[4910-06]

FEDERAL RAILROAD ADMINISTRATION

U.S. Department of Transportation

FRA Emergency Order No. 16

Notice No. 1

Owners of Railroad Tank Cars; Railroads

Emergency Order Requiring

Inspection and Repair of Dual Diameter Tank Cars

The Federal Railroad Administration (FRA) of the United States Department of Transportation has determined that public safety compels issuance of this Emergency Order requiring the owners of certain tank cars to perform inspections and, as necessary, repairs as specified in this Order. The affected tank cars (known as "dual diameter" tank cars) are used to transport some of the most lethal hazardous materials in very large quantities. Some of these cars have been found to have defects that threaten their structural integrity, and there is reason to believe that others of this type may have similar defects.

Authority

Authority to enforce the Federal railroad safety laws, including laws pertaining to the transportation of hazardous materials by railroad, has been delegated by the Secretary of Transportation to the Federal Railroad Administrator. 49 CFR § 1.49. Railroads, shippers of hazardous materials, and owners of tank cars are subject to FRA's safety jurisdiction under the Federal Railroad Safety Act of 1970, 45 U.S.C. §§ 421, 438, and the Hazardous Materials Transportation Act, as amended, 49 App. U.S.C. § 1804. FRA is authorized to issue emergency orders where an unsafe condition or practice creates "an emergency situation involving a hazard of death or injury to persons." 45 U.S.C. § 432(a). These

orders may immediately impose "such restrictions or prohibitions as may be necessary to bring about the abatement of such emergency situation." (*Ibid.*)

Background

Shortly after noon on January 18, 1992, tank car CONX 9101, loaded with a liquefied petroleum gas, was in the consist of Norfolk Southern Corporation freight train 326A8, standing in a siding near Dragon, Mississippi, awaiting the passage of another train. When the main track was clear, train 326A8 began to move; when it had proceeded about two engine lengths, it had an emergency brake application. Readouts from the event recorders indicate that the train was traveling at less than 5 mph when the emergency brake application occurred.

A member of the train crew, standing near the locomotives, saw a white vapor cloud at the far end of the train that, within seconds, ignited into a fireball. Subsequent investigation showed that CONX 9101, the 72nd car in an 84-car train, had separated and released its entire load. Due mostly to the remote location of the train, there were no injuries or evacuations; fire and radiant heat damage affected a vacant home and the facilities of two gas terminals adjacent to the tracks. The National Transportation Safety Board (NTSB) estimates property damage to be about $400,000.

CONX 9101 was a Department of Transportation (DOT) specification 112J340W tank car built in 1965 by General American Transportation Corporation (GATC) as one of 34 DOT112A340W cars on the same Certificate of Construction. Conversion from an "A" specification to a "J" took place in 1979 and involved application of half-head shields, thermal protection, and a jacket. CONX 9101 was designed and built as a dual-diameter, 32,878 gallon, 125-ton car, larger in the midsection than at the ends over the trucks (thus the "dual diameter" description). It was not overdue for periodic tests or inspections under current regulations.

Failure occurred when the tank separated in the heat-affected zone of the weld joining the large diameter section and the transition sheet at the A-end of the tank. Preliminary examination of the circumferential break disclosed a discolored crescent region, typically indicative of a large preexisting crack, about 21 inches long and centered at the bottom centerline of the tank. The crack began along the inside diameter surface of the tank at the weld/transition sheet junction. At its deepest point, the crack extended through 95 percent of the tank wall thickness before separation. Preliminary metallurgical examination by the NTSB's materials laboratory showed that the crack fracture surface was extensively oxidized, thus indicating a crack with long-term exposure to the atmosphere. Oxidization was so extensive that the original fracture surfaces were obliterated. The NTSB's laboratory notes the possibility of a small undercut at the toe of the weld in the area of crack initiation.

GATC has indicated that, using the same design, it had built the 34 cars in the series CONX 9100-9133, 31 cars in the series VICX 9001-9031 (née CONX 9001-9031), and 50 cars in the series GATX 30750-30799, for a total of 115 cars. On January 21, 1992, the Association of American Railroads (AAR), a private trade association representing the nation's largest railroads, issued an "Early Warning" letter to members and private car owners directing them to immediately stop and inspect cars in the series CONX 9100-9133, the series that included CONX 9101, whether loaded or empty. On March 4, 1992, AAR expanded its "Early Warning" letter to include the remainder of the 115 cars identified by GATC as having been built to the same design as CONX 9101.

On January 30 and February 10, 1992, FRA sent letters to CONOCO, Inc., Vista Chemical Company, and GATC, owners of the CONX, VICX, and GATX cars, respectively. In these letters and through subsequent telephone contacts, FRA requested the owners to remove the cars from service and inspect each car for cracks in an area extending on both sides of the bottom centerline of the circumferential welds between the transition sheet and the large and small diameter portions of the tank. Owners were to use non-

destructive methods and were to notify FRA prior to each tank inspection. Inspection protocols were reviewed and agreed upon by FRA, the owners, and the AAR. In letters to the three owners dated March 19, 1992, FRA formalized the inspection and test procedures.

Based on its preliminary investigation, the NTSB, on March 13, 1992, issued the following recommendation to the FRA:

> Require owners and operators of dual-diameter pressure tank cars to inspect by X-ray radiography and/or other appropriate means a representative sampling of their dual-diameter cars for evidence of cracks and other serious defects in the circumferential welds between the transition and larger diameter tank shell plates. Based on these inspections, assess whether the total fleet of dual-diameter pressure tank cars should be inspected immediately for evidence of cracking, and if periodic inspections should be required. (Class I, Urgent Action) (R-92-7)

FRA agrees with the NTSB and, as the chronology of this matter shows, began acting along the lines suggested by the Board immediately following the January 18 accident in consultation with Transport Canada, the Canadian agency with safety authority corresponding to that of FRA. Actions taken by several entities in the industry, including the AAR Tank Car Committee, the members of the Railway Progress Institute, and the Tank Car Safety Research Project also demonstrate a unanimity of purpose among public and private sector interests in the wake of this very serious safety threat.

As of March 26, 1992, thirty-eight of the 115 tank cars that FRA requested the owners to immediately remove from service and inspect had been inspected. Of the thirty-eight, twenty-two bore defects in areas analogous to the car that failed. The defective cars have cracks ranging from two to forty-eight inches in length and up to 3/8 inch in depth, weld inclusions, incomplete weld fusion and other defects. While it is clear that these cars represent a threat to the public safety, at least until their defects are corrected, it is not clear that this series of cars is representative of the dual-diameter portion of the North American tank car fleet.

Dual-diameter tank cars are among the older tank cars in the fleet. The design requires building the car with draft sills attached to each end of the tank (instead of attaching

the tank to a continuous center sill) and uses the tank itself to function as the main structural member of the car. Consequently, the tank, in addition to the force resulting from the pressurized lading, is subject to loaded and empty static forces and cyclic loadings introduced through the coupler and wheel/rail interface.

These cars carry some of the most volatile products transported on North American railroads. For example, these cars carry compressed gases such as liquefied petroleum gas, anhydrous ammonia, and vinyl chloride. Because of their long service, these cars may have been subjected to stresses in the transition sheets and associated welds sufficient to initiate cracks through fatigue and/or propagation of minor fabrication defects. As in the case of the non-continuous center sill tank cars generally, vertical loadings may be particularly suspect as a factor in crack initiation and propagation.

FRA understands that there are somewhere between 5,000 and 5,500 dual-diameter cars in the North American fleet and that they probably represent fewer than 12 design types. In addition to obtaining the removal from service and inspection of 115 cars of the same design as the car that released its contents at Dragon, Mississippi, FRA has elicited the cooperation of affected parties in inspecting 100 other dual-diameter cars that are in shops or in route to shops. This process is now under way. Until owners inspect these 100 cars and inspect a representative sample of the remainder of the dual-diameter fleet, there is no certain way to assess the safety threat they pose; nor is there any way to exclude the possibility that this problem is endemic to all dual-diameter designs. FRA does not yet know whether the car that failed near Dragon, Mississippi, and those of its same design that have been inspected and found to be nearly 60 percent defective are typical of dual-diameter cars. While the hazardous materials release at Dragon caused no injuries, the consequences of such a release in a more populous area are so obvious and so potentially catastrophic that all concerned must move without delay.

In summary, the order requires that car owners determine and remove from service for inspection a statistically valid sample for each dual-diameter design and inspect each design so to achieve a 99 percent confidence level that no more than one percent of the cars permitted in service have defects. Car owners may undertake this activity individually or in cooperation with other owners of cars of the same design. Owners are to inspect the initial sample immediately. If no imperfections as defined in Appendix W of the Tank Car Manual are found, further inspections are not required. If any car is found to have such an imperfection, then no car of that design may be loaded with any product prior to being inspected. Upon inspection and discovery of such an imperfection, the car may be returned to service only after repairs sufficient to return it to specification. FRA estimates that a minimum of 1,000 cars will be subject to inspection under this order.

Finding and Order

The continued use of uninspected dual-diameter tank cars poses an imminent and unacceptable threat to public safety. I find that the unsafe conditions discussed above create an emergency situation involving a hazard of death or injury to persons. Accordingly, pursuant to the authority of section 203 of the Federal Railroad Safety Act of 1970 (45 U.S.C. § 432), delegated to me by the Secretary of Transportation (49 CFR § 1.49), it is ordered that:

1. Starting on the effective date of this order, no owner of a dual-diameter tank car may permit its further loading or its further offering into transportation until the owner has submitted to FRA the sampling program required by paragraph 3, below. If the owner is a lessor of the car, the owner shall, as soon as possible, notify the respective lessee of this Order and instruct the lessee not to load the car or offer it for transportation until the owner complies with this Order. The owner shall notify the railroad currently in possession of any dual-diameter car it owns of the provisions of this Order and instruct the railroad not to accept for transportation any such car until the owner has complied with this Order. When

the owner has complied with paragraph 3 of this Order, it shall inform any lessee of its cars or railroad having possession of its cars of how each car is to be routed. Upon notification by the car owner or the FRA, each railroad upon whose line a subject car is located shall route such car, or refrain from placing such car for loading, as prescribed herein.

2. Any report or program required to be submitted to FRA by this Order should be submitted to:

Chief, Hazardous Materials Division, RRS-12
Office of Safety Enforcement
Federal Railroad Administration
400 Seventh Street, SW; Room 8326
Washington, D.C. 20590

The report or program may be submitted by facsimile to (202) 366-7136.

3. Owners of dual-diameter tank cars shall determine a statistically valid sample for inspection of each design type that will assure a 99 percent confidence level that, within each design type, no more than one percent of the cars not selected for the sample contain an imperfection as defined in the 1990 *Association of American Railroads Manual of Standards and Recommended Practices, Section C - Part III, Specifications for Tank Cars, Appendix W* in the inspection areas required by this order. Sampling shall be based on a hypergeometric distribution as described in Bishop, Fienberg, and Holland, *Discrete Multivariate Analysis: Theory and Practice*, The MIT Press, Cambridge, Massachusetts (1975). As soon as possible after issuance of this Order, owners shall report the identity of the sample (including the identity of the design types and the reporting marks of all cars built to the same design), to the Chief, Hazardous Materials Division, FRA. The submission to FRA shall also contain a proposed schedule for completion of the inspection of the sample.

4. Each owner shall ensure that each car selected as part of the sample required under paragraph 3 is immediately routed to expedite its inspection. Once identified as part of the sample, such a car may not be loaded until it has been inspected. Inspection of the

entire representative sample shall be completed as soon as possible, but no later than 60 days after the effective date of this order. The inspection of any car that was subject to the 100-car immediate sampling under way at the time this Order was issued may be counted toward the completion of the inspection of the larger sample of the design type to which that car was constructed.

5. Owners shall furnish daily reports to the Hazardous Materials Division, Office of Safety Enforcement, FRA of the cars inspected the previous day and the car number, certificate of construction number, built date, accumulated mileage, last periodic tank hydrostatic test date, and results of the inspection.

6. If any sample car of a particular design type is found with an imperfection as defined in Appendix W of the Tank Car Manual, the owner shall immediately notify FRA and any other owners of cars built to that design type (to the extent the owner knows of such other owners). Thereafter, owners of cars of that design type must ensure that all such cars are inspected in accordance with paragraph 8 of this Order before permitting any further loading of such cars.

7. Owners shall periodically inspect (under the procedures set forth in paragraph 8, below) all of those dual-diameter cars built to the same designs as any car found to have a crack (as defined at 49 CFR § 215.5). To determine future inspections, owners shall estimate the car's anticipated mileage and choose the year the car will reach 150,000 miles or ten years, which ever comes first, from the date of the inspection required by this Order.

8. Except as otherwise provided, owners shall inspect each car required to be inspected under this Order as follows:

a. Clean the interior of each car.

b. Remove the tank jacket and insulation/thermal protection from the draft sill reinforcement pad and the transition sheet weld

areas at least twenty-four inches on each side of the tank car longitudinal centerline (see Figure 1).

c. Use a wire brush on all interior and exposed exterior welds and visually inspect for defects.

d. Radiograph A1, A2, B1, and B2 circumferential weld areas two inches on each side of each weld and at least twenty-four inches on each side of the tank car longitudinal centerline. (See Figure 1)

e. Inspect the draft sill pad and pad-to-tank welds near the termination of the non-continuous center sill using dye penetrant testing methods.

f. Use ultrasonic examination to find the tank shell thickness in internal and exposed external areas showing mechanical or corrosion damage and to determine the depth of defects found.

g. The nondestructive examinations and acceptance standards of Appendix W of the Tank Car Manual apply.

h. For repaired areas, the requirements of Appendix R of the Tank Car Manual apply.

i. The standards for non-destructive test technicians of Appendix W of the Tank Car Manual apply.

j. The requirements of Rule 88, "Mechanical Requirements for Acceptance," of the 1992 AAR *Field Manual of Interchange Rules* apply.

FRA realizes that some car designs may not be appropriate for some inspection techniques. For instance, radiography may not be possible is areas hidden under structural elements. Owners who cannot comply with the protocol above may establish an alternative, equivalent

protocol that, after submission to and approval by the Chief, Hazardous Materials Division of FRA, may be used in lieu of the inspection protocol in this paragraph.

9. If, during the inspection, a car is found to have any imperfection as defined in Appendix W of the Tank Car Manual, the car may be returned to service only after the car has been repaired in accordance with Appendix R of the Tank Car Manual.

10. Cars inspected as required by this Emergency Order shall have the marking **DDI** followed by the month and year of inspection stenciled in 1-inch (minimum) letters in association with the stenciling for specification and test dates as set forth in Appendix C of the Tank Car Manual. Any car requiring periodic inspection under this Order shall also have the due date stencilled in 1-inch (minimum) letters to the right or below the inspection date.

11. Records of inspections performed under this Emergency Order, including radioscopy films, be retained by the owner for the life of the car.

Relief

Tank car owners may obtain relief from this Order by informing the Federal Railroad Administration, as directed, of the identity of the representative sample and by performing the inspections and making the reports as required.

Penalties

Each violation of this Emergency Order shall subject the respondent committing such violation to a civil penalty of up to $20,000. 45 U.S.C. §§ 432, 438. FRA may, through the Attorney General, also seek injunctive relief to enforce this order. 45 U.S.C. § 439.

Future Action

FRA believes that this Emergency Order may be only the first step in achieving safety with dual-diameter tank cars. The results of the car inspections will be studied and additional notices under this Emergency Order may be issued, and/or other enforcement actions, as appropriate, may be taken.

Notice to Affected Persons

Notice of this Order will be provided by publishing it on an emergency basis in the Federal Register. Copies of this Emergency Order were sent by mail or facsimile prior to publication to the Association of American Railroads, the American Short Line Railroad Association, the Regional Railroads of America, the Railway Progress Institute, all members of the AAR Tank Car Committee, and to owners of dual-diameter tank cars as follows: PLM Transportation Equipment Corp.; Chevron, U.S.A., Inc.; Continental Tank Car Corporation; General American Transportation Corp.; Phillips 66 Company; Suburban Propane; ACF Industries, Inc.; CGTX Inc.; Procor Limited; Union Tank Car Company; and U.S. Rail Services, Inc.

Review

Opportunity for formal review of this Emergency Order will be provided in accordance with section 203(b) of the Federal Railroad Safety Act of 1970, 45 U.S.C. § 432(b), and section 554 of Title 5 of the United States Code. Administrative procedures governing such review are found in 49 CFR Part 211 (see § 211.47, .71-.75).

Effective Date

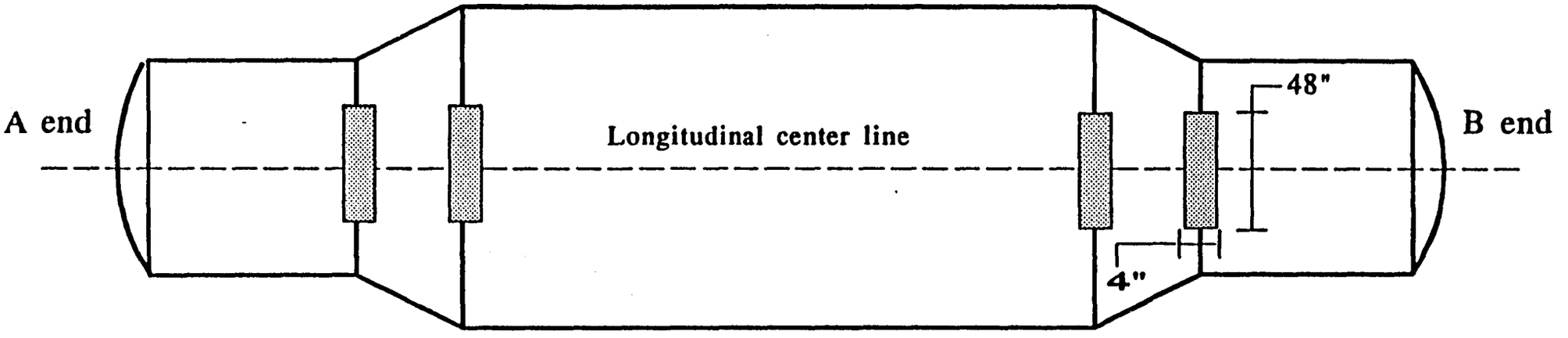
This Order shall be effective at 12:01 a.m (E.S.T.) on April 4, 1992.

Issued in Washington, D.C. on April 2, 1992.

Gilbert E. Carmichael
Administrator

Fiqure 1

Radiograph Inspection and Test Zones



A1 A2 B2 B1