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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 17, 1986
In reply refer to: I-86-5 through I-86-8

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On August 12, 1985, the Norfolk Naval Shipyard at Portsmouth, Virginia, loaded 5,000 gallons of corrosive hazardous waste into a single compartment, stainless steel cargo tank operated by Applied Technology Transportation, Inc. The hazardous waste, a pipe cleaning solution used on ships, was loaded into the cargo tank from a 20,000-gallon storage tank to be shipped to a waste disposal facility in Deepwater, New Jersey. 1/

U.S. Department of Defense (DOD) personnel began loading the hazardous waste into the 17-year-old cargo tank about 11 a.m. and finished about noon. The driver drove the tractor-semitrailer to a truckstop, weighed it, and began his trip about 1 p.m. He followed Interstate 95 (I-95) north and stopped at a weigh station and service area about 3 p.m. He walked around the vehicle and checked the tires; he saw no leak at that time. After entering the Washington, D.C. beltway about 4:30 p.m., a motorist signaled to the truckdriver that something was wrong with the semitrailer. The driver pulled the vehicle onto the right shoulder of the highway and inspected it. At that time, he found a liquid leak near the rear of the cargo tank, but he could not determine the precise location of the leak because the outside of the cargo tank was covered with insulation and a stainless steel jacket. (Examination of the cargo tank at a later date disclosed a crack 12 inches long immediately adjacent to a vertical weld in the rear head.)

The fire department closed the Washington, D.C. beltway to all northbound and southbound traffic from the junction of I-95 and Interstate 495 (I-495) near Springfield, Virginia, to the Van Dorn Street exit about 4 miles away. Several thousand vehicles were stranded on the closed section of highway during rush hour, and an estimated 34,000 vehicles were rerouted during the 9-hour period it was closed. The fire department also evacuated about 600 people from a mixed residential and business area located within a half-mile radius of the vehicle and ordered a Richmond, Fredricksburg and Potomac Railroad track closed to traffic.

The DOD had contracted Applied Technology, Inc., to dispose of the hazardous waste and by that contract assigned to it the responsibilities of a shipper to properly describe the material and to use a transportation container meeting U.S. Department of

1/ For more detailed information read Special Investigation Report--"Failure of Cargo Tank Transporting Hazardous Waste on the Washington, D.C. Beltway, Interstate 95, Fairfax County, Virginia, August 12, 1985" (NTSB/SIR-86/02).

Transportation (DOT) regulations. Applied Technology, Inc., hired Applied Technology Transportation, Inc., to transport the load in a cargo tank leased from D. M. Equipment Leasing, Ltd., which had purchased the used cargo tank from a private salesman on March 27, 1985, specifically for transporting the hazardous waste solution for the Norfolk Naval Shipyard. All three companies are commonly owned.

Although the DOT's regulations did not require the 17-year-old cargo tank to be visually inspected or hydrostatically tested before being sold, the original owner and the salesman buying it exceeded DOT regulatory requirements by agreeing that the cargo tank pass a hydrostatic test before a manufacturer's certificate designating it as an MC-307 specification cargo tank would be transferred. After the cargo tank initially failed the hydrostatic test because of a liquid leak, the salesman and the owner of the testing and repair facility entered the cargo tank and found a small corrosion hole in the shell. The salesman asked the repair facility to repair the cargo tank shell by welding a patch over the hole. Since DOT regulations provide that the "suitability" of repairs made to cargo tanks failing to pass a hydrostatic test be determined "by the same method of test," this repair by itself probably would have been sufficient to meet DOT repair requirements when a cargo tank fails a hydrostatic test. However, the salesman and the owner of the repair facility also noticed that several weld seams inside the cargo tank had corrosion damage, and the salesman asked the repair facility to repair some of the welds that he judged to be more severely damaged: those generally concentrated in the lower third of the cargo tank. The cargo tank was given another hydrostatic test after the repairs were made and since it did not leak, the repairs met DOT requirements.

The owner of D. M. Equipment Leasing, Ltd., did not inspect the cargo tank before purchasing it and did not conduct a visual inspection after obtaining it. 2/ Furthermore, he apparently never questioned who had previously owned the 17-year-old cargo tank, what it had been used to transport, or what previous repairs and tests had been performed on it. However, even if the new owner had conducted a "visual inspection" of the cargo tank, there is no reason to believe that he too would not have "judged" it to be safe for transportation under current DOT regulations. A Bureau of Motor Carrier Safety (BMCS) mechanical engineer testified at the Safety Board's deposition proceedings that there are no BMCS criteria that tell an inspector when to pass or fail a cargo tank if corrosion is found in either the shell or welds. The determination of an unsafe condition is a judgment call with no specific tests being required to determine the effects of corrosive damage to welds and the structural integrity of the tank.

The Safety Board previously investigated an accident near Beaumont, Texas, on March 9, 1983, involving a rubber-lined MC-312 cargo tank transporting 5,000 gallons of hydrochloric acid. After the cargo tank shell sheet material separated catastrophically behind a ring stiffener and between two continuous circumferential welds which attached the ring stiffener to the tank, the cargo tank released its entire load onto the highway. Samples of the shell were removed from the cargo tank and analyzed; rusting on the outside surface of the cargo tank at locations inaccessible to normal visual inspection techniques had reduced the material thickness by approximately one half. As a result of the investigation, the Safety Board issued Safety Recommendation H-83-30 on May 10, 1983, to the DOT's Research and Special Programs Administration (RSPA):

2/ The last visual inspection was conducted by Chemical Leaman on March 25, 1983. Since the DOT requires a visual inspection every 2 years, a visual inspection was due before the new owner used the cargo tank to transport hazardous materials.

Revise 49 CFR 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 predetermined percentage (consistent with stress levels that will insure operational safety) of its manufactured thickness.

Concurrently, as a result of the Beaumont, Texas, accident, the Safety Board issued Safety Recommendation H-83-27 to the Federal Highway Administration (FHWA):

Develop and prescribe continuing motor carrier operational inspection requirements for hazardous materials cargo tank sheet material thickness consistent with the results of the ultrasonic, or equivalent, inspection sampling program recommended by the Safety Board.

Following the Safety Board's recommendations, the RSPA and the FHWA jointly funded research of the integrity of MC-307 and MC-312 cargo tanks including manufacturing, inspection, and retest and repair requirements. Subsequently, they issued a Notice of Proposed Rulemaking (NPRM) on September 17, 1985, effecting those requirements, and they requested public comments to be submitted by May 22, 1986. As a result of the August 12, 1985, incident, the Safety Board urges the RSPA and the FHWA to respond as expeditiously as possible to Safety Recommendations H-83-30 and H-83-27.

In its preliminary regulatory evaluation of the proposed rulemaking, the RSPA and FHWA concluded that severe internal and external tank corrosion in MC-307 and MC-312 cargo tanks contributed to a high incidence of cargo tank motor vehicle failures and that the number of cargo tanks demonstrating evidence of external and internal corrosion appeared to be increasing. The RSPA and FHWA also found that the regulations inadequately addressed cargo tank corrosion problems and cargo tank inspection and testing requirements. Furthermore, the motor carriers involved in the RSPA and FHWA research program suggested more frequent and more adequate inspection, testing, and repair requirements.

Among other changes, the proposed DOT regulations increase the frequency of external visual inspections and require internal visual inspections for more cargo tanks. Despite these provisions, the proposed regulations fail to provide adequate guidelines to evaluate the integrity of welds when corrosion is present. Appropriate technical examinations, i.e., radiography, wet fluorescent magnetic particle, liquid dye penetrant,

ultrasonic, or other equivalent techniques, should be specifically required to evaluate the severity of corrosive damage to welds or other defects identified during visual inspections to preclude the necessity of inspectors making nonscientific, subjective judgments. The proposed regulations also would require thickness tests every 2 years, rather than annually as recommended by the Safety Board in Safety Recommendation H-83-30, or in conjunction with annual visual inspections when the severity of corrosion or other defects needs to be evaluated.

Furthermore, while requiring persons performing visual inspections to "judge" the condition and structual integrity of cargo tanks, neither the current nor the proposed regulations establish measurable qualification standards for persons performing visual inspections. The current regulation requires only that the inspector be "responsible and experienced" while the proposed regulation requires the inspector or witness to "be familiar with the cargo tank and skillful in the use of the inspection and testing equipment needed." The DOT should develop objective standards for the qualification of persons inspecting and testing cargo tanks.

On February 26, 1986, the Safety Board filed comments on the NPRM with the DOT. The Safety Board stated that while the proposal clarifies and strengthens the conditions under which cargo tanks must be tested or inspected, it does not adequately establish measurable qualification standards for persons performing or witnessing important visual inspections and testing, and that the inspection requirements are inadequate for welds when indications of corrosion are present.

The proposed rulemaking also would require all cargo tanks to be repaired by a facility that holds a current certificate of authorization from the American Society of Mechanical Engineers (ASME) for Boiler and Pressure Vessel Code, Section VIII, Division 1; holds a valid National Board of Boiler and Pressure Vessel Inspectors certificate; or is under the direct supervision of an Authorized Inspector 3/ provided the Authorized Inspector witnesses the repair and subsequent testing of the repair and then certifies the repair as being acceptable. The Boiler and Pressure Vessel Code provides standards for the repair of weld defects, the removal of unacceptable defects, the rewelding of areas to be repaired, the examination of repaired welds by non-destructive examination methods to ensure that satisfactory repairs are made, and the qualification of persons doing the repair work.

Although the facility that repaired the cargo tank that failed during this incident held a current certificate of authorization from the ASME, the cargo tank was neither repaired in accordance with ASME standards nor was it required to be by the DOT. No technical examinations were performed on the cargo tank either before or after repairs were performed, and no one inspected the repair work after it had been completed. Furthermore, the repair work was not performed by an ASME-qualified welder. Had the cargo tank repairs been subject to the ASME or equivalent standards, including appropriate technical examinations, and had it been inspected by an independent inspector to ensure compliance with those standards, the testing and repair of other corrosion-damaged welds most likely would have been performed, and the failure that occurred on August 12, 1985, probably would have been prevented. While DOT's proposed regulation changes would improve cargo tank repair requirements, those changes may not go into effect because some of the proposed requirements may be different or impossible to meet.

3/ The DOT defines "Authorized Inspector" as an inspector who is currently commissioned by the National Board of Boiler Pressure Vessel Inspectors and employed as an inspector by an Authorized Inspection Agency, Title 49 CFR 171.8.

The DOT should require corrosive damage and weld defect repairs to cargo tanks to be performed in accordance with measurable qualification standards and should require technical examinations, i.e., radiography, wet fluorescent magnetic particle, liquid dye penetrant, ultrasonic, or other equivalent techniques, after the repairs have been performed. Furthermore, all cargo tank corrosion damage and weld defect repairs should be performed either by a person who meets measurable qualification standards or by a person working under the direct supervision of an independent inspector who is so qualified and who will witness the repairs and subsequent examination(s) of the repairs and then certify the repairs as being acceptable.

Also during the investigation of this incident, the Safety Board found that while the description of the hazardous waste on the shipping paper exceeded DOT requirements by identifying the hazardous ingredients in the waste solution, relative quantities of those materials were not provided. Even a very low concentration of some of the hazardous materials contained in that shipment can be harmful. The lack of that information to help evaluate the severity of the threat posed to public safety and the lack of information about the condition of the cargo tank, which could not be inspected because of an insulated covering, caused the well-trained fire department to properly take a conservative approach and to evacuate the area for the worst-case scenario. It was not until 10 p.m., 5 hours after arriving on scene, that the fire department finally was provided the results of an analysis confirming that the concentrations of hazardous materials contained in that shipment were low. By then, however, on-scene personnel were preparing to transfer the load to another cargo tank, and the condition of the leaking cargo tank was still unknown. Therefore, the fire department continued its evacuation of the area until about midnight when the transfer was completed; the highway was reopened to traffic about 2 hours later, after the spilled solution was cleaned up. While the fire department probably would have closed the beltway until after the hazardous waste was transferred to another cargo tank even if they had initially known the concentrations of the hazardous ingredients, they may not have evacuated 600 persons from nearby areas.

In 1984, the Safety Board investigated another incident involving difficulties experienced by emergency response personnel in determining the composition and hazards of waste material contained in a cargo tank. On March 6, 1984, in Orange County, Florida, vapors escaping from a cargo tank containing waste acids caused the evacuation of a 3-square-mile area and the injury of 12 persons. The shipper, in compliance with DOT regulations, used the shipping name "waste, acid liquid, NOS" 4/ for the waste material. The Board found that, as was the experience with the Fairfax County Fire and Rescue Department, the fire department could not quickly get accurate information about the composition of the hazardous waste acids from the shipping papers, the shipper, or the carrier during the incident. As a result of its investigation, the Board issued Safety Recommendation I-85-10 to RSPA on May 16, 1985:

> Determine the adequacy of general shipping names on shipping papers for hazardous wastes and the need for additional information, such as technical and chemical group names, to better inform emergency response personnel about the composition and hazards of the material being shipped.

4/ NOS (n.o.s.) is a transportation industry abbreviation for "not otherwise specified." If a proper technical shipping name is not shown in DOT's hazardous materials table, a proper shipping name must be selected from general descriptions or n.o.s entries.

The DOT has taken no substantial action on this recommendation, which remains open.

As a result of its investigation, the National Transportation Safety Board reiterates Safety Recommendation I-85-10 and further recommends that the Research and Special Programs Administration:

> Require measurable qualification standards for persons performing inspections, tests, and technical examinations of cargo tanks. (Class II, Priority Action) (I-86-5)
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> Require measurable qualification standards for persons performing repairs on cargo tanks involving corrosion damage and weld defects, or that the repairs be performed under the direct supervision of an independent inspector qualified to established standards, who will witness the repairs and subsequent examination(s) of the repairs and then certify the repairs as being acceptable. (Class II, Priority Action) (I-86-6)
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> Require appropriate technical examinations to be performed on cargo tanks when corrosion damage or weld defects are identified to scientifically measure and evaluate the severity of the corrosion damage or weld defects, and prohibit use of the cargo tanks to transport hazardous materials when the results of technical examinations signify structurally unsafe conditions. (Class II, Priority Action) (I-86-7)
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> Require measurable standards for repairs to cargo tanks with corrosion damage and weld defects, including postrepair technical examinations. (Class II, Priority Action) (I-86-8)

GOLDMAN, Acting Chairman, and BURNETT, LAUBER, and NALL, Members, concurred in these recommendations.

Patricia A. Goldman

By: Patricia A. Goldman
Acting Chairman