

**DEPARTMENT OF TRANSPORTATION**

**Federal Railroad Administration**

**[Railworthiness Directive, Notice No. 1]**

**Railworthiness Directive Under 49 CFR 180.509 for Railroad Tank Cars Equipped With Certain McKenzie Valve & Machining LLC Valves**

**AGENCY:** Federal Railroad Administration (FRA), Department of Transportation (DOT).

**ACTION:** Notice, Railworthiness Directive

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**SUMMARY:** Recent FRA investigations identified several railroad tank cars transporting hazardous materials and leaking small quantities of product from the cars' liquid lines. FRA's investigation revealed that the liquid lines of the leaking tank cars were equipped with a certain type of 3" ball valve marketed and sold by McKenzie Valve and Machining (McKenzie) (formerly McKenzie Valve & Machining Company), an affiliate company of Union Tank Car Company (UTLX). FRA further found certain closure plugs installed on the 3" valves cause mechanical damage to the valves, which leads to the destruction of the valves' seal integrity and that the 3" valves, as well as similarly-designed 1" and 2" valves provided by this manufacturer are not approved for use on tank cars. FRA is issuing this Railworthiness Directive (Directive) to all owners of tank cars used to transport hazardous materials within the United States to ensure they identify and appropriately remove and replace these valves with approved valves consistent with Federal regulations.

**DATES:** This Directive is effective March 13, 2015.

**FOR FURTHER INFORMATION CONTACT:** Karl Alexy, Staff Director,  
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**SUPPLEMENTARY INFORMATION:** Recent FRA investigations identified several DOT Specification 111 railroad tank cars transporting hazardous materials and leaking small quantities of product.<sup>1</sup> One instance occurred during the week of January 11, 2015, and involved a train of 100 tank cars loaded with crude oil being transported by BNSF Railway (BNSF) from Tioga, ND, to a refinery in Anacortes, WA. BNSF discovered 14 tank cars leaking crude oil en route and in accordance with the applicable regulations, notified FRA of the releases. Upon discovery of the defective condition of these cars, BNSF removed the cars from the train (at Hauser, ID; Vancouver and Auburn, WA, respectively). When the train arrived at its final destination in Anacortes, the consignee, Tesoro Refining, discovered two additional cars leaking product. In all, BNSF and Tesoro identified 16 leaking tank cars from the original train consist.

On January 15, 2015, FRA inspected seven of the identified leaking tank cars that BNSF removed from the train in Vancouver. The FRA inspector observed crude oil on the sides of each of these cars, and upon inspection of each tank car's top fittings, found product leaking from the liquid line ball valves and around each valve's closure plug.

FRA also found the standalone closure plugs in each of these valves loose. Further

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<sup>1</sup> DOT Specification 111 tank cars are general purpose, nonpressure railroad tank cars commonly used to transport a variety of regulated hazardous materials, as well as nonregulated commodities. In 2011, through issuance of Casualty Prevention Circular 1232, the Association of American Railroads (AAR) adopted an industry standard intended to improve the crashworthiness of DOT Specification 111 tank cars used in crude oil and ethanol service. These cars, known as CPC 1232 cars, include a thicker shell, head protection, top fittings protection, and relief valves with a greater flow capacity as compared to baseline DOT Specification 111 cars. The leaking tank cars identified in this Directive include both a baseline DOT 111 Specification car and CPC-1232 cars.

inspection revealed that the valve balls had visual signs of mechanical damage. The mechanical damage FRA observed indicated that the bottom face of the closure plug came in contact with the valve ball, consequentially preventing complete engagement of the closure plug.

A second instance involved a single tank car loaded with mineral spirits (a Class 3 flammable liquid) found leaking on January 15, 2015, in a BNSF yard in Denver, CO. FRA's preliminary investigation shows that the leak occurred through the liquid line valve while the car was en route to its destination.

UTLX owns all 17 of the cars found leaking as described above. Each of the leaking cars was configured with liquid line ball valves sold by UTLX's affiliate, McKenzie, and each valve was configured with a 3" standalone plug as a closure. FRA identified the leaking valves as 3" McKenzie UNNR threaded ball valves (McKenzie valves).

McKenzie provided FRA several valve configuration drawings indicating that the valve was a full port valve. This configuration requires a 3" x 2" reducer bushing with a 2" plug to prevent contact between the closure plug and the valve ball. McKenzie also informed FRA that it markets and sells the same design of valve in 1" and 2" models. For the 2" valve, McKenzie specified the use of a 1" plug and an appropriately sized reducer.

At FRA's request, UTLX provided FRA drawings of the top fittings arrangements for these cars. However, unlike the drawings provided by McKenzie, the UTLX drawings provided by UTLX did not include a full port valve with a reducer bushing.

Instead, consistent with the physical configuration of the tank cars FRA inspected, the drawings showed a full port threaded valve along with a 3" plug and chain.

On January 27, 2015, FRA conducted field testing of the McKenzie valves at UTLX's Altoona, PA, tank car repair facility. FRA tested new 1", 2", and 3" McKenzie valves at the facility's valve shop. The field testing included two cycles of application and removal of each valve's plug. FRA found that the 1" and 2" McKenzie valves showed no signs of contact between the valve ball when a 1" or 2" closure plug was installed and tightened. However, when a 3" closure plug was applied and tightened in the 3" McKenzie valve, the plug contacted and damaged the ball. The damage observed during this testing was consistent with the type of damage observed on the leaking UTLX tank cars described above.

FRA's field testing further found that the application of downward force on the valve ball applied by the 3" plug resulted in the over-compression, damage, and misalignment of the inboard seal, causing the valve to leak. FRA also observed that once a valve's ball is damaged, when the valve is subsequently opened, the damaged surface of the ball also damaged the valve's top seals by tearing the seals. This further compromises the valve's seal. Additionally, FRA understands that with repeated opening and closing (exemplifying in-service use), the valve's threads will degrade, necessitating further engagement of the threads during subsequent applications of the plug. This continual degradation of the threads will require increasingly more tightening of the plug, exacerbating the damage to the ball and seals. In summary, FRA found that normal application and tightening of the 3" plug in a 3" McKenzie valve destroys the valve seal integrity.

FRA conducted a followup investigation at the UTLX facility in Altoona to perform a leak test of the 3" McKenzie valve that was field tested and damaged on January 27, 2015. Although the designed leak-free working pressure of this valve is up to 500 pounds per square inch (psi), the leak test procedure requires that the valve hold a minimum pressure of 30 psi. The subject McKenzie valve failed to retain the minimum 30 psi of compressed air test pressure. The valve showed signs of a significant leak.

As required by Title 49 Code of Federal Regulations (CFR) 179.100–13 and 179.200–16 of the Federal Hazardous Materials Regulations (49 CFR Parts 171–180; (HMR)), all valves applied to tanks cars must be of an approved design. The term “approved” is defined in 49 CFR 179.2 as “approved by the [AAR] Tank Car Committee.”<sup>2</sup>

McKenzie provided FRA with the Association of American Railroads (AAR) approval letters for the McKenzie valves. While McKenzie may have believed these approvals were sufficient, the provided AAR approvals demonstrate clear inconsistencies between the type of valve design that AAR approved versus the design of the valve actually being used and the design depicted on the valve configuration drawings both McKenzie and UTLX provided to FRA. AAR Approval E-077035 (October 26, 2007) is a renewal of previous AAR approvals,<sup>3</sup> and describes a 3" standard port threaded ball

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<sup>2</sup> As background, the Tank Car Committee is composed of various railroad industry representatives, including railroads, tank car shipper and owner organizations, tank car builders, and chemical and industry associations. FRA and the DOT's Pipeline and Hazardous Materials Safety Administration also participate in the Tank Car Committee's processes. The Tank Car Committee has traditionally been the body with the expertise to develop tank car design, construction, and maintenance standards in this country. DOT sets minimum tank car specifications at 49 CFR part 179, and AAR approves designs meeting the requirements of part 179.

<sup>3</sup> AAR Approval E-977030 (April 9, 1997). AAR Approval E-977030 was a renewal of AAR Approval E-897047 (June 21, 1989), which also referred to UTLX Drawing 72916.

valve. The original approvals that AAR renewed described and referred to UTLX Drawing 72916, which depicts a 3" standard port threaded ball valve. In contrast, the 3" McKenzie valve at issue is a full port ball valve. A full port valve is different from a standard port valve.<sup>4</sup> The dimensions of the valve body that AAR approved is significantly longer than the bodies of the valves depicted on the McKenzie drawings and the bodies of the valves actually installed on the leaking tank cars. McKenzie also provided a copy of a September 29, 2008, application for approval of a 3" threaded full port valve (AAR application number E-087016), but neither McKenzie nor AAR have provided evidence of that valve's subsequent approval.

McKenzie provided information to FRA indicating that from 2009 through the present, it sold approximately 11,200 of the 3" valves to a variety of tank car owners and tank car facilities. McKenzie indicates that since 2012, its sales of these valves were predominantly to replace in-kind valves previously installed on existing tank cars. Further, McKenzie informed FRA that as of January 26, 2015, the company has stopped selling the 3" valves as a result of the noted safety concerns. Overall, McKenzie and UTLX provided information leading FRA to conclude that approximately 6,000 DOT Specification railroad tank cars are equipped with the unapproved 3" McKenzie UNNR valves. In addition, McKenzie indicates that it has sold over 37,000 1" and 2" valves to a variety of tank car owners and tank car facilities.

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<sup>4</sup> The difference between a full port and standard port ball valve is the size of the ball's bore diameter as related to nominal pipe sizes, with the ball size being in proportion to the bore size diameter. The bore size in a full port valve is that of its nominal pipe size, where the bore size in a standard port valve is that of the next smallest nominal pipe size. For example, the bore diameter for a 3" standard port ball valve is approximately 2.25", or one pipe size smaller, and for a full port ball valve, the bore diameter is approximately 3" in diameter (the actual size of the pipe).

To date, FRA has identified only a small number of relatively minor hazardous materials leaks directly attributable to the identified McKenzie valves. FRA believes that the number of leaks potentially attributable to the identified McKenzie valves used in tank car liquid lines could be much higher. Based on FRA's field testing, the 3" McKenzie valve appears to present an immediate safety issue in certain circumstances. While the 1" and 2" McKenzie valves do not appear to present similar concerns, based on the information that AAR, McKenzie, and UTLX have provided to date, it does not appear that any size of the McKenzie valves (i.e., the 1", 2", or 3" UNNR valves) are currently approved for use on railroad tank cars. Accordingly, use of such valves on tank cars is in violation of the HMR. At this time, FRA is not aware of any non-accident releases or other releases from railroad tank cars involving the 1" or 2" McKenzie valves, but since the valves have not been approved by AAR they have not been shown to be safe for use on railroad tank cars.

McKenzie and UTLX have taken independent actions to address some of the safety concerns with the 3" valves. However, FRA believes those actions fail to adequately address the safety issue the valves present.

**Railworthiness Directive:** Based on the above discussion, and acting under the authority granted in 49 CFR 180.509(b)(4), FRA finds that the continued use of railroad tank cars equipped with the unapproved McKenzie UNNR threaded ball valves (including the 1", 2", and 3" UNNR valves) to transport hazardous materials by rail in the United States presents an unsafe operating condition. The use of such tank cars equipped with these valves could result in the release of hazardous materials. Further, the use of tank cars equipped with these McKenzie valves used to transport hazardous materials in

the United States violates the requirements of the HMR. FRA is issuing this directive to ensure public safety, ensure compliance with the applicable Federal regulations governing the safe movement of hazardous materials by rail, and restore the railworthiness of all tank cars equipped with the above-described McKenzie valves.

Upon the effective date of this Directive, any railroad tank car equipped with an unapproved McKenzie UNNR threaded ball valve (McKenzie valve) is prohibited from being loaded with any hazardous material described in 49 CFR 172.101 and offered into transportation until the requirements listed below are met. Tank car owners<sup>5</sup> of tank cars equipped with McKenzie valves must:

- (1) Identify the railroad tank cars in their fleet equipped with any McKenzie valve.
- (2) Provide to FRA: (a) the reporting mark and number of each car equipped with any McKenzie valve; and (b) the type of valve each car is equipped with.
- (3) Create and maintain for a minimum of 6 months from the effective date of this directive a record of the inspection of each McKenzie valve. The record must include, at a minimum, the inspection date and location, as well as the results of the inspection (i.e., whether the valve was removed or not). The record must be made available to FRA for inspection upon request.
- (4) Immediately inspect the 3" McKenzie valves on each affected car. If any valve is configured with a 3" standalone plug, ensure that the car is not loaded and offered into transportation until that valve is replaced with an approved valve consistent with 49 CFR part 179. In addition, any tank car equipped with an unapproved 3"

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<sup>5</sup> The term "tank car owners" is as defined in 49 CFR 180.503.



McKenzie valve is prohibited from being offered into transportation (whether loaded or residue) after May 12, 2015.

(5) Immediately inspect the 1" and 2" McKenzie valves on each affected car. If any valve shows evidence of mechanical damage, ensure that the car is not loaded and offered into transportation until that valve is replaced with an approved valve consistent with 49 CFR part 179. Even if a valve is not damaged, a tank car equipped with an unapproved 1" or 2" McKenzie valve is prohibited from being offered into transportation (whether loaded or residue) after June 11, 2015.

(6) Ensure that each unapproved McKenzie valve is removed and replaced by an entity permitted to perform such work in accordance with 49 CFR part 179.

(7) Ensure the valve application is properly qualified as required by subpart F of 49 CFR Part 180.

After tank car owners have inspected and/or replaced the unapproved valves on each affected tank car as required above, and have provided the necessary information regarding that car to FRA, tank car owners may load the cars with hazardous materials and offer those cars for transportation. Alternatively, if upon an adequate showing demonstrating the safety of the 1" and 2" valves, McKenzie obtains AAR's approval for the use of those valves on DOT Specification 111 tank cars, cars equipped with these 1" or 2" McKenzie valves may be returned to hazardous materials service.

Tank car owners must send the information required to be submitted to FRA under this Directive to:

Mr. Randy M. Keltz, Jr.

Tank Car Quality Assurance Specialist

Office of Railroad Safety  
Federal Railroad Administration  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
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Regardless of any entity's compliance with this directive, FRA reserves the right to seek civil penalties or to take any other appropriate enforcement action for violations of the HMR that have occurred. FRA will be conducting an investigation to ensure that all tank cars equipped with the valves in question are identified and repaired consistent with the requirements of this Directive.

Issued in Washington, DC, on MAR 13 2015



Robert C. Lauby  
Associate Administrator for Railroad Safety  
Chief Safety Officer