Log N-360

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 10, 1983

Forwarded to:

Honorable Howard Dugoff
Administrator
Research and Special Programs
Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

H-83-29 and -30

About 12:45 a.m., c.s.t., on March 9, 1983, a rubber-lined MC312MS (49 CFR Sections 178.340 and 178.343) cargo tank semitrailer separated through its lower midsection and released its entire load of 5,000 gallons of hydrochloric acid on State Route 287 near Beaumont, Texas. The incident occurred while the vehicle combination was traveling over the highway. No other vehicles were involved, and no unusual vehicle handling problems had been encountered. The truckdriver and a responding police officer suffered acid burns. The highway was closed for 5 hours to clean up the acid spill.

The National Transportation Safety Board examined the cargo tank at the manufacturer's facility in Springfield, Missouri, on March 14 and 15, 1983. The cargo tank was 36 feet long and 58 3/8 inches in diameter, and had 8 longitudinally spaced, hat section type, circumferential ring stiffeners at 51-inch intervals. Each ring stiffener had a 3/8-inch-diameter drainage hole at the bottom. The tank separated around the lower 8 feet of the tank's 15.3-foot circumference at its approximate midpoint. The separation was in the tank shell sheet material behind a ring stiffener and between two continuous circumferential welds which attached the ring stiffener to the tank. The cross-sectional design of the ring stiffener prevented visual inspection of the tank shell sheet material beneath.

The cargo tank was fabricated and certified by the manufacturer in 1974 in accordance with 49 CFR Section 178.340, "General Design and Construction Requirements. . ." The last visual inspection required by 49 CFR Section 177.824, "Retesting and Inspection of Cargo Tanks," was conducted during August 1982. The deteriorating condition of the tank material was not detected at that time.

Two laboratory samples were cut from the cargo tank. The first sample was taken from the bottom of the tank at the separation and included a portion of the tank shell sheet material and sections of the ring stiffener and structural crossmember. The second sample was taken from the bottom of the tank at another ring stiffener 51 inches rearward of the separation. It included the top of the hat-shaped cross section of the ring stiffener. When the second sample was removed, a significant quantity of rust fell out of the air cavity.

In the first sample, tank shell sheet material fore and aft of the ring stiffener was at its original thickness of 0.135 inch. The inner surface of the ring stiffener and the outer surface of the tank shell sheet material under the ring stiffener formed an air cavity. These surfaces were heavily rusted. Rusting reduced the material thickness of these components by approximately one half. The Safety Board's X-ray energy dispersive analysis revealed that the rusted material at the separation contained high concentrations of chlorine, which apparently resulted from the escaping hydrochloric acid passing over the material. The internal tank lining material and its adhesive bond to the inside surface of the tank were in excellent condition. There was no evidence of corrosion on the inside surface of the tank shell sheet material.

The inside surface of the ring stiffener sample removed from the bottom of the tank 51 inches aft of the separation was also rusted. This rusted material was approximately one half of its original manufactured thickness, but did not contain any chlorine. It was concluded that rusting of these unpainted internal surfaces was initiated by trapped water and/or water vapor within the air cavity. It can also be concluded that the drainage hole at the bottom of the stiffener did not prevent rusting in the air cavity. The cargo tank manufacturer ultrasonically tested the shell sheet material at the bottom of the tank under this ring stiffener and at another location under a ring stiffener 102 inches aft of the separation. It was found that the tank shell sheet material at these locations also had been reduced in thickness.

The Safety Board believes that the presence of extensive rusting on external surfaces of the cargo tank sheet material at locations that are inaccessible to normal visual inspection techniques prescribed by Federal regulations is hazardous, that additional cargo tank failures may occur, and that immediate corrective action should be taken. This concern relates specifically to all mild and high strength, low alloy steel cargo tanks where air cavities are formed not only by ring stiffeners but also by upper couplers, suspension subframes, trailer support mountings, or the attachment of other appurtenances.

Since the safe operation of vehicles engaged in interstate commerce is the responsibility of the Federal Highway Administration (FHWA), the Safety Board recommended to the FHWA that an immediate inspection of mild and high strength, low alloy steel hazardous materials cargo tanks that are 4 years old or older be required to determine the thickness of the tank sheet material, including that sheet material which may be hidden by appurtenances. The Safety Board also recommended to the FHWA that all motor carrier operators of cargo tank vehicles be immediately alerted of the findings in this incident and the recommended inspection program. Recommendations to accomplish these objectives have been addressed to the FHWA in a letter of May 10, 1983, a copy of which is attached.

Existing Federal regulations for the design, construction, and inspection of hazardous materials cargo tanks which are the responsibility of the Research and Special Programs Administration should be revised. Design configurations that led to this incident and prevented early detection of extensive rusting on external surfaces of the cargo tank material should be prohibited. Additionally, more frequent and improved inspection procedures should be prescribed for cargo tanks currently in use and those cargo tanks to be manufactured in the future.

The National Transportation Safety Board recommends that the Research and Special Programs Administration:

Revise 49 CFR Section 178.340-6, "Supports and Anchoring," and 49 CFR Section 178.340-7, "Circumferential Reinforcements," of 49 CFR Section 178.340, "General Design and Construction Requirements. . .," to prohibit appurtenance design configurations that create air cavities adjacent to external cargo tank sheet material and to eliminate exceptions based on provisions for venting or draining. (Class II, Priority Action) (H-83-29)

Revise 49 CFR Section 177.824, "Retesting and Inspection of Cargo Tanks," to:

(1) Require that all hazardous materials cargo tanks of mild and high strength, low alloy steel be subjected to several periodic external visual inspections annually.

(2) Require that the thickness of cargo tank sheet material be inspected once each year using ultrasonic or equivalent techniques.

(3) Require measurement of the thickness of appurtenances once each year that form air cavities adjacent to the cargo tank sheet material. If the thickness of the appurtenance material has corroded to a predetermined percentage of its manufactured thickness, require that access to the tank sheet material within the air cavity be made and that the thickness of the tank sheet material be measured.

(4) Require that cargo tanks be placed out of service when the thickness of the tank sheet material has corroded to a specific predetermined percentage (consistent with stress levels that will insure operational safety) of its manufactured thickness.

(Class II, Priority Action) (H-83-30)

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

By: Jim Burnett
Chairman