original HYDROFRAME 40 unit, which had been manufactured by Pullman Standard. The primary dimensional difference between the units is in the cushion unit end caps: the HYDROFRAME 40 end cap thickness is a nominal 2 1/2 inches, while the FREIGHT-SAVER 20B end cap thickness is a nominal 1 7/16 inches. The cushion unit is located within a pocket in the center sill of

1/ The term "cushion underframe" refers to an energy absorption device installed on some rail cars to minimize the effects of compressive and tensile forces in a train which can damage lading and equipment.

the car and secured by a steel carrier plate affixed with 16 bolts. At Charlotte, the securement bolts were burned off with a torch, the carrier plate was removed, and the failed HYDROFRAME 40 unit was replaced with the FREIGHT-SAVER 20B unit later found at the accident site. The carrier plate was then re-installed using 16 hex-head common bolts which were torqued in place with an impact air-wrench. The boxcar then was returned to revenue service.

Boxcar SBD 156678, which originally was built by Pullman Standard, Inc., was one of a series of similar cars manufactured for a predecessor of SBD in 1967 and 1968. A design modification performed by Pullman Standard in 1967, consisted of shortening one end of the carrier plate approximately 5/8 inch, welding a length of angle iron to the shortened end of the carrier plate, and bolting a 5/8-inch spacer shim to the angle iron. The bolt holes in the carrier plate were elongated to facilitate installation of the carrier plate to the fixed sill of the rail car. The modification was performed to improve the service characteristics of the cushion unit. The SBD personnel who performed the December 4, 1984, repairs at Charlotte could not recall with certainty whether the modification had been performed on boxcar SBD 156678; the carrier plate was not found after the accident.

Subsequent to the accident, the SBD forwarded boxcar SBD 156678 to its testing facility and heavy repair shops located at Waycross, Georgia. The car then was restored to the same condition that it was reported to be in before the derailment. A new carrier plate was fabricated in accordance with Pullman Standard drawings. The drawings did not indicate the addition of the angle iron or the spacer shim; however, they did indicate the carrier plate modification which shortened it by 5/8 inch at one end. The carrier plate was installed using 16 hex-head common bolts. During the test procedure, boxcar SBD 156678 was impacted from either end to simulate train service conditions. After several impacts, the gas pressure in the cushion unit had reduced; the cushion unit's pressurization affects the unit's designed capability to center itself and the car's sliding sill apparatus. Following additional reduction in pressure and further impacts, the cushion unit lost centering ability. After still further impacts, the cushion unit end cap wedged between the fixed draft stop and the carrier plate at that plate's shortened end. The next impact resulted in the shearing of 1 of the 16 bolts and the canting of the remaining bolts in the elongated bolt holes in the carrier plate. The next impact resulted in the shearing of the remaining bolts and the loss of the carrier plate. Further movement of boxcar SBD 156678 resulted in the loss of the cushion unit, which fell into the track gage.

During a review of these test procedures with representatives from Joy Manufacturing, the SBD, the Federal Railroad Administration, and Safety Board investigators, Pullman Standard representatives advised that askew head high strength bolts or high strength bolts with wedged washers should be utilized in securing the carrier plate in place in order to properly compensate for the fixed sill flange taper. At the time of the review, it was noted that the cushion unit pocket was 1 inch longer than specified in the construction drawings and that the car showed signs of previous heavy repair or overhaul. The Pullman Standard representative advised Safety Board investigators that the permissible dimensional tolerances of such equipment within specification could result in a gap of 1 7/16 inch between the fixed draft stop and the end of a modified (shortened) carrier plate.


Pullman Standard has advised the Safety Board that since 1967 it has built about 12,000 freight cars with similarly configured cushion units. Pullman Standard and Joy Manufacturing also advised the Safety Board that a normal service life cycle for the cushion unit is 10 to 20 years. The Safety Board is concerned that failures of the cushion units carry the potential for derailments with catastrophic results.

The SBD has advised the Safety Board that it has begun an inspection on all of its freight cars which may have had the Pullman Standard, Inc., cushion unit replaced with a Joy Manufacturing Company cushion unit, and, in such cases where replacement has been made, the SBD will replace the carrier plate with a longer carrier plate designed to eliminate any gap between the carrier plate and the fixed draft stops.

Therefore, the National Transportation Safety Board recommends that the Association of American Railroads:

Urge its membership to inspect promptly all cushion underframe freight cars which have had original equipment Pullman Standard, Inc., cushion underframe units replaced with Joy Manufacturing Company cushion underframe units to determine whether carrier plates are fitted which eliminate any gap between the carrier plate and the fixed draft stops and to install longer plates where necessary. Provide the Safety Board a report of the number of freight cars found by each member railroad to require longer carrier plates and an estimated completion time for replacement. (Class II, Priority Action) (R-85-86)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in this recommendation.

By: 
Jim Burnett
Chairman