



U.S. Department  
of Transportation  
**Pipeline and Hazardous  
Materials Safety  
Administration**

1200 New Jersey Avenue, SE  
Washington, DC 20590

May 4, 2015

The Honorable Christopher A. Hart  
Chairman  
National Transportation Safety Board  
490 L'Enfant Plaza, SW  
Washington, DC 20594

Dear Chairman Hart:

This letter responds to the National Transportation Safety Board's (NTSB) April 3, 2015, letter urging the Pipeline and Hazardous Materials Safety Administration (PHMSA) to take action on new Safety Recommendations concerning rail transportation of Class 3 flammable liquids. These new Safety Recommendations, R-15-14 through R-15-17, resulted from the NTSB's examination of damaged tank cars following the February 16, 2015, derailment of a CSX Transportation crude oil unit train in Mount Carbon, West Virginia, as well as a review of data collected from several other crude oil unit train accidents occurring in the same timeframe. These Safety Recommendations address the retrofit of Specification DOT-111 tank cars with thermal protection systems that are used to transport Class 3 flammable liquids (hereafter referred to as "flammable liquid").

We thank the NTSB for its vigilance on this transportation safety issue and its continued investigative efforts to improve rail transportation safety for crude oil, ethanol, and other flammable liquids. We share your commitment to enhancing the safety of rail transportation, and are pleased to inform you that Secretary Anthony R. Foxx has signed and announced a final rule entitled "Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains" (HM-251). Pending publication of the final rule in the *Federal Register*, we posted the signed version at our website homepage for public viewing. This rule focuses on prevention, mitigation, and response, to manage and reduce the risk posed by the transportation of flammable liquids by rail tank car. Through tremendous collaborative efforts with the Federal Railroad Administration (FRA), we established a comprehensive solution designed to reduce the probability and minimize the consequences of an accident. We have adopted risk mitigation requirements that address braking, classification, operating speeds, and routing to reduce the probability of accidents. Finally, we adopted enhanced design and performance standards for rail tank cars in flammable liquid service to minimize the consequence of an accident. The required safety measures and the timeline for phase-out and

retrofit of legacy tank cars used in high-hazard flammable train (HHFT)<sup>a</sup> service will strike a balance between the safety needs of rail transportation of flammable liquids and the economic viability of the rail industry. Upon consideration of shop capacity, the comments received on the Notice of Proposed Rulemaking (NPRM), and the potential impacts associated with the retrofit schedule, PHMSA recognizes the need to upgrade the rail car fleet, but finds that a targeted phase-out of the DOT-111 tank cars is the most prudent and protective approach.

#### R-15-14

*Require that all new and existing tank cars used to transport all Class 3 flammable liquids be equipped with thermal protection systems that meet or exceed the thermal performance standards outlined in Title 49 Code of Federal Regulations 179.18(a) and are appropriately qualified for the tank car configuration and the commodity transported.*

#### R-15-15

*In conjunction with thermal protection systems called for in safety recommendation R-15-29, require that all new and existing tank cars used to transport all Class 3 flammable liquids be equipped with appropriately sized pressure relief devices that allow the release of pressure under fire conditions to ensure thermal performance that meets or exceeds the requirements of Title 49 Code of Federal Regulations 179.18(a), and that minimizes the likelihood of energetic thermal ruptures.*

We concur with these recommendations, and our rulemaking will implement them in many situations identified by the NTSB. As discussed in our August 1, 2014 NPRM, thermal protection systems do increase tank car protection in a pool fire environment such that it can delay, or even prevent, thermal ruptures caused by extreme heat, increasing internal tank pressure, and tank wall thinning. Further, appropriately sized pressure relief devices (PRDs) also provide safety benefits by allowing for sufficient release of pressure under fire conditions. A thermal protection system serves to prolong the survivability of a tank exposed to a pool or torch fire by limiting the heat flux into the tank and its lading, thereby delaying the increase in pressure in the tank exceeding the start-to-discharge pressure of the PRD. If a PRD on a tank car exposed to a pool fire is under the liquid level of the tank, the thermal protection system will help delay the release of the lading through the PRD. Based on the results of simulations, an approved thermal protection system delays rupture of a tank until most of the lading has been expelled through the PRD and lessens the energy available if a rupture were to occur. Therefore, consistent with NTSB's recommendation, PHMSA has adopted thermal protection system requirements, as specified in 49 CFR 179.18, to include a reclosing PRD conforming to 49 CFR 173.31(b)(2), for new tank cars (i.e., DOT-117s) constructed after October 1, 2015, and to be used in flammable liquid service as part of a HHFT. In addition, we have adopted the same

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<sup>a</sup> A HHFT is defined as any train transporting 20 or more tank cars loaded with Class 3 flammable liquid in a continuous block or any train carrying 35 or more tank cars loaded with Class 3 flammable liquid throughout the train consist. Thus a tank car that is not transported as part of a HHFT would not be required to be equipped with a thermal protection system.

requirements for retrofit of existing DOT-111 and CPC-1232 tank cars to ensure all existing tank cars used in a HHFT are equipped with a thermal protection system and appropriately sized PRDs. When combined with the enhanced design and performance criteria (e.g., head shields, jackets) also adopted for DOT-117 tank cars and retrofit tanks cars (i.e., DOT-117Rs), we believe our actions in the final rule are sufficiently “robust” to account for variables such as damage that may occur under accident conditions.

However, our approach differs from the NTSB’s recommendation in that the thermal protection system requirement is justified only for higher risk train configurations. Our regulatory impact analysis does not support extending this requirement to all tank cars configured in any type of train. PHMSA and FRA do not intend to impose thermal protection system performance standards on lower risk, “manifest” trains. Our objective has been to address the higher risk HHFT configurations as reflected in the series of unit train derailment accidents that have resulted in these and other recommendations. Additionally, based on stakeholder comment to our proposed rule and our regulatory impact analysis, requiring thermal protection system performance standards for every tank car loaded with flammable liquid would be overly burdensome, particularly for small entities, and would not yield sufficient safety benefits relative to the cost of retrofitting existing tank cars to meet such a requirement. Therefore, in an effort to provide regulatory flexibility, maximize safety benefits, and limit cost impacts, we have excluded lower risk, “manifest” train configurations, by applying the thermal protection system requirements (including PRDs) to tank cars used as part of a HHFT, as described in the footnote below.

#### R-15-16

*Require an aggressive, intermediate progress milestone schedule, such as a 20 percent yearly completion metric over a 5-year implementation period, for the replacement or retrofitting of legacy DOT-111 and CPC-1232 tank cars to appropriate tank car performance standards, that includes equipping these tank cars with jackets, thermal protection, and appropriately sized pressure relief devices.*

#### R-15-17

*Establish a publicly available reporting mechanism that reports at least annually, progress on retrofitting and replacing tank cars subject to thermal protection system performance standards as recommended in safety recommendation R-15-16.*

We concur that replacing or retrofitting of “legacy” DOT-111 and CPC-1232 tank cars should follow an “aggressive schedule.” PHMSA used a risk-based data analysis with stakeholder input to develop an implementation timeline that is commensurate with the safety risks introduced by the different tank car types and flammable liquids combinations. We adjusted the retrofit schedule to accommodate varying deadlines, and what we believe will effectively incorporate “intermediate progress milestone[s].” This assures the greatest amount of risk reduction in the shortest amount of time feasible. We target the highest risk combination of tank car types and

flammable liquid service (i.e., non-jacketed DOT-111 tank cars in PG I service) first, and impose the shortest implementation period on this segment of the tank car fleet and service by January 1, 2017 and January 1, 2018, respectively.

PHMSA's implementation timeline addresses the risks associated with varying tank car type and the characteristics of the flammable liquids according to its Packing Group (PG) assignment.

Regarding tank car types, we have categorized the tank car types as follows:

- 1) Non-jacketed DOT-111s;
- 2) Jacketed DOT-111s;
- 3) Non-jacketed CPC-1232s; and
- 4) Jacketed CPC-1232s.

Under the final rule, both new and existing tank cars used in flammable liquid service as part of an HHFT must be equipped with jackets, thermal protection systems, and upgraded PRDs. New tank cars must be constructed to enhanced design and performance standards starting October 1, 2015. The existing fleet must be retrofitted to include a thermal protection system and jacket according to a risk-based implementation timeline that prioritizes retrofit of higher risk tank car types and higher risk flammable liquids; or be placed out of this service. This timeline is reflected in Table 1 below.

<b>Table 1. Timeline for the Retrofit of Affected Tank Cars for Use in U.S. HHFTs</b>	
<b>Tank Car Type / Service</b>	<b>Retrofit Deadline</b>
Non Jacketed DOT-111 tank cars in PG I service	(January 1, 2017*) January 1, 2018
Jacketed DOT-111 tank cars in PG I service	March 1, 2018
Non-Jacketed CPC-1232 tank cars in PG I service	April 1, 2020
Non Jacketed DOT-111 tank cars in PG II service	May 1, 2023
Jacketed DOT-111 tank cars in PG II service	May 1, 2023
Non-Jacketed CPC-1232 tank cars in PG II service	July 1, 2023
Jacketed CPC-1232 tank cars in PG I and PG II service** and all remaining tank cars carrying PG III materials in an HHFT (pressure relief valve and valve handles).	May 1, 2025

The January 1, 2017, deadline triggers a reporting requirement for those entities that have not retrofitted all of their fleet as required. The report to DOT must include the number of tank cars they own or lease that have been retrofitted, and the number of those that have not yet been retrofitted. Conversely, the lowest risk tank car type (i.e., the jacketed CPC-1232), and tank cars carrying PG III flammable liquid material, will undergo retrofitting in conformance with the least aggressive deadline (May 1, 2025). Other tank cars and flammable liquid services are addressed by intermediate milestones as shown in Table 1. PHMSA and FRA have worked with Transport

Canada to harmonize our respective timelines. As a result, all tiers except for the first tier, of the retrofit schedule have been harmonized.

The year 2025 final deadline signals a total implementation period of 10 years; however, we believe our targeted approach to address the greatest risks posed by rail transport of flammable liquid in a shorter period of time satisfies the intent of Safety Recommendation R-15-16 (see Table 1). Notably, the entire fleet of the highest risk tank car type (i.e., non-jacketed or “legacy” DOT-111s in PG I service) will be removed from service or be retrofitted in less than 5 years and all PG I service with these tank cars in HHFTs will cease in 5 years. Further, we fully expect the majority of tank cars in the last, lowest risk grouping (i.e., jacketed CPC-1232 tank cars and all remaining tank cars carrying PG III materials), will be retrofitted markedly in advance of the 2025 deadline because of existing tank car requalification and maintenance scheduling.

Finally, we intend to collaborate with various stakeholders to develop an additional reporting mechanism to report the progress made in retrofitting or replacing tank car types in flammable liquid service used as part of a HHFT. We further note that PHMSA and FRA are collaborating with different stakeholders, including Transport Canada and the Association of American Railroads (AAR), to further address this issue. The industry’s achievement of other important milestones in the implementation timeline should be monitored and evaluated in some form. As a possible avenue for an additional reporting mechanism, at the AAR Tank Car Committee Meeting held in April 2015, Transport Canada, with PHMSA and FRA’s support, requested the AAR modify the rail industry’s Universal Machine Language Equipment Register (UMLER) System to include an appropriate reporting mechanism. Modifying UMLER in such a fashion should yield a variety of important metrics that could then be used to assess and report on the progress made in retrofitting or replacing the population of tank cars subject to the thermal protection system requirements. We will update the NTSB on any future progress with regard to a publicly available reporting mechanism.

### **Other Related NTSB Safety Recommendations**

#### R-12-5

*Require all newly manufactured and existing general service tank cars authorized for transportation of denatured fuel ethanol and crude oil in PGs I and II have enhanced tank head and shell puncture resistance systems and top fittings protection that exceed existing design requirements for DOT Specification 111 (DOT-111) tank cars.*

#### R-12-6

*Require all bottom outlet valves used on newly manufactured and existing non-pressure tank cars are designed to remain closed during accidents in which the valve and operating handle are subjected to impact forces.*

These recommendations were issued to PHMSA as a result of the NTSB's investigation of a June 19, 2009, train derailment in Cherry Valley, Illinois. The incident occurred at a rail grade crossing and involved the derailment of 15 DOT-111 rail tank cars that led to the release of ethanol, and a subsequent fire. The incident resulted in a fatality, several injuries, the evacuation of nearby residents, and close to \$8 million in monetary damages. The NTSB concluded in part that inadequate design features of a DOT-111 rail tank car made it susceptible to damage and catastrophic loss of hazardous material during the derailment, and thus, contributed to the severity of the incident.

We concur in part with these recommendations. This final rule includes several enhancements to design and performance criteria for new and existing tank cars used as part of a HHFT that exceed the existing requirements for Specification DOT-111 tank cars. The safety measures will improve the survivability of rail tank cars in flammable liquid fuel service under accident conditions and will mitigate the consequences of these accidents. Specifically, new construction of tank cars placed in this service must conform to the enhanced safety measures of new Specification DOT-117, which includes a full-height ½-inch thick head shield, an increase in shell thickness to 9/16 inch minimum, and a minimum 11-gauge jacket all to improve puncture resistance. Additionally, we require a thermal protection system, protection of top fittings and removal or design of a bottom outlet valve (BOV) to prevent unintended actuation during accident conditions. Further, existing DOT-111 tanks cars in a HHFT will be required to be retrofitted with a full-height ½-inch thick head shield; a minimum 11-gauge jacket; a thermal protection system; and removal or design of a bottom outlet valve that prevents unintended actuation during accident conditions. We believe these safety features will result in fewer car punctures, fewer releases from the service equipment, and delayed release of flammable liquid through the PRDs or a tank car rupture.

Note however, PHMSA chose not to include enhanced top fitting protections as part of the retrofit requirement as the cost of such a retrofit is not supported by a corresponding safety benefit. PHMSA estimated that top fittings protection would add \$24,500 to the retrofit cost of each tank car, but would provide only a marginal (1.3%) additional safety protection. This is a minimal contribution to the overall safety enhancements when compared to the effect of full-height head shields, thermal protection, and a full jacket that reduces the probability of release. The combined retrofit cost of these components was estimated at \$27,400 per car. We estimate that outfitting legacy DOT-111s with top fittings protection might yield benefits of roughly one tenth or less the size of the cost. That being said, PHMSA is aware of AAR Tank Car Committee efforts as part of a task force to evaluate potential advancements in existing top fittings protections that may provide additional protection without significant modifications to the tank car. PHMSA and FRA urge industry to consider these enhancements that can be used for both new and retrofitted tank cars.

Regarding the recommended design enhancement of BOVs, we have adopted a requirement that all bottom outlet handles either be removed or be designed with a protection safety system(s) to prevent unintended actuation during train accident scenarios. We note that an AAR task force has been convened to develop a BOV design that would prevent opening during a derailment.

We believe that if a car owner and/or offeror chooses not to remove the handle for transportation, an easy to install design will soon be readily available at a low cost.

#### R-14-4

*Work with FRA to expand hazardous materials route planning and selection requirements for railroads under Title 49 Code of Federal Regulations 172.820 to include key trains transporting flammable liquids as defined by the AAR Circular No. OT-55-N and, where technically feasible, require rerouting to avoid transportation of such hazardous materials through populated and other sensitive areas.*

We concur. The final rule expands the applicability of route planning and selection requirements to include HHFTs. Rail carriers transporting HHFTs will be required to perform additional safety and security planning (route planning) requirements to include compilation of commodity flow data, route(s) analysis including identification of alternatives, and determination of the safest, most secure route(s). We note that an overwhelming majority of commenters to our proposed rule expressed support for additional routing requirements for HHFTs and that the NTSB commented it believes that the proposed requirement, if implemented, would satisfy the intent of this recommendation.

#### R-14-6

*Require shippers to sufficiently test and document the physical and chemical characteristics of hazardous materials to ensure the proper classification, packaging, and record-keeping of products offered in transportation.*

We concur. The final rule adopts a new section 49 CFR 173.41, which plainly outlines minimum sampling and testing requirements for shippers transporting unrefined petroleum-based products, i.e., hazardous petroleum hydrocarbons extracted from the earth that has yet to be refined for consumer or industrial use. The new section also reinforces the certification requirement of 49 CFR 172.204, requires documentation of the testing and sampling program, and must make this information available to DOT personnel, upon request. The sampling and testing program requirements address the following key elements to ensure the variability of the physical and chemical characteristics of these products are carefully considered for purposes of classification, selection of packaging, and documentation for materials offered in transportation:

- Sampling and testing frequency that accounts for variability of the material;
- Sampling prior to offering into transport or at any instance when the material properties may change (e.g., at a point in the supply chain where material from different sources are mixed or blended);
- Sampling methodology to ensure a representative sample is collected;
- Use of test methods that enable classification in accordance with the 49 CFR;
- Quality control measures for sampling frequencies;
- Duplicate sampling or equivalent measures for quality assurance;

- Criteria for modifying the sampling and testing program; and
- Testing or other appropriate methods used to identify properties of the mixture relevant to packaging requirements.

We also concur with NTSB that the inherent safety of the hazardous materials transportation network is based on the shippers' classification of hazardous materials. Proper classification is integral to determination of the appropriate packaging, hazard communication, and emergency response. We disagree that there should be an across-the-board requirement to test and document the physical and chemical characteristics. Shippers of hazardous material are already required to certify performance and properly classify and describe hazardous material (see 49 CFR 172.204 and 173.22(a) (1), respectively). To a great extent, this is a matter of reinforcing what is already codified rather adopting new regulation. Unrefined petroleum-based products present a unique situation such that the classification of the material may change because of the potential for variability in the material properties as a function of time, location, method of extraction, temperature at time of extraction, and the type and extent of conditioning or processing of the material. The intent of the requirement of this sampling and testing plan is to address these materials that have inherent variability of properties. The physical and chemical properties of manufactured and refined products are typically purer and therefore follow a more predictable classification pattern than other, lesser-known materials. Additionally, we believe a requirement for a testing and documentation program for all hazardous material and oversight of such a requirement would be overly burdensome and in some ways duplicative as, for example, the Occupational Safety and Health Administration already has documentation requirements for hazardous chemical products under its Safety Data Sheet requirement which includes a requirement for information on physical and chemical properties. At this time, we plan no further action to require shippers to sufficiently test and document the physical and chemical characteristics of hazardous materials beyond the scope of the final rule.

#### R-14-14

*Require railroads transporting hazardous materials through communities to provide emergency responders and local and state emergency planning committees with current commodity flow data and assist with the development of emergency operations and response plans.*

We concur with this recommendation. This recommendation was issued to DOT as a result of a train derailment on November 30, 2012. While traveling over a moveable bridge in Paulsboro, New Jersey, three tank cars containing vinyl chloride came to rest in Mantua Creek, of which one was breached and released about 20,000 gallons of vinyl chloride (a division 2.1 flammable gas). Nearby residents sought medical attention for possible exposure, and the train crew and many emergency responders were also exposed. Damage estimates were \$451,000 for equipment and about \$30 million for emergency response and remediation.

As discussed above for Safety Recommendation R-14-4, this final rule will require additional (route) planning requirements for rail carriers. As part of the route planning requirement, a rail



carrier transporting an HHFT will now have to annually compile HHFT commodity flow data for the previous calendar year based on route, line segment or series of line segments, and must use this data to analyze the safety and security risks of those and alternative routes. Additionally, the rail carrier must provide a point of contact to State and/or regional Fusion Centers that have been established to coordinate with state, local, and tribal officials on security issues and provide a point of contact to state, local and tribal officials in jurisdictions that may be affected by a rail carrier's routing decision.

We had proposed a requirement for notification of State Emergency Response Commissions of crude oil transportation (for specific crude oil shipments). Commenters both supported and opposed this measure. For those opposed, the consensus was that applicability for notification would be too narrow. This coincides with the NTSB's September 26, 2014 comment to the docket for this rulemaking, urging PHMSA to fully address this recommendation (to apply to all classes of hazardous material) or, for purposes of the rulemaking, apply to all Class 3 flammable materials at a minimum.

Not adopting the proposed separate notification requirements and instead relying on the expansion of the existing route analysis and consultation requirements of 49 CFR 172.820 to include HHFTs allows for consistency with the route planning regulatory scheme in the 49 CFR. Specifically, this provides for consistency of notification requirements for rail carriers transporting security sensitive hazardous materials subject to the routing requirements. Additionally, it allows for applicability to all flammable liquids transported as part of a HHFT.

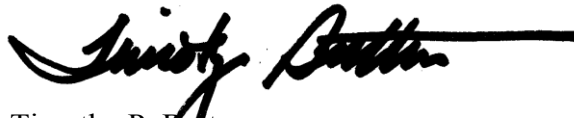
Furthermore, on January 27, 2015, AAR's Safety and Operations Management Committee made changes to OT-55 (AAR Circular No. OT-55-O), to revise the Transportation Community Awareness and Emergency Response Implementation (TRANSCAER®) program. The circular now states that "railroads will assist in implementing TRANSCAER, a system-wide community outreach program to improve community awareness, emergency planning, and incident response for the transportation of hazardous materials." Specifically, the key revised text of OT-55-O is "[u]pon written request, AAR members will provide bona fide emergency response agencies or planning groups with specific commodity flow information *covering all hazardous commodities transported through the community for a 12-month period in rank order.*" (Emphasis added).

The request must be made using an authorized form by an official emergency response or planning group. The formality of this process reflects that the railroad industry considers this information to be restricted information of a security sensitive nature. The recipient of the information must agree to release the information only to bona fide emergency response planning and response organizations and not distribute the information publicly in whole or in part without the railroad's express written permission. It should be noted that commercial requirements change over time, and it is possible that a hazardous material transported tomorrow might not be included in the specific commodity flow information provided upon request, since that information may not have been available at the time the list was generated.

We believe the combination of the new route planning requirements for HHFTs, the updated AAR OT-55 circular, and our efforts through our Hazardous Materials Emergency Preparedness (HMEP) Grant Program to provide grants to entities to conduct commodity flow studies, as related in our December 15, 2014 letter to the NTSB; speak to the intent of providing current commodity flow data and assistance with developing emergency response operations and plans.

If we can be of further assistance or answer any additional questions, please do not hesitate to contact Stephen Domotor, Chief Safety Officer/Assistant Administrator, at 202-366-7530 or at [Stephen.Domotor@dot.gov](mailto:Stephen.Domotor@dot.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Timothy P. Butters". The signature is written in a cursive style with a long horizontal stroke extending to the right.

Timothy P. Butters  
Deputy Administrator