

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 27, 1972

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 29th day of June 1972

FORWARDED TO:)
Director)
Office of Hazardous Materials)
Department of Transportation)
Washington, D.C. 20590)

SAFETY RECOMMENDATION R-72-²⁵~~34~~

The movement of highway trailers on railroad flatcars, commonly referred to as piggyback or trailers on flatcars (TOFC), has increased from a relatively small number in the 1950's to 3,061,062 trailers and containers in 1970. Some of these trailers have been moved from origin to destination on flatcars, and others have been moved varying distances on the highway in combination with the railroad trip.

There are hazards in this mode of transportation which can be eliminated or reduced. Recognition of these hazards and an evaluation of the risks may prevent a serious accident in the future.

Federal regulations do not specify design strength of semitrailers in use on highways. However, 49 CFR 393.85, which requires protection against penetration of the cargo-compartment wall when the vehicle is subjected to maximum braking deceleration, is being revised, effective January 1, 1973, to require a front-end structure capable of resisting penetration by any item of cargo that contacts it when the vehicle decelerates at a rate of 20 feet per second per second. There will be a comparable requirement for blocking and bracing cargo not firmly braced against a front-end structure that meets the requirements of Section 393.85(e).

Federal regulations (49 CFR 174.526) require (1) that class A and B explosives in trailers on flatcars be loaded, blocked, and braced within the trailer and (2) that the trailer be secured on the flatcar so that the trailer and lading will not change position under an impact from either end of at least 8 miles per hour. Section 174.532, "Loading other hazardous materials," refers the shipper to Bureau of Explosives Pamphlet No. 6 for recommended methods of blocking and bracing articles in trailers on flatcars and states: "Ends, side walls, or doors of truck bodies or trailers shall not be relied upon to prevent the shifting of heavy loads unless adequately designed."

The Truck Trailer Manufacturers Association recommends that the kingpin of a 60,000-pound trailer designed for TOFC service be able to withstand a horizontal shear load in the forward direction of 3.5 g. Tests by manufacturers of trailer hitches indicate that an 8-mile-per-hour impact by a flatcar loaded with two 60,000-pound trailers (gross weight 210,000 pounds) will develop a load about 3.5 g at the kingpin. Thus, an anticipated 8-mile-per-hour coupling between railroad cars will produce an acceleration impact upon the trailer about 5.6 times as great as the impact required to be withstood without penetration of cargo-compartment walls under 49 CFR 393.85.

As stated in 49 CFR 174.533, the trailers on flatcars containing hazardous materials "must be of such design and so loaded that they will not rupture or become seriously damaged under conditions normally incident to transportation." The "conditions normally incident to transportation" are not defined.

The conditions and placards required for highway trailers hauling hazardous materials are specified in 49 CFR 177.823. Except in the case of Class A and B explosives and certain radioactive material, a highway trailer may haul up to 1,000 pounds of hazardous materials without a placard. In contrast, 49 CFR 174.540 requires that freight cars with one or more packages of hazardous materials requiring labels (as prescribed by Section 173.408 and by Section 173.402(a)(2)) must be placarded with a "Dangerous" or with a "Poison Gas" placard.

Sections 174.510 and 177.817 require that a carrier "not accept for transportation nor transport any hazardous material subject to the regulations in this chapter unless that article is described on the shipping paper by the shipping name prescribed in 172.5 of this chapter and by the classification prescribed in 172.4 of this chapter." These sections require further that the conductor of each train and the driver of each motor vehicle transporting hazardous materials must have in his possession a copy of the shipping papers.

The National Transportation Safety Board is concerned about the differences in requirements for trailers specified for highway use and those specified for piggyback service. Shippers of mixed freight may load hazardous materials into highway trailers which may not be adequate for "conditions normally incident to transportation" by rail. It is also conceivable, because of the difference in requirements, that a shipper may load up to 1,000 pounds of hazardous materials in a highway trailer without placards and that later, this trailer may be loaded on a flatcar for part of its trip. In that case, a railroad carrier unknowingly may find itself "humping" an inadequately designed trailer containing hazardous materials. When one considers that many times the rail carrier receives trailers loaded with mixed freight accompanied by shipping papers which describe the contents as FAK (freight all kinds), the problem becomes more real.

Although we do not know of a trailer accident in railroad service which has resulted in a catastrophe, normal switching impacts may induce stresses on highway trailers which exceed their design capabilities. The railroad industry has learned from the use of impact recorders that many freight cars in normal service are frequently subjected to impacts of 8 miles per hour. It was reported in Railway Age, March 27, 1972 ("How Santa Fe and Admiral 'get it there safely' ") that "...use of impact recorders has told Midwest that an average car shipped gets 26 impacts, mostly in the 4- to 6-mph range but with a few over 6 mph. In fact, about two-thirds of these cars will get an impact at 8 mph. And about one-third will be whacked at over 9 mph." Occasionally, malfunctioning hump equipment allows impact speeds exceeding 10 miles per hour. Loaded trailers not designed primarily for railroad piggyback service do not always withstand the overspeed impacts.


The regulations to which this document refers do not appear to provide adequate safety when transporting hazardous materials in trailers on flat-cars. The trailer designers and the railroad industry have recognized that a condition normally incident to transportation by rail requires a trailer that is structurally stronger than the normal trailer designed primarily for highway use. Impacts of even 6 miles per hour, which occur frequently in switching railroad cars, impart stresses to trailers which exceed those for which normal highway trailers are designed.

The Safety Board recommends that:

(72-25) The Office of Hazardous Materials, in cooperation with the Federal Railroad and Highway Administrations, make a review of the practices of shipping, and if the need is indicated, amend the regulations to minimize the probability of transporting by rail hazardous materials in trailers which are not structurally designed to withstand the normal conditions of rail transportation and to prescribe proper labeling and documentation for such trailer shipments.

This recommendation will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Reed, Chairman, McAdams, Thayer, Burgess, and Haley, Members, concurred in the above recommendation.

By: 
John H. Reed
Chairman