

Log R-634



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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Date: March 13, 1992

In reply refer to: R-92-7

Honorable Gilbert E. Carmichael  
Administrator  
Federal Railroad Administration  
U.S. Department of Transportation  
Washington, D.C. 20590

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About 12:40 p.m. local time on January 18, 1992, three tank cars in Norfolk Southern Corporation freight train 326A8 derailed between mile posts 80 and 81 at Dragon, Mississippi. The derailed tank cars (UTLX 89170, CONX 9101, and CHVX 180130) each contained about 32,000 gallons of liquefied propane and were positioned 71, 72, and 73 cars, respectively, behind 4 locomotives. The train contained 84 cars, was 5,525 feet long, and weighed 7,045 tons.

The Safety Board's investigation of the accident disclosed that prior to the derailment, northbound train 326A8 was holding on a side track until a southbound train passed on the main track. When the main track was clear, the northbound train began to move from the side track onto the main track. A carman for the Norfolk Southern, who had been assisting the train crew, was standing next to the locomotives as the train began to move. He estimated that the train had moved about two engine lengths when it had an emergency brake application. Readouts from the event recorders on the locomotives indicate that the train was traveling at less than 5 mph when the emergency brake application was made.

The carman then saw a white vapor cloud from the south end of the train. He indicated that several seconds later, but not more than a minute, the vapor cloud ignited into a fire ball. Other witnesses also reported seeing a large white cloud that extended from the ground to above trees that were estimated to be 100 feet in height. These witnesses also stated that several seconds passed before the cloud ignited into a fire ball.

Notation 5688

The A-end<sup>1</sup> of CONX 9101, which was the trailing end, separated circumferentially, resulting in the derailment of CONX 9101. The two tank cars coupled to CONX 9101 (UTLX 89170 and CHVX 180130) were also derailed. The entire load for CONX 9101 was released; no cargo was released from either UTLX 89170 or CHVX 180130.

There were no injuries or evacuations. There was fire and heat damage to a vacant home and to the facilities of two gas terminals adjacent to the tracks. There was negligible environmental damage. Total property damage is estimated to be about \$400,000.

CONX 9101 was a U.S. Department of Transportation (DOT) specification 112J340W rail tank. According to the Association of American Railroads (AAR) Certificate of Construction, the rail tank was 1 of 34 cars constructed in 1965 by General American Transportation Company (GATC) as a DOT specification 112A rail tank. It was converted to a DOT specification 112J when half head shields, thermal protection, and a jacket were added to the car in January 1979. CONX 9101 was a dual diameter tank car with a capacity of 32,878 gallons, and running gear of 125-ton capacity. The tank had a larger diameter at its midsection than at its end sections over the trucks. An angled transition section joined the large and small diameter sections. The stub sill was welded to attachment plates on the small diameter section and transition section, and terminated about 6 inches outside of the circumferential weld joining the transition section and larger diameter section of the tank. CONX 9101 was last hydrostatically tested to 300 psig in February 1983, and was not due for another hydrostatic test until 1993.<sup>2</sup>

The circumferential separation occurred near the weld joining the large diameter section and the transition section for the A-end of the tank. Examination of the circumferential break disclosed a discolored crescent region indicative of a large preexisting crack that was about 21 inches long and centered at the bottom centerline of the tank. This crack initiated along the inside diameter surface of the tank at the weld/transition plate interface. At the deepest point, the crack extended through about 95 percent of the tank wall thickness before separation. Preliminary metallurgical examination at the Safety Board's materials laboratory showed that the crack fracture surface was extensively oxidized, which is indicative of long-term exposure to a corrosive medium. The oxidization had obliterated the original fracture surfaces of the crack. Microscopic examination of a section through the crack disclosed that the cracking occurred in the plate section at and adjacent to the heat-affected zone from the weld. There were indications that the weld/plate interface may have had a small undercut at the toe of the weld in the area of the initiation of the crack. Metallurgical examination of this tank car separation is continuing.

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<sup>1</sup> The A-end of a tank car is the end opposite the B-end. The hand brake is located on the B-end.

<sup>2</sup> Qualification, maintenance, and retest requirements for tank cars are set forth in Title 49 Code of Federal Regulations Section 173.31.

General American indicated that it had also built, in addition to the 34 cars in the series that included CONX 9101, tank cars CONX 9001 through 9031 (now identified as VICX 9001 through 9031), and GATX 30750 through 30799 that are of similar design. The Federal Railroad Administration (FRA) has requested the owners/operators<sup>3</sup> of these three groups of cars to withdraw them from interchange, and to conduct nondestructive testing, including X-rays, of the circumferential welds between the transition section and larger diameter sections at the bottom centerline of the rail tanks. The FRA also requested notification prior to each tank car inspection and copies of records of all of the inspections. Inspection procedures were reviewed and agreed upon by the FRA, the tank car owners/operators, and the AAR.

On January 21, 1992, the AAR issued to member railroads and private car owners an "Early Warning" of potential tank car shell failure. The "Early Warning" directed that tank cars in the series CONX 9100 through 9133, loaded or empty, be stopped immediately and scheduled for inspection. The AAR expanded the "Early Warning" on March 4, 1992, to include an additional 81 dual diameter tank cars owned or operated by Vista Chemical Company and General American Transportation Company.

As of March 4, 1992, five tank cars from these three series of tank cars (5 of about 115) had been inspected. Of the five tank cars inspected, VICX 9019 was found by X-ray and confirmed by ultrasonic inspection to have a crack indication in the same area as that found on CONX 9101. A Safety Board metallurgist obtained specimens from the reported cracked area of the weld on VICX 9019 on March 9, 1992. Examination of these specimens showed that a crack about 12 inches long had initiated at the inside transition plate/weld bead interface in the same area as that of CONX 9101. This crack was about 0.06 inch deep, or about 10 percent of the tank plate thickness. The initiation, in part, was clearly in an area where a shallow undercut weld occurred at the toe of the weld. Heavy oxidation had also obliterated the fracture features of the crack, but near its deepest point (terminus) the features showed indications of high stress fatigue.

On March 11, 1992, the Safety Board was notified by Vista Chemical Company that three additional tank cars had been inspected (VICX 9008, VICX 9025, and VICX 9010); X-ray radiography indicates that all three tank cars have circumferential cracks on both the A- and B-ends in the same locations ranging from 2 inches to 30 inches long. Ultrasonic testing will be performed to confirm these cracks.

An estimated total of 6,000 to 7,000 dual diameter pressure tank cars, similar in design to the 115 tank cars discussed above, were built during the 1960s by several manufacturers and represent about one-third of the nationwide fleet of pressure rail tank cars.

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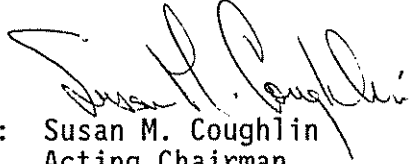
<sup>3</sup> The FRA's Associate Administrator for Safety sent letters to CONOCO, Inc., on January 30, 1992, and to Vista Chemical Company and General American Transportation Company on February 10, 1992.

Although the number of dual diameter tank cars that have been inspected to date is small, the Safety Board is concerned about the number and nature of the cracks that have been found in these tank cars. Consequently, the Safety Board believes that all dual diameter tank cars, regardless of their capacity or manufacturer, may be susceptible to cracks along the bottom of the tank in the circumferential welds joining the transition and large diameter sections of the tanks. Because of the potential catastrophic effects from the type of failure experienced in Dragon, Mississippi, the Safety Board believes that random testing of the fleet (6,000 to 7,000) of dual diameter pressure tank cars is urgently needed to more accurately determine how extensive the problem is, and to assess whether inspections should be required for all dual diameter tank cars.

The National Transportation Safety Board therefore recommends that the Federal Railroad Administration:

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)

Acting Chairman COUGHLIN, Members LAUBER, HART, HAMMERSCHMIDT, and KOLSTAD concurred in this recommendation.

  
By: Susan M. Coughlin  
Acting Chairman