

I-47A

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: April 28, 1982

Forwarded to:  
Mr. Robert W. Grant  
President  
National Fire Protection Association  
Batterymarch Park  
Quincy, Massachusetts 02269

SAFETY RECOMMENDATION(S)

I-82-6

On March 25, 1981, at Enos, Indiana, a railroad flatcar which had derailed struck three of four 1,000-gallon farm truck tanks loaded with anhydrous ammonia parked near the mainline tracks. The flatcar breached two of the tanks, opening a tear in one tank and shearing off all of the valves from a second. Ammonia escaped and mixed with fog, drifted across a divided highway 1/4 mile away, obscured motorists' vision, and led to multiple motor vehicle crashes. As a result of the accident, the train conductor and a motorist died and the rear brakeman and two motorists were injured. The distance from the tanks to the track ranged from about 19 to 40 feet. The flatcar traveled 65 feet from the track before coming to rest.

On November 26, 1976, in Belt, Montana, one of a number of derailed railroad cars struck a 16,000-gallon gasoline storage tank; in the ensuing fire the entire bulk storage plant burned; 2 persons were killed and 24 others were injured as a result. <sup>1/</sup> The tank was located about 42 feet from the mainline track; several of the derailed cars traveled more than 100 feet from the track.

While the farm truck tanks and the storage tank at Enos and Belt were far enough away from the tracks to provide adequate clearance for normal train operations, they were not far enough away to prevent them from being struck by the derailed cars. No specific protection against damage by derailed cars was provided or required. At both Enos and Belt, the hazardous materials tanks were on property leased from the railroad.

In both cases the hazardous materials tanks complied with regulations, codes, and contract requirements regarding minimum clearance and construction. The farm truck tanks involved in the Enos accident were built in accordance with the American Society of Mechanical Engineers Boiler and Pressure Code. The boundary of the carrier's right-of-way at Enos was 18 feet from the mainline tracks; the farm truck tank were at least 19 feet from the tracks, in compliance with the terms of a 1963 contract between the carrier and the facility operator.

<sup>1/</sup> "Railroad Accident Report: Derailment of a Burlington Northern Freight Train, Belt, Montana, November 26, 1976" (NTSB-RAR-77-7).

Apart from the minimum clearance requirements in the Enos lease, the American National Standards Institute (ANSI), in its consensus standard K 61.1 - 1972, specifies a 25-foot minimum distance from the mainline of railroads for storing 1,000-gallon anhydrous ammonia containers. The Milwaukee Railroad, which was operating the train which derailed on Conrail tracks at Enos, requires at least a 20-foot clearance for 1,000-gallon above-ground anhydrous ammonia tanks along Milwaukee Railroad rights-of-way. 2/

The above-ground storage tanks in the Belt accident were inspected by the State fire marshal and found to be in compliance with National Fire Protection Association (NFPA) No. 30, "Flammable and Combustible Liquids Code" which prescribes 20 feet as the minimum distance for 16,000-gallon above-ground fuel storage tanks from adjoining property. The Association of American Railroads (AAR), in its Bureau of Explosives Circular No. 17, incorporates this provision of NFPA No. 30.

State statutes and administrative orders usually do not prescribe specific separation or other safeguards for bulk hazardous materials stored along railroad rights-of-way. A 1951 Indiana statute established an 8-foot general horizontal track clearance requirement primarily for train crew protection. In Montana, Railroad Commissioners' Order 2597 established a similar general horizontal clearance requirement of 8 feet 6 inches. Thirty-eight other States have established similar general clearance requirements ranging from 8 feet to 12 feet. 3/

In 1976, the Safety Board began recording the maximum lateral distance traveled by derailed cars after they leave the track. The results of such measurements from 298 NTSB investigations from 1976 to 1979 follow:

| MAXIMUM DISTANCE<br>TRAVELED BY<br>A DERAILED CAR<br>(Ft) | NUMBER OF<br>ACCIDENTS |
|---|------------------------|
| 1-10  | 39                     |
| 11-20   | 33                     |
| 21-30   | 28                     |
| 31-40   | 29                     |
| 41-50   | 46                     |
| 51-60   | 31                     |
| 61-70   | 25                     |
| 71-80   | 24                     |
| 81-90   | 9                      |
| 91-100  | 15                     |
| 101-110   | 2                      |
| 111-120   | 2                      |
| 121-800   | 15                     |

2/ "Chicago, Milwaukee, St. Paul, and Pacific Railroad Company: Rules and Specifications Governing the Location, Construction and Operation of Loading Apparatus, Unloading Apparatus, Storage Tanks and Buildings Used for Storage and Handling of Flammable Liquids, Liquids Emitting Flammable Vapors, Compressed Gases and Other Hazardous Liquids Transported in Tank Cars or Other Containers." Red Book, January 1, 1948.

3/ American Railway Engineering Association Manual for Railroad Engineering, "Legal Clearance Requirements," 28-3-25, 1975.

Based on The Safety Board's measurements, in more than half of these derailments hazardous materials placed as close to the tracks as the hazardous materials in Belt could have been struck. Had hazardous materials been placed as close as those at Enos, they could have been struck by derailed cars in three-fourths of the accidents. Storage tanks 8 feet from tracks would have been vulnerable to damage by derailed cars in over 90 percent of the 298 accidents investigated by the Safety Board. (See figure 1.)

The Safety Board also investigated a 1979 accident in which derailed freight cars damaged mobile living cars for railroad maintenance-of-way workers, temporarily parked as close as 18 feet from the main track. While none of the workers in the cars were seriously injured, the foregoing derailment data suggest that trackside placement of such temporary facilities could be hazardous to the occupants. At that distance, they could have been struck by derailed cars in three-fourths of the accidents surveyed.

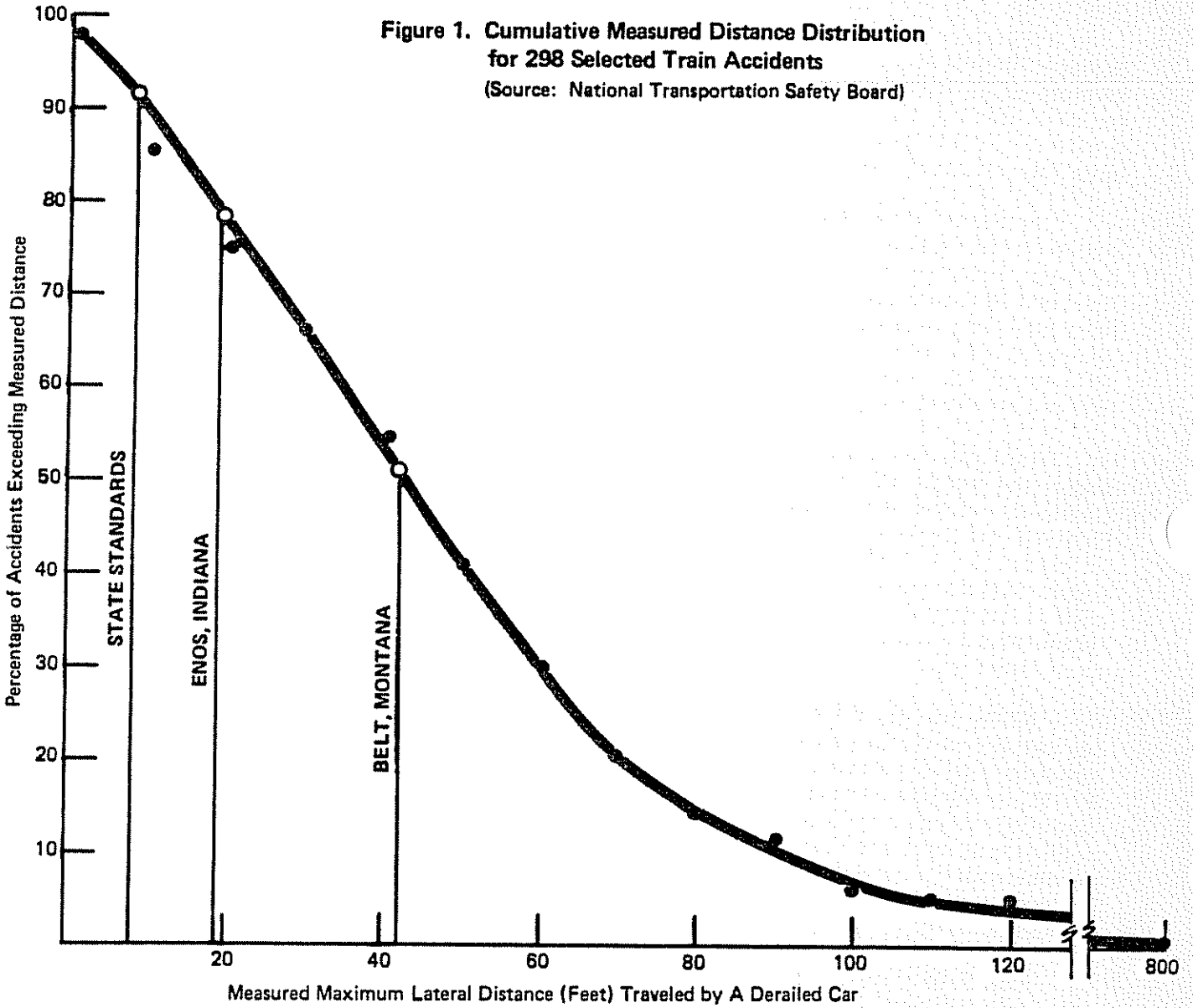
The Safety Board could not determine the extent to which hazardous materials are stored in vulnerable locations near railroad tracks because records are not available. However, industry and carrier representatives have indicated to the Safety Board that the Enos and Belt storage locations were not unique. The Safety Board recognizes that there have been few serious derailments involving hazardous materials storage; however, the accidents and data cited suggest that railroads should reevaluate existing requirements influencing the location and protection of hazardous materials storage near mainline railroad tracks to assure that the risks such storage poses are adequately controlled.

Railroads can control the location of hazardous materials storage on their property under the terms of leases they negotiate for use of the property by other parties. However, railroads have little control over storage on property that is beyond railroad right-of-way boundaries. Storage on property beyond railroad right-of-way boundaries is addressed by a NFPA code and ANSI standards. State track clearance statutes or regulations can affect storage on and beyond right-of-way boundaries. Therefore, these organizations and State authorities also should reevaluate their standards or statutes and regulations to more effectively control the risks of hazardous materials storage adjacent to rights-of-way.

NFPA No. 30, a standard known as the Flammable and Combustible Liquids Code, is recommended for use as the basis of legal regulations, and has been judged suitable for adoption and enforcement. Bureau of Explosives Circular 17, by referencing NFPA No. 30, recognizes this standard for use by the railroads. Safety Board data showing distances traveled by derailed cars in serious train accidents and the circumstances of the accidents at Belt and Enos indicate that NFPA No. 30 should be reevaluated to assure that recommended above-ground tank locations and other code provisions provide adequate protection for hazardous materials storage against derailed railroad cars in train accidents.

The Safety Board is recommending that the AAR reevaluate existing practices and standards influencing the location of hazardous materials storage along rights-of-way and that the National Association of Regulatory Utility Commissioners and the ANSI reevaluate relevant statutes, orders or regulations. Since these recommendations are all closely related to NFPA requirements, the Safety Board is recommending that the AAR coordinate its reevaluation with your organization, to assure consistency among all the practices, standards, statutes, and regulations which will be applicable in the future.

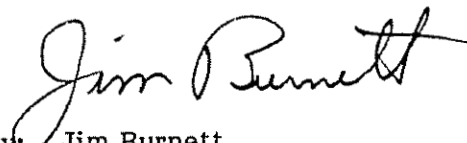
Figure 1. Cumulative Measured Distance Distribution for 298 Selected Train Accidents  
(Source: National Transportation Safety Board)



Therefore, the National Transportation Safety Board recommends that the National Fire Protection Association:

Reevaluate National Fire Protection Association No. 30 "Flammable and Combustible Liquids Code" to assure adequate protection of hazardous materials storage located near mainline railroad tracks against derailed railroad cars in train accidents. (Class III, Longer Term Followup) (I-82-6)

BURNETT, Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

A handwritten signature in cursive script that reads "Jim Burnett". The signature is written in black ink and is positioned above the typed name and title.

By Jim Burnett  
Chairman