



**U.S. Department
of Transportation**

Federal Railroad
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

JUL 29 2013

Mr. Jack Gerard
American Petroleum Institute
1220 L Street NW
Washington, DC 20005

Dear Mr. Gerard:

The Federal Railroad Administration (FRA) is reviewing potential safety issues related to the transportation of crude oil by rail. FRA has specific safety concerns about the proper classification of crude oil being shipped by rail, the subsequent determination or selection of the proper tank car packaging used for transporting crude oil, and the corresponding tank car outage requirements. This letter presents the basis for FRA’s concerns regarding these potential safety issues, notifies you of our intended path forward, and provides recommendations to help ensure compliance with the Department of Transportation’s (DOT) applicable Hazardous Materials Regulations (HMR; Title 49 Code of Federal Regulations (CFR) Parts 171–180). In addition, we request that you distribute this letter to those of your members that ship crude oil via rail.

Industry statistics demonstrate that, in terms of rail originations, crude oil shipments are the fastest growing of all hazardous materials shipped by rail. According to the Association of American Railroads’ (AAR) Annual Report of Hazardous Materials Transported by Rail for 2012, the number of crude oil originations has increased by 443 percent since 2005.

Table 1: Annual number of originations of tank cars containing crude oil, hazardous materials in tank cars, and all hazardous materials

Year	Crude Oil (4910165)	Crude Oil (4915165)	Total HM in tank cars	Total HM
2005	2,626 (71)	4,472 (45)	1,355,070	1,587,469
2006	2,573 (71)	3,510 (61)	1,370,674	1,571,665
2007	2,235 (79)	4,772 (46)	1,440,341	1,988,294
2008	7,524 (34)	4,368 (51)	1,444,194	1,999,757
2009	7,961 (28)	4,940 (42)	1,379,949	1,895,066
2010	27,979 (8)	5,746 (40)	1,525,540	2,085,361
2011	74,057 (4)	6,117 (40)	1,616,580	2,242,389
2012	257,450 (2)	7,096 (48)	1,789,529	2,474,356

In addition, crude oil transportation presents unique operating considerations because, in general, crude oil is transported in units of cars (blocks of crude oil cars within a train) and by entire unit trains consisting wholly of tank cars containing crude oil. Tank cars containing crude oil are typically loaded by one of two methods: transloading (where crude oil from cargo tanks is transferred directly into tank cars) or bulk loading operations (where crude oil is delivered to a bulk storage facility and the crude oil is then transferred from storage tanks to the railroad tank cars). In both operations, there is a blend of crude oil from a variety of sources in each tank car and the properties of the materials may vary depending on the constituent crude oils.

The HMR require that an offeror (shipper) of a hazardous material properly classify and describe the hazardous material. See 49 CFR § 171.1. To attest compliance with the HMR, a shipper of a hazardous material must also certify that the hazardous material being offered into transportation is offered in compliance with the HMR. Further, the HMR prohibit a shipper from offering hazardous material for transportation unless a tank car being used to transport such hazardous material meets the applicable HMR requirements. See, for example, 49 CFR § 171.2. Only after the properties of a hazardous material are determined and the material is properly classified can a shipper ensure compliance with the HMR. In the case of crude oil, relevant properties to properly classify the material include: flash point, corrosivity, specific gravity at loading and reference temperatures, and the presence and concentration of specific compounds such as sulfur (as found in sour crude oil). This information enables a shipper to properly classify a hazardous material and select the proper HMR-authorized packaging for transportation of that hazardous material. Such information and determination of the authorized packaging also ensures that the required tank car outage can be maintained.

FRA's safety concerns stem from the following three considerations.

1. Crude oil transported by rail often derives from different sources and is then blended, so it is critical that shippers determine the proper classification of the crude oil per the HMR. FRA audits of crude oil loading facilities indicate that the classification of crude oil being transported by rail is often based solely on Material Safety Data Sheet (MSDS) data that only provides a material classification and a range of material properties. This MSDS information is typically provided by the consignee to the shipper, and the shipper is unaware of validation of the values of the crude oil properties. Further, FRA's audits indicate that MSDS information is not gleaned from any recently conducted tests or from testing for the many different sources (wells) of the crude oil. For example, a shipper provided information to FRA showing that crude oil being transported by rail had a flash point of 68° F, or a Packing Group I hazardous material. However, the crude oil had been improperly classified as a Packing Group III material and was being transported in AAR class tank cars that were not equipped with the required design enhancements. This constituted a misuse of the crude oil HMR packaging exceptions and subsequent violations of the HMR.

The HMR contain exceptions that allow for the use of non-DOT-specification tank cars for the transportation of crude oil in certain circumstances. Title 49 CFR § 173.150(f)(1) states, “A flammable liquid with a flash point at or above 38 °C (100 °F) that does not meet the definition of any other hazard class may be reclassified as a combustible liquid.” Further, 49 CFR § 173.150(f)(3) allows materials that are classified as combustible liquids to be transported in non-DOT-specification bulk packagings.¹ As such, AAR 211 class cars are permitted to be used to transport crude oil that has been classified as a Packing Group III material with a relatively high flash point. These cars are not built and/or maintained to the standard of a DOT-specification tank car. This distinction has safety implications if the crude oil being transported has been improperly classified and actually has a lower flash point and is a Packing Group I flammable liquid hazardous material. If improperly classified, the crude oil might then be shipped in a lesser standard tank car, as occurred in the above example.

Unfortunately, the AAR standard transportation commodity code data does not distinguish between the different packing groups within the hazard class. Without further information in that regard, and in relation to the accuracy of crude oil classifications being made, FRA can only speculate as to the number of potential crude oil shipments that are being made in AAR class tank cars in violation of the HMR. Recently, the AAR Tank Car Committee introduced new requirements for tank cars constructed for ethanol and crude oil (Packing Groups I and II) service. The new requirements are intended to improve the crashworthiness of the tank cars and include a thicker shell, head protection, top fittings protection, and relief valves with a greater flow capacity. Clearly, any improper classification of crude oil and subsequent shipment in an unauthorized tank car contravenes these industry efforts to improve the safety of transporting hazardous materials, and it also contravenes the requirements of the HMR.

2. Title 49 CFR § 173.24b(a) sets the minimum tank car outage for crude oil at 1 percent at a reference temperature based on the existence of tank car insulation. A crude oil shipper must know the specific gravity of the hazardous material at the reference temperature as well as the temperature and specific gravity of the material at that temperature when loaded. This information is then used to calculate the total quantity that can be safely loaded into the car to comply with the HMR’s 1-percent outage requirement. Because it is likely that the temperature of the hazardous material loaded into the car is lower than the reference temperature, the outage after the car is loaded will likely be greater than 1 percent. If the outage is not properly calculated because the material’s specific gravity is unknown (or is provided only as a range), the tank car could be loaded such that if the temperature increases during transportation, the tank will become shell-full and the material will leak from the valve fittings or manway.

¹ Section 172.102, Special Provision B1, states, “If the material has a flash point at or above 38 °C (100 °F) and below 93 °C (200 °F), then the bulk packaging requirements of § 173.241 of this subchapter are applicable.”

Since 2004, approximately 10 percent of the one-time movement approval (OTMA) requests that FRA has received have been submitted to move overloaded tank cars.² Of these requests, 33 percent were tank cars containing flammable liquids. FRA notes that tank cars overloaded by weight are typically identified when the tank cars go over a weigh-in-motion scale at a railroad's classification yard. As indicated above, crude oil is typically moved in unit trains, and the cars in a unit train do not typically pass over weigh-in-motion scales in classification yards. Therefore it is unlikely that FRA would receive many OTMA requests for overloaded tank cars containing crude oil. Moreover, crude oil accounted for the most nonaccident releases (NARs) by commodity in 2012, nearly doubling the next highest commodity (alcohols not otherwise specified, which accounts for a comparable annual volume transported by rail). FRA's data indicates that 98 percent of the NARs involved loaded tank cars. Also, less than 2 percent of the NARs occurred at the bottom outlet valve. Product releases through the top valves and fittings of tank cars when the hazardous material expands during transportation suggest that loading facilities may not know the specific gravity of the hazardous materials loaded into railroad tank cars, resulting in a lack of sufficient outage.

3. FRA's review of the OTMA data also indicates an increasing number of incidents involving damage to tank cars in crude oil service in the form of severe corrosion of the internal surface of the tank, manway covers, and valves and fittings. A possible cause is contamination of the crude oil by materials used in the fracturing process that are corrosive to the tank car tank and service equipment. Therefore, when crude oil is loaded into tank cars, it is critical that the existence and concentration of specific elements or compounds be identified, along with the corrosivity of the materials to the tank car tanks and service equipment. Proper identification of these elements will enable a shipper to ensure the reliability of the tank car. Proper identification also enables a shipper to determine if there is a need for an interior coating or lining, alternative materials of construction for valves and fittings, and performance requirements for fluid sealing elements, such as gaskets and o-rings.

As a result of the concerns outlined above, FRA is investigating whether crude oil is being properly classified and, subsequently, whether the proper tank car packagings are being used for transportation. As part of this investigation, FRA will be requesting analytical data supporting the current classification of a shipper's crude oil, as well as information related to shipper crude oil loading practices. If analytical data regarding the current classification of crude oil is not available, FRA, in partnership with the Pipeline and Hazardous Materials Safety Administration (PHMSA), may use PHMSA's Hazardous Materials Testing Program. Under this program, a sample of a shipper's hazardous material is sent to a certified laboratory for testing, and the results of the laboratory testing are then shared with the shipper. FRA may also consider exercising its authority under 49 CFR § 109.9 to determine whether crude oil is being properly classified and transported in HMR-authorized packaging. If an investigation reveals that crude oil is not being properly classified per the HMR, FRA may use its enforcement tools to address noncompliance. Some of these enforcement tools

² Per 49 CFR § 174.50, an OTMA is required to move a nonconforming DOT-specification bulk packaging for cleaning and/or repair.

include the issuance of compliance orders, emergency orders, and civil penalties. See 49 CFR Parts 209 and 211.

FRA recommends that shippers evaluate their processes for testing, classifying, and packaging the crude oil that they offer into transportation via railroad tank car. The frequency and type of testing should be based on a shipper's knowledge of the hazardous material, with specific consideration given to the volume of hazardous material shipped, the variety of sources that the hazardous material is generated from, and the processes that generate the hazardous material.

FRA welcomes the opportunity to assist crude oil shippers in their efforts to comply with the HMR. Please contact Mr. Karl Alexy, Staff Director, Hazardous Materials Division, at (202) 493-6245 or Karl.Alexy@dot.gov to discuss this matter further.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas J. Herrmann", with a long horizontal line extending to the right.

Thomas J. Herrmann
Acting Director, Office of Safety Assurance and Compliance